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# Wankel Rotary Engine's Apex Seal/Trochoid Wear Chatter *'the Devil's Nail Marks Persist'*

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**Abstract-** A problem existing since 55 years causes Wankel rotary engine to seize before it achieves operational loading conditions. Leading engine manufacturers like Ford, Curtiss Wright, and Bentley have studied this problem and have cited series of patents, but the cause of the problem remains unknown. Existing research literature shows one of the primary indications are the chatter marks, popularly known as 'the devil's nail marks', causing engine failure. The present study focuses on the root cause analysis of the chattering phenomenon occurring at the contact sliding interface between trochoid substrate and apex seal. An analogy drawn from Shobert's carbon-brush vibration and chatter analysis concludes coefficient of friction, being the driving cause of chatter initiation, is directly proportional to the angle between the contact elements.

**Index Terms-** Tribology, Chattering, Wear, Scuffing, Surface Roughness

## I. INTRODUCTION

Felix Wankel patented the first rotary engine in 1929 with an idea to by-pass the traditional reciprocating piston motion. He wanted to achieve the four cycles – intake, compression, combustion, and exhaust while rotating, thus avoiding translating reciprocating motion into rotational motion. The steps towards research and development in rotary engines were taken in 1924, when Wankel was supported by the German Aviation Ministry and civil corporations to serve the national interest during World War II. Wankel, essentially, established the Institute of Engineering Study to develop rotary compressors. The idea turned to reality when he joined the prominent motorcycle manufacturer, NSU. In collaboration with NSU, the first Wankel engine of the type DKM rotary engine led to the birth of commercial rotary engines in 1957. Mazda, claiming itself as the sole automobile manufacturer in the world that produces rotary engine cars,<sup>1</sup> negotiated with NSU in 1961 to produce large number of Wankel engines for commercial use.<sup>2,3,4,5</sup>

“The Wankel engine has 48% fewer parts and about a third the bulk and weight of a reciprocating engine.”<sup>6</sup> It uses no pistons, piston pins, piston pin retainers, connecting rods, connecting rod bearings, crankshaft, and piston rings.<sup>7</sup> “The four-stroke cycle events occur in a moving combustion chamber between the inside of an epitrochoid shaped housing and a trochoidal rotor with bow-shaped flanks.”<sup>8</sup> Due to these characteristics, Wankel engines can achieve smooth and high engine operations.



Figure 1: Rotary Combustion Engine<sup>9</sup>

Before Mazda could move forward with practical usage of Wankel engines in automotive use, there were number of problems that served as an obstacle, the chatter marks being the most prominent causes out of all, and thus the important area of interest in this review. Mazda's team of engineers working in collaboration with the NSU named these chatter marks, 'the devil's nail marks', causing the engine failure.

### A. Trochoid Chattering

Chattering is a phenomenon that exists in a rotary engine caused by the vibrations between the apex seal and trochoid surface contact. The ripple-like marks called chatter are formed by the apex seals which were lifted off from the trochoid surface by a combination of events including combustion pressure and pushing of fuel and combustion residues along the surface; the seals would then touch down again with enough force to remove particles of the trochoid surface.<sup>10</sup> It affects the life and efficiency of the rotary engine and the engine components.

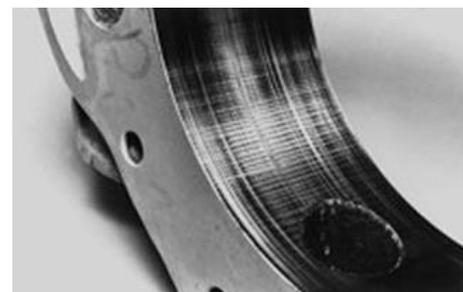


Figure 2: Trochoid chatter marks on Mazda's rotary engine<sup>10</sup>

### B. Patents claiming chatter elimination via studying materials, coatings and lubricants

Fuhrmann E. and Frenzel M. claimed that the weight of the sealing bars play an important role in the formation of chatter marks. "According to the invention, it is proposed to make the radially acting sealing bars in the form of hollow members, thus permitting extremely light-weight bar-like sealing elements."<sup>11</sup> Moskoqitz D. and Uy J. claimed inertial or dynamic mass weight of the seal element and the relative freedom from high interengaging friction as the two major aspects in the chatter problem. Their invention primarily focused on utilizing composition of materials, such as carbide, Nickel, Molybdenum disulfide etc, for the sealing element.<sup>12</sup>

Telang Y. and Uy J. invented a wear-resistant rotor housing for a rotary internal combustion engine by adding a coating of a mixture of martensitic stainless steel powder and a nickel-based alloy powder on the trochoid surface. The idea behind the invention was to achieve a stable hardness level of at least Rc 30 at operating temperatures of 400°F to minimize chatter.<sup>13</sup> Also, Jones C. found surface hardness a crucial factor in chatter elimination during his investigation to provide a liner of a wear resistant material on the inner surface of the trochoid wall to increase its wear life.<sup>14</sup>

Rogers T., Lemke W., Lefevre J, and Ohzawa T. performed a lubricants study to improve the efficiency and durability of rotary engines, addressing trochoid chatter wear.<sup>10</sup> Bedague P., Marchand P., Parc G., and Roux F. patented a method to lubricate 2-stroke engines and rotary engines. "The rotary engines fed with a fuel lubricant mixture, the fuel-lubricant compositions according to the invention are constituted to a conventional fuel from 50 ppm to 2% by weight with respect to said fuel."<sup>15</sup> Also, it was found that the addition of specific organic compounds to the base lubricants results in a highly improved lubrication composition for a rotary engine.

### C. Existing chatter in Wankel rotary UAV engines

The learning from the patents were utilized on the UAV rotary engines by the US Army and the engine still fails due to chattering. Two housings, LKI trochoid and Mazda RX-2, for the trochoid surface were tested for a duration of 100 hours, whose after-test measurements indicated substantial chattering on the trochoid surfaces leading to a complete engine failure (see LKI housing in figure 3 below).



Figure 3: Photograph of chatter marks after test operation of LKI trochoid housing

The patents fail to minimize contact surface temperature at the interface of apex seal and trochoid chatter and to minimize/eliminate the frictional energy generated at the sliding interface. Thus, the conclusion was drawn that the problem exists in identifying potential root cause of rotary engine trochoid chatter and that the understanding of parameters accounting for chattering is still lacking.

### D. Carbon-brush friction and chatter

Chattering, in general, can be seen as a result of rotary motion between the seal and trochoid surface that causes vibrations leading to chatter marks. These marks are caused due to friction, which was theoretically frame worked by Shobert. He conducted a mechanical brush holding experiment and found that different positions of the brush to the armature i.e. leading, radial, or trailing, results in a unique friction pattern. He also found that the angle between the brush and the armature plays an important role in determining the range of friction causing chatter.<sup>16</sup>

In this paper a systematic approach to evaluate materials, coatings, and lubricants and their combination to remove frictional heat (thermal energy) developed at the interface of the trochoid surface and the apex seal would be utilized. Materials and coatings would be identified that would eliminate friction at the sliding interface to maintain lubricant/additive chemistry. High modulus trochoid material with an objective on minimizing micro deflection of trochoid surface when chatter occurs would be of interest. Advanced fabrication methods, focusing additive manufacturing, would be taken into consideration majorly accounting towards cost reduction. The proposed solutions would aim to achieve an extended MTO target of 1000 hours with reduced fuel consumption, reduced power, and reduced engine cost.

## II. TECHNICAL CONCEPTS AND METHODOLOGY – EFFECTS OF VARYING PARAMETERS ON ENGINE PERFORMANCE

### A. Effect of angle variation on chatter initiation

Variation in electrical voltage was measured for varying positions of the brush against the armature. It was found that when the brush was positive as leading brush, as shown in figure 4, chatter resulted as a loss of voltage due to brush chatter on the voltage graphical readings (figure 5).

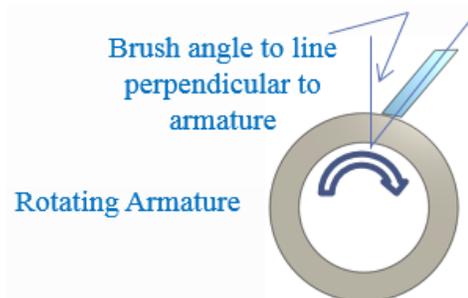


Figure 4: When brush is positive as leading brush (Chatter/Noise)

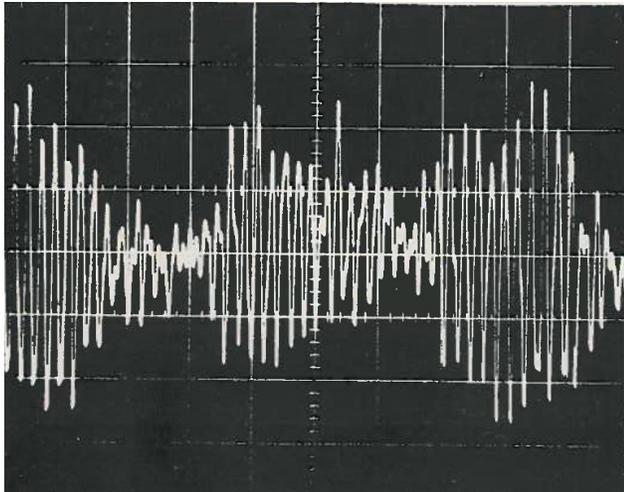


Figure 5: Vibration in electrical voltage (Chatter/Noise)<sup>16</sup>

Alternatively, when the brush was positive as trailing brush, as shown in figure 6, uniform electrical voltage was measured indicating no chatter (figure 7).

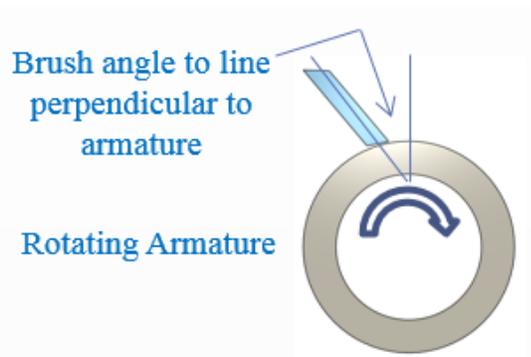


Figure 6: When brush is positive as trailing brush (No chatter)

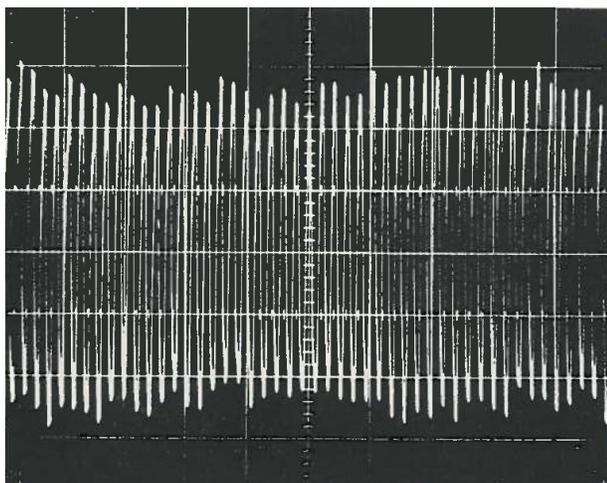


Figure 7: Uniform electrical voltage (No chatter)<sup>16</sup>

*B. Chatter angle varying as function of coefficient of friction*

The phenomena described above was theoretically formulated to describe relationship between coefficient of friction and the angle between centerline of brush and normal to armature, which comes out to be:

$$\theta = \tan^{-1}\mu \quad \text{Eq. 1}$$

where,

$\mu$  = coefficient of friction

$\theta$  = angle between centerline of brush and normal to armature

Equation 1 provides a valuable relationship indicating possible range of angles that results in chatter initiation in effect of friction, as shown in figure 8. It can be deduced that for large coefficient of friction magnitudes, the chatter start occurring at relatively large angles or vice-versa. The chatter angles were obtained using equation 1 for varying coefficient of friction, example, a friction of 0.1 yields an angle of 6°, 0.2 yields 12°, and 0.4 yields 22° etc . Thus, it gives an urge to lower the coefficient of friction, i.e. “zero friction”, to minimize/eliminate chatter by bringing the chatter angle to zero.

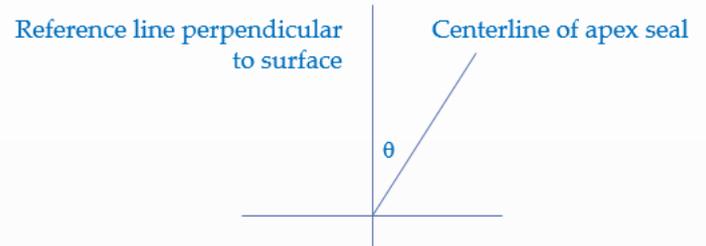


Figure 8: Effect of coefficient of friction  $\mu$  on range of angle  $\theta$  that chatter occurs

*C. Analysis of root cause of trochoid chatter caused by apex seal in Wankel rotary engine*

The brush chatter experimentation provides an analogous phenomenon that occurs in Wankel rotary engine. The chatter that was made to occur in Shobert’s mechanical system serves as a model to depict the trochoid chatter caused by the apex seal in Wankel rotary engine and thus serves as a potential root cause of the trochoid chatter problem. Figure 9 indicates the geometry relationship of apex seal centerline position with respect to instantaneous normal of line perpendicular to trochoid surface varies as the rotor rotates.

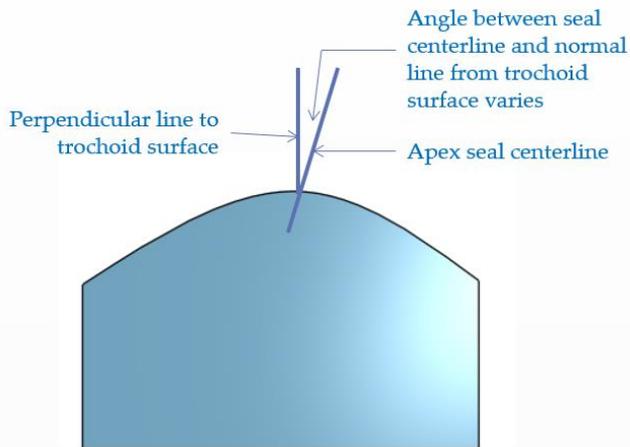


Figure 9: Angle between centerline of apex seal and normal to trochoid surface

As the apex seal travels making contact with the trochoid surface, the angles between seal centerline and normal line from trochoid surface vary simultaneous to the travel motion, as shown in figures 10 and 11. These ranges of angles constitute critical chatter angle, where chatter occurs, depending on the coefficient of friction existing between the two contact surfaces.

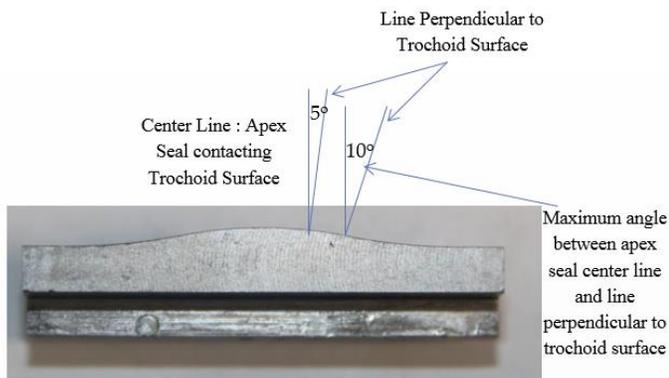


Figure 10: Varying angle between apex seal centerline and line normal to trochoid coupon surface

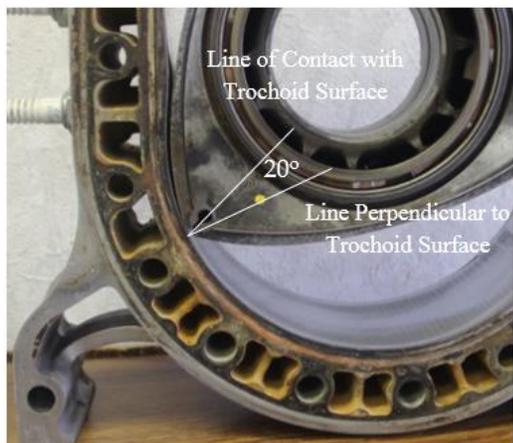


Figure 11: Varying angle between rotatory apex seal and line perpendicular to trochoid surface of Wankel rotary engine

### III. PROPOSED ANALYTICAL SOLUTIONS

#### A. Proposed solution to eliminate trochoid chatter

Having identified the root cause for the existing chatter in Wankel's rotary engine, possible steps could be taken to eliminate the underlying cause. As understood, the contact angle between the trochoid surface and the apex seal serves as a determining parameter of chatter existing region that corresponds to the critical chatter angle experimentally derived by Shobert. For a matter of fact, it was concluded that critical chatter angles are affected in relationship to the friction coefficient, and thus corresponding to the thermal energy developed at the contact interface of trochoid surface and apex seal.

$$\text{Thermal Energy developed in sliding system} \approx \frac{\mu * S * F}{A}$$

Eq. 2

where,

$\mu$  = coefficient of friction

S = Speed

F = Force/Load applied

A = Area

The equation 2 identifies possible parameters considered responsible in affecting the thermal energy developed at the interface of the contact surfaces. Analyzing the parameters for the operational range of a typical rotary engine would constitute towards the thermal energy multiplication factor, it is found that the friction co-efficient is the dominant factor, typically in the range of 0.02 to 0.15 constituting a thermal energy multiplication factor of 75X. Thus, it imposes a potential need to address coefficient of friction to achieve determined thermal energy for the engine efficiency thus eliminating trochoid chatter developing at the sliding interface.

For the trochoid substrate, HTCS-150 Hard and A-2 Tool Steel would be the participating candidates chosen based on the following desirable properties fulfilled:

- Inherently high modulus of elasticity. Modulus of elasticity at the surface can be increased by plasma ion nitriding.
- Ion implantation
- High thermal conductivity
- Can be machined/ground utilizing conventional purposes
- Substantial bond between plated/frame sprayed materials
- Molten aluminum can be bonded to surface

For the trochoid surface, Non/limited Hydrogenated DLC (Diamond-Like Carbon) coating, Nikasil with Diamond particles, and Ion Implanted CRC Chromium Plate would serve as test coatings in combination to the trochoid substrate materials. The properties achieved by the chosen trochoid coatings are:

- Low coefficient of friction
  - Inherent friction
  - When in present of friction modifiers in oil

- Bulk temperature capability >800°F (maintains hardness and strength)
- High thermal conductivity
- High modulus of elasticity
- High yield strength
- Required minimum preparation of base support material
- Limited or no secondary finishing subsequent to application

For the lubrication, Synthetic Group V Base Stocks comprising Esters and Polyalkylene Glycols would be considered, as they are polar and can adsorb on metal surfaces providing substantial lubrication without additives. However, additives can also be utilized to increase the effectiveness of the resulting system. Some of the properties aimed at by the lubricants to influence coefficient of friction would constitute of the following:

- Base fluid technology
- Additive chemistry
- Viscosity
- Bulk/instantaneous temperature at interface of opposing surfaces
- The relative sliding speed of the opposing surfaces which could be sliding or rolling, or a mixture of both
- The chemistry of the opposing surfaces
- Conformal or non-conformal contact between opposing surfaces
- Contact pressure
- Surface roughness

Advanced fabrication methods are considered one of the major players in the research. Additive manufacturing, in particular, would be of interest to achieve the following desired requirements:

- Allow fabrication of complex parts at reduced cost
- Shorter lead time
- No assembly required
- Easy to implement changes
- Fewer constraints

#### B. Numerical Analysis - Computational and experimental simulation approach

In the search of materials that can perform effectively at high temperatures by reducing wear and friction, several dry-film lubricants and materials have been tested for friction and wear measurements in bench tests for comparison. However, it is found difficult to model sophisticated properties of the lubricants and advanced materials being utilized on CAD supported software to perform finite element analysis. A research performed as part of the PhD dissertation at the Air Force Institute of Technology where coatings were studied to analyze material damage when impacted under high energy. The actual test sled was simulated on LS-DYNA3D and the test codes were written and compared using CTH, ABAQUS, and LS-DYNA3D.<sup>17</sup> The simulation incorporated materials and coatings only, where no lubricants were considered as part of the designed model. It was found that the characteristics of the lubricants and the additives, if involved, imposes limitations to numerically

simulated model to identify unknown properties as part of the parameter definition, which gets reflected to the simulated outcomes. Thus, experimentation has proved much successful over computer-aided simulations where advanced lubrication, additives, and friction modifiers are utilized as part of the system.

In this study, LS-9 bench fixture, shown in figure 12, would be utilized, which is a tester that simulates engine conditions for testing different materials, lubricants, liner, and ring combinations. It incorporates apex seals in a holder loaded with two cut trochoid engine surface segments (coupons) positioned 180° apart. The seal holder reciprocates with a stroke of about 1-in and lubricant is introduced to the wear interface periodically by a peristaltic pump. The entire unit can be heated to the required temperature up to 470°C. Pre-test and post-test surface measurements/traces of the coupons and seals are used to determine the amount of wear developed whilst a data acquisition system calculates the coefficient of friction.

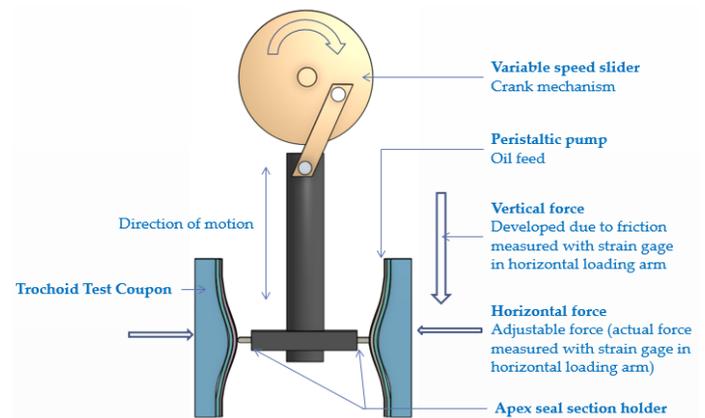


Figure 12: LS-9 Wear Test Bench Fixture identifying critical parameters that can be adjusted and automated during testing

The test specimen utilized would be of a trochoid shape to analyze the effect of change in angular contact between the trochoid surface and the apex seal, as depicted by the rotary engines. The test specimens would make use of the combination of materials and coatings as identified for the runs of extended duration in addition to advanced lubricants forming a thin layer at the contact interface of the sliding system, as shown in figure 13. Factors pictured in figure 12 that includes varying bulk temperature, peak velocity at the sliding test surfaces, rate of oil feed, and trochoid design to constitute range of angle between apex seal centerline to line perpendicular to trochoid surface would be utilized against testing the specimen (figure 13). The range of these parameters are listed in table 1.

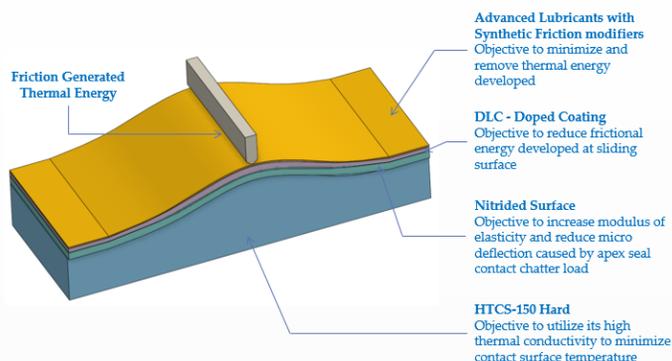


Figure 13: Concept fixture duplicating apex seal and trochoid engine surface sliding system

Table 1: LS-9 Test Parameters Limit

Parameters	Range of Parameters Applicable to LKI Apex Seal/Trochoid Surface	System Overall Capabilities
Bulk Temperature	RT, 250-300°F	RT-750°F
Surface Pressure between Apex Seal/Trochoid Coupon	255 PSI	0-2,315 PSI
Relative Sliding Velocities between two test surfaces	Peak Velocity: 4.36 ft/s (1.33 m/s) Mean Piston Speed: 52.92 ft/s (16.13 m/s)	Peak Velocity: 6.99 ft/s (2.13 m/s) Mean Piston Speed: 169.32 ft/s (51.61 m/s)
Rate of Oil Feed to sliding surfaces	0-0.5 ml/hr (0.01 g/min) Scale Rate: 0-0.565 in/min (14.351 mm/min)	0 - 1.32 ml/hr (0.02 g/min) Scale Rate: 0-1.489 in/min (37.82 mm/min)
Range of angle of apex seal centerline to line perpendicular to trochoid coupon surface	0-10 degrees	With coupon modifications 0 - 25 degrees

It would be expected that a reduction in coefficient of friction at the sliding interface of the system would be measured indicating elimination of trochoid chatter. As a motivation, a UK based developer of advanced formulation of base stocks/additive for two cycle engine named Croda, managed to achieve a coefficient of friction as low as 0.02 making use of advanced friction modifiers (polymeric) in chemistry to DLC coating. A graphical comparison between commercial oil and the effect of additive chemistry utilizing friction modifiers in interaction with DLC coating to test against coefficient of friction is shown in figure 14 below.<sup>18,19</sup>

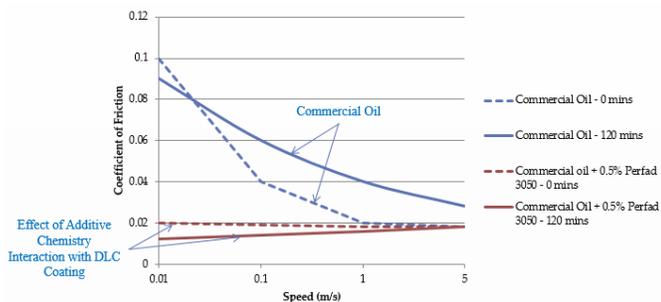


Figure 14: Example of interaction of lubricant/additive with sliding surface to reduce friction (per Croda)<sup>18,19</sup>

#### IV. CONCLUSION

In this paper, coefficient of friction has been identified as a root cause of chattering in rotary engines. The proposed solutions are targeted at reducing friction coefficient outside of the chatter zone. Bench testing is planned for this research to confirm the hypothesis for the existence of trochoid chatter marks observed in Wankel rotary engines and to validate the recommended solutions against chatter elimination.

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# Knowledge, Attitude, and Risk Behavior Regarding Sexually Transmitted Infections (STIs) Among Street Children in Medan

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## Abstract

**Introduction:** Sexually transmitted infections (STIs) are still a main health problem all over the world, both in developed and developing countries. Individual who are at high risk of having free sex who is at risk of getting STI is in street children.

**Objective:** To describe knowledge, attitudes, and risk behaviors regarding STIs among street children in Medan.

**Methods:** this research is a descriptive surveillance study with a cross-sectional method involving 61 street children aged 6-18 years as respondents in Medan. Data of this research are collected by filling the questionnaire through direct interviews with respondents. The validity instruments tested by using validity construct test and reliability instrument tested by using Cronbach Alpha.

**Results:** All respondents were not fully aware of STIs. The majority (55,7%) had a poor knowledge, 29,5% had a moderate knowledge, and only 14,8% had a good knowledge. 30 respondents (49,2%) indicate a poor attitude regarding STIs, 19 respondents (31,1%) indicate a moderate attitude and 12 respondents (19,7%) indicate a good attitude. We also found majority 52.5% had a high risk behavior, 32,7% had a moderate risk behavior and only 14,8% had a low risk behavior.

**Conclusion:** Generally, street children had a poor knowledge, attitude and had a high risk behavior regarding STIs.

**Keywords:** Street Children, Sexually Transmitted Infections, Knowledge, Attitude, Risk Behavior

## I. INTRODUCTION

Sexually transmitted infections (STIs) are still a main health problem all over the world, both in developed and developing countries. The effort to prevent the STIs that carried out in many countries do not seems to give a satisfaction result.<sup>1</sup> This is caused by several obstacles such as the emerge of drug resistances, improper treatment, difficult to arrange a diagnosis, the influence of environmental factors that increase easiness in transmission, and negative public stigma towards STIs patients. Sexually transmitted infections mostly occur through sexual contact (90%), blood transfusion, syringes, and from maternal transmission during pregnancy and childbirth.<sup>2</sup> Diseases classified into STIs are gonorrhoea, genital sores (genital herpes, syphilis, mole ulcer), genital tumor (condyloma acuminata), scabies, pediculosis pubis, molluscum contagiosum, hepatitis and HIV.<sup>3</sup> The incidence of STIs has increased in Indonesia. This was shown in data from the survey in 2016, the incidence of STIs was 19.973 cases when compared to the results of the survey in 2015 which were 16.110 cases and in 2014 there were 11.141 cases.<sup>4</sup>

Street children are children experiencing poverty, homelessness or both, who are still immature (physically and psychologically), under 18 years old and spends most of their time on the streets by doing activities to earn money to sustain their life which sometimes gets physical or mental distress from their environment. *United Nations International Children's Emergency Fund* (UNICEF) estimates approximately 100 million children and adolescents grow up in the streets of big cities.<sup>6</sup> Based on the data from DKI Jakarta Social Service, the number of street children in 2009 was 3.724. In 2010, it increased to 5.650 and in 2011 was 7.315 children. Based on the data from North Sumatera Province Social Service, the number of street children in 2014 was 2.267, in 2015 it counted 2.099 and in 2016, it was 2948 children.<sup>7</sup> Meanwhile, according to data from Medan Social Service the number of street children in 2014 was 463, in 2015 it was 535 and in 2016 was 663 children.<sup>8</sup>

Street children have a lack knowledge about reproduction health. This certainly will affect their attitudes and behavior towards risk of STIs. Limited social contact and information received only from the street environment shapes their knowledge according to what they see, hear and feel on the streets. Based on data from Amelia Foundation that handling street children's education in Central Jakarta and North Jakarta, almost all of 100 street children they served have experienced sexual violence.<sup>9</sup> This sexual violence is carried out by fellow street children or other older people. The result of a study conducted by Civil Society Organizations in Medan involving 40 street children also reported similar things. That street children experienced arbitrary sexual treatment such as sodomy, oral sex and rape.<sup>5,9</sup>

## II. METHODS

This research is a descriptive surveillance study with a cross-sectional method to describe the variable from this study that are knowledge, attitude and risk behavior regarding STIs involving 61 street children aged 6-18 years as respondents in Medan. The sampling was done by accidental sampling and each of them asked to fill the questionnaire. The validity instruments tested by using validity construct test and reliability instrument tested by using Cronbach Alpha. The result will be analyzed and presented in frequency distribution table. This study has been approved by the Health Research Ethics Commission of the Faculty of Medicine, Universitas Sumatra Utara / H. Adam Malik General Hospital Medan.

## III. RESULTS

From 61 street children as a respondent, the highest proportion based on gender was female with 33 respondents (54,1%), meanwhile male was 28 respondents (45,9%). The highest proportion according to the age group was 14–18 years old (50,8%) and the lowest was 6–9 years old (13,1%). According to education status, the majority respondents were dropped out at high school (68,9%), 19,7% were dropped out at middle school and only 11,5% respondents were in primary school. According to the religion, the majority were Muslim (52,5%), followed by Protestant 36,1% and Catholic 11,5%. Description of respondents characteristic based on duration of being a street children that is 29 respondents (47,5%) had become street children for more than 3 years, 16 respondents (47,5%) for 1-3 years, 9 respondents (14,8%) for 6 months to 1 years, and 7 respondents (11,5%) had become a street children less than 6 months.

### Description of Respondent's Knowledge Regarding STIs

Knowledge	Number (n)	Percentase (%)
Good	9	14,8
Moderate	18	29,5
Poor	34	55,7
<b>Total</b>	<b>61</b>	<b>100</b>

### Description of Respondent's Attitude Regarding STIs

Attitude	Number (n)	Percentase (%)
Good	12	19,7
Moderate	19	31,1
Poor	30	49,2
<b>Total</b>	<b>61</b>	<b>100</b>

### Description of Respondent's Risk Behavior Regarding STIs

Risk Behavior	Number (n)	Percentase (%)
High risk	32	52,5
Moderate risk	20	32,7
Low risk	9	14,8
<b>Total</b>	<b>61</b>	<b>100</b>

### Description of Knowledge, Attitude and Risk Behavior Regarding STIs Based on Age Group

Age Group (years old)	Total	Knowledge			Attitude			Risk Behavior		
		Good	Moderate	Poor	Good	Moderate	Poor	High	Moderate	Low
6-9	8	-	2	6	2	3	3	7	1	-
10-13	22	6	5	11	4	7	11	7	11	4
14-18	31	5	10	16	9	9	13	6	7	18
<b>TOTAL</b>	<b>61</b>	<b>11</b>	<b>17</b>	<b>33</b>	<b>15</b>	<b>19</b>	<b>27</b>	<b>20</b>	<b>19</b>	<b>22</b>

### Description of Knowledge, Attitude and Risk Behavior Regarding STIs Based on Gender

Gender	Total	Knowledge	Attitude	Risk Behavior
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		Good	Moderate	Poor	Good	Moderate	Poor	High	Moderate	Low
Female	33	7	9	17	7	12	14	6	10	17
Male	28	3	11	14	3	7	18	3	5	20
<b>TOTAL</b>	61	10	20	31	10	19	32	9	15	37

Description of Knowledge, Attitude and Risk Behavior Regarding STIs Based on Education Status

Education Status	Total	Knowledge			Attitude			Risk Behavior		
		Good	Moderate	Poor	Good	Moderate	Poor	High	Moderate	Low
Primary School	7	-	1	6	1	3	3	7	1	-
Middle School	12	2	6	4	3	5	4	6	2	4
High School	42	4	9	29	6	11	25	6	12	24
<b>TOTAL</b>	61	6	16	39	10	19	32	19	15	28

Description of Knowledge, Attitude and Risk Behavior Regarding STIs Based on Duration of Being a Street Children

Duration	Total	Knowledge			Attitude			Risk Behavior		
		Good	Moderate	Poor	Good	Moderate	Poor	High	Moderate	Low
< 6 months	7	1	3	3	3	1	3	1	4	2
6 months – 1 years	9	2	3	4	1	2	6	2	2	5
1-3 years	16	4	3	9	2	4	10	1	3	12
> 3 years	29	2	10	17	7	11	11	6	8	15
<b>TOTAL</b>	61	9	19	33	13	18	30	10	17	34

#### IV. DISCUSSION

Description of respondent’s characteristic based on age group shows that majority are 14-18 years old (50,8%). This result is similar with other study among street children in four big cities in Indonesia that street children who are >14 years old doing more sexual activities than <14 years old.<sup>5</sup> And also in study that was done before by Hutagalung involving 45 respondents showed that 30 respondents (66,7%) are >15 years old and the remains 15 respondents (33,3%) are <15 years old. This study also describe that there is a relationship between age and sexual activities among street children. Street children who are more than 15 years old indicates a poor sexual attitude and has a risk of getting STIs compared to age under 15 years old.<sup>10</sup>

Description of respondent’s characteristic based on gender shows that from 61 respondents, 33 (54,1%) are female; while 28 (45,9%) are male. This result is similar with study that was done by Hutagalung at the Pinang Baris Medan terminal region found that from 45 street children as respondents, 25 (55,6%) are female and 20(44,4%) are male. Female street children tends to be a victims of sexual exploitation compared to male gender that this underlying higher incidence of STIs among street children.<sup>10</sup>

Description of respondent’s characteristic based on education status shows that majority were dropped out in high school which numbered 42 respondents (68,9%). There is a relationship between level of education and knowledge of the street children towards prevention of STIs. The higher level of their education status, the better their knowledge to prevent STIs. However, street children are commonly have dropped out from school so in general street children has poor knowledge.<sup>12</sup> Among street children themselves, it is easier to have free sex because their free environment and minimum supervision from family or parents coupled with many other supporting factors include promiscuity among street children that increase the risk of getting STIs.<sup>11</sup>

Description of respondent’s characteristic based on duration of being a street children shows that many of them (47,5%) had been a street children for 3 years. This indicate that respondents already familiar with the pattern of sexual behavior among them.<sup>11</sup> The easy way to gain knowledge about sex influence their attitude. The social interaction among them also become an effective tool in exchanging information about sex. The wrong information leads to wrong behavior and understanding about sex has the potential to cause many problems. Not surprisingly, many of young street children had practicing free sex.<sup>10</sup>

In this study, we found that mainly the street children in Medan has poor knowledge about STIs. Many of them doesn't know the signs and symptoms of STIs that particularly found in genital part; they don't know yet about group of infectious diseases transmitted through sexual contact called Sexually Transmitted Infections (STIs). They do not know what to do if they are infected with STIs where they need to get a treatment in nearest health care facility. Still many of street children are not aware about the main source of transmission of STIs is free sex.

Lack of knowledge of free sex offenders exclusively in street children is very influential towards STIs and how to prevent them. Some fact found provide program implications, namely when the sex offender has poor knowledge hence condom usage as prevention of STIs is also decrease, and even they are susceptible STIs transmission.<sup>13</sup> The street children have a lack knowledge about reproduction health. This surely will affect their attitude and behavior regarding STIs.<sup>1</sup> Limited social contact and information that only received from the street environment shapes their knowledge according to what they see, what they hear and what they feel in the streets. The street children gets knowledge about sex from among them of the same age or older, reading pornographic book, watching pornographic movies / VCD, or peeking the people who are having sexual intercourse. The easiness of getting inappropriate information affect the street children's attitude towards sexual relationship.<sup>1</sup>

This study shows that majority street children in Medan as a respondent indicate a poor attitude regarding STIs. Many of them declare that oral sex doesn't increase STIs transmission whereas in fact, oral sex provoking and transmit the STIs. They claim that there is no need to utilize health services when they are infected because they think that STIs are not a dangerous disease even though in fact STIs are dangerous and causing morbidity and even mortality. Respondent also stated that STIs are not become a problem to keep usual activities thus assuming STIs does not require special handling. This underlying the incidence of STIs increase among street children but the exact number of incidence can not be determined because they do not want to voluntarily goes to health care facilities for getting treatment.<sup>10</sup>

From this study, we found that majority of street children in Medan shows high risk behavior of having STIs. The result shows that most of them have had free sex (premarital sex), practicing unprotected sexual intercourse and are at risk getting STIs. They practice oral and anal sex without using condoms that are also can cause STIs, they never conduct health consultations with health care provider (VCT-HIV clinic, government facilities, hospital) to carry out STIs tests. This contributes in increasing STIs among street children that is not well recorded. If we looked back in the way of the street children's life, they are at risk on getting sexual violence among them or other older people.<sup>5,9</sup> Amelia Foundation which handles street children's education in Central and North Jakarta explained almost all of 100 street children they served have experienced sexual violence and unprotected sexual behavior increase incidence of STIs.<sup>10</sup>

## V. CONCLUSION

Knowledge and attitude are very influential on risky behavior regarding to STIs including street children. Poor knowledge and attitude coupled with the possibility of them getting sexual violence underlying higher incidence of STIs among street children, inclusively in Medan.

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# An Investigation on the Properties of Rabbit Leather from Different Tannages

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## ABSTRACT

The non-conventional sources of raw materials, i.e. exotic skins are skins obtained from animals such as crocodiles, alligators, snakes and rabbits. Rabbit farming in Kenya has emerged as a good source of supply of raw materials to the exotic leather industry. However, there lacks detailed knowledge on the structural and physical properties of rabbit leather and specifically from different tannages. The knowledge would be of benefit to tanners in designing their processes as well as leather goods designers in designing products to meet the desired end-use. For this reason, a study was undertaken to analyse the structural and physical properties of the rabbit leather tanned using chrome and mimosa. The skins were collected from a local slaughterhouse and subjected to standard pre-tanning beamhouse processes followed by the respective different tanning processes. Physical properties of the crust leathers from the two tannages were analysed by determining the thickness, shrinkage temperature, tensile strength, tear strength, ball burst and flex endurance in accordance with IUP official methods. The statistical results for the two tannages were analysed using excel. From the study, the average shrinkage temperature of mimosa tanned leather was 83°C and chrome was 100°C. Notably, chrome tanned leather recorded higher tear strength value (37.4 N) than that of mimosa tanned leather (28 N). The other physical parameters were comparable for both tannages. Based on the results both tannages produced leather with physical properties that can be used in production of lining as well as fancy products such as watch strap

**Key words:** Exotic skins, rabbit skin, tannages.

## INTRODUCTION

Exotic leather production refers to the tanning of skins of animals like; crocodiles, alligators, lizards, cobras, pythons, rabbits and fish. The exotic leathers are usually preferred because of their natural patterns, colour and unique structures[1]. The use of exotic skins dates back to the early man. The hunting and the gathering community used skins from reptiles, birds, fish and amphibians for adornments to their clothing or for their head-dresses as well as for covering articles such as drums[2]. The skins were made less resistant to putrefaction by drying, they were made supple by fleshing and applying animal oils. Different animals have different features that provide leather with varying properties and these have resulted to the increased demand of various leather products in the market[1].

The Kenyan leather industry is mainly based on the livestock population which has provided vast growth of the leather industries[3]. Other than the conventional sources of raw material such as cattle, sheep and goat, there exists new emerging supply of raw materials such as donkeys, horses, fish and rabbits[4-5]. According to Ministry of Agriculture, Livestock and Fisheries report (2015), it is estimated that there are at least 600, 000 rabbits[6-7]. The number has increased as a result of the extensive

research that has been done on breeding aspects as well as management of the breeding of rabbits[8-9].

Rabbits in Kenya are mainly for meat production[10] and their skin by products from the slaughterhouse[11]. The skins are disposed and there has been a challenge to dispose them[12]. Rabbit skins in Kenya are being considered as a new source of raw materials for leather production[13]. Despite this, their application in leather production has not been fully exploited[12]. Knowledge of the physical properties of rabbit leather could be a welcome boost to their use. This study aimed at understanding the physical properties of chrome and mimosa tanned rabbit leather.

## EXPERIMENTAL PROCEDURE

### Materials

30 pieces of wet salted rabbit skins were obtained from a local rabbit slaughterhouse. Commercial tannery grade chemicals were purchased from Pryann Enterprise (Kenya).

### Beamhouse processes

The pre-tanning processes were carried out as presented in Table 1

Table 1  
Process for pre-tanning of the rabbit skins

Process	Chemicals	Percentage	Time duration	Remarks

Soaking	Water Wetting agent Soaking enzyme	300% 1% 1%	2 hrs.	3times
Fleshing				
Paste Liming and Hair save Unhairing	Water Lime Sodium sulphide	20% 8-10% 1.5-2%		Piled overnight. Next-day emove the hair by knife
Re-liming	Water Lime Sodium sulphide	200% 5% 0.5%	4 hr.	pH ≥ 12.0
De-liming	Water Ammoniu m Sulphate	150% 2%	1 hr.	Clear to phenolphthal ein pH 8.0-8.2
Bating	Water Bate	100% 1%	1 hr.	pH 8-8.5 Drain, wash and drain
Degreasing	Water Degreasing agent	200% 4%	1 hr.	Drain, wash and drain

### Tanning

After the pre-tanning processes the skins were separated into three groups which were subjected to different tannages as in tables 2 and 3.

**Table 2  
Chrome Tannage**

Pickling	Water Salt Formic acid Sulphuric acid	100% 8% 1% 1.5%	20min 2*10 + 30 3*10+ 30,	Check pH 2.8-3.2
Tanning	Basic chromium sulphate	5%	2hrs	
Add	Basic chromium sulphate	3%	Leave overnight	
Basification	Sodium formate Sodium bicarbonate	2% 2%	45 1hr.	pH 3.8-4.0 Drain, wash and drain

Drain, wash and drain Leave overnight for aging				
Neutralization	Water Sodium bicarbonate	100% 2%	1hr.	pH 4.8-5.0
Re-tanning, Dyeing and Fatliquoring	Water Re-tanning Syntans Dye Fatliquor Add Formic acid	100% 8% 3% 3% 1%	1 hr. 1 hr. 1 hr. 30 min 30 min	pH 3.5-4.2 Drain wash and Drain
pile it, hooking to drying, stacking, mollisa, buffing and dry drumming if necessary				

**Table 3  
Mimosa tannage**

Tanning – Vegetable Tanning	Water Mimosa	100% 5%	5 hrs.	
Add	Mimosa Formic acid	5% 1%	5hrs / leave overnight 1hr.	pH4.6 pH 3.5
Drain, wash and drain Leave overnight for aging				
Re-tanning Dyeing and Fatliquoring	Water Re-tanning Syntans Dye red Fatliquor Formic acid Formic acid	100% 8% 3% 3% 0.5% 0.5%	1 hr. 1 hr. 1 hr. 30 min 30 min	pH 3.5 Drain wash Drain
pile it, hooking to drying and dry drumming				

### PHYSICAL TESTING

#### Sampling and sample preparation

The leathers were sampled in accordance with the official method IUP 2, (2001). The samples were cut in triplicate both in parallel and perpendicular direction for the belly and butt region. The samples were then conditioned at a standard atmosphere of temperature 25±2°C and relative humidity of 65%±2% for at least 48 hours and this was done in accordance with IUP 3, (2001).

#### Analysis of physical properties

The physical properties of the leather analysed were: Shrinkage temperature; IUP 16, (2001), Thickness; IUP 4, (2001), Tensile strength; IUP 6, (2001), Tear strength; IUP 8, (2001), Distension and strength of the grain measurement; IUP 9, (2001), Flex resistance measurement IUP 20, (2001).

## RESULTS AND DISCUSSION

### 1. Shrinkage temperature

Fig. 1 shows the hydrothermal stability of the rabbit leather from different tannages for both the belly and backbone region. Shrinkage temperature is parameter used to determine the resistance of the leather to wet heat [14]. It gives the characteristic thermal stability of leather and this is usually indicated by the point at which the leather shrinks over the heating media [15]. The higher the shrinkage temperature the higher the number the number of crosslinks that have been formed between the tanning agent and the pelt [16]. .

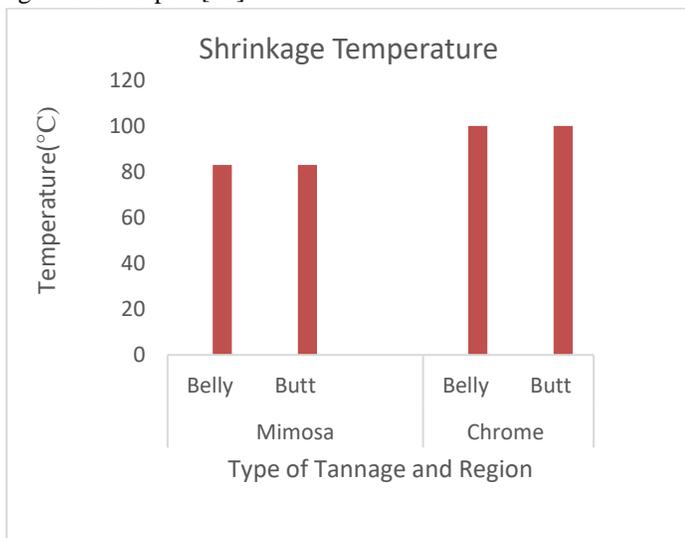
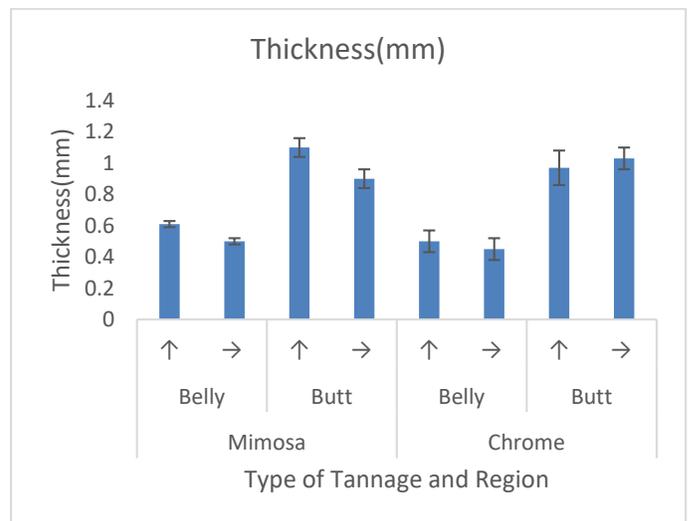


Figure 1: Shrinkage Temperature results

From the results, chrome tanned leather had the highest shrinkage temperature of 100°C both at the belly and the butt region. Mimosa tanned leather had a shrinkage temperature of 83°C and this agreed with other studies[16]. There was no observable difference in shrinkage temperatures in either parallel or perpendicular direction. From literature, we note that chrome tanning imparts more stabilization as it forms strong crosslinks with the collagen fibres than any other tannage[17]. High stabilization of the collagen can be associated by the ability of chromium being able to form complexes with the collagen[18].

### 2. Thickness of the different leathers

Fig. 2 shows the thickness of the rabbit leather from different tannages for both the belly and butt region.



**Key**     ↑ Samples obtained in the parallel direction  
              → Samples obtained in the perpendicular direction

Figure 2: Thickness test results

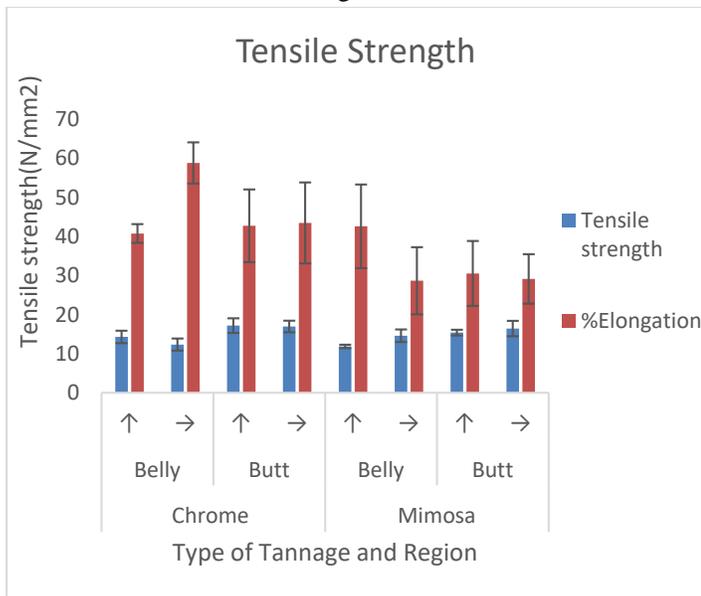
From the results, the belly region of mimosa tanned leather had the highest thickness compared to chrome tanned leather. At the butt region mimosa tanned leather also had the highest thickness compared to mimosa tanned leather. There existed variation in thickness at the butt region in relation to direction. The variation could be as a result fibre orientation as well as structure[19]. The variation could also be as a result of the aggregation of the of the collagen fibres in the leather which affects the degree of orientation.[20]

In relation to region, the butt region had the highest thickness compared to the samples from the belly region for the two tannages. The thickness from the butt region was almost twice the thickness from the belly region. This could be as a result of dense packing of the fibre structure at backbone region compared to the belly region[21]. The variation could also be as a result of degree of fullness where vegetable tanned leathers are known to have the highest degree of fullness compared to the other tannages[17]. Vegetable tannins are known to contain tannins and non-tannins[15] where the tannins are used to crosslink the fibre structure of the leather where the non-tannins are known to provide some degree of fullness. The chrome tanned leather could have a greater thickness because of using syntans which are known to increase the degree of fullness of chrome tanned leather[22]. The values for this study agreed with the values found by Taha et al., (2017) where he found New Zealand breed to have a thickness 1.12mm[23].

### 3. Tensile strength and %Elongation

Tensile strength of the leather is the maximum force that is required to fracture the leather [24]. Elongation is known to be degree at which the leather is stretched before failure[25]. Fig. 3

shows the tensile strength and percentage elongation for the leather from the different tannages



**Key** ↑ Samples obtained in the parallel direction  
 → Samples obtained in the perpendicular direction

**Figure 3: Tensile strength and % elongation**

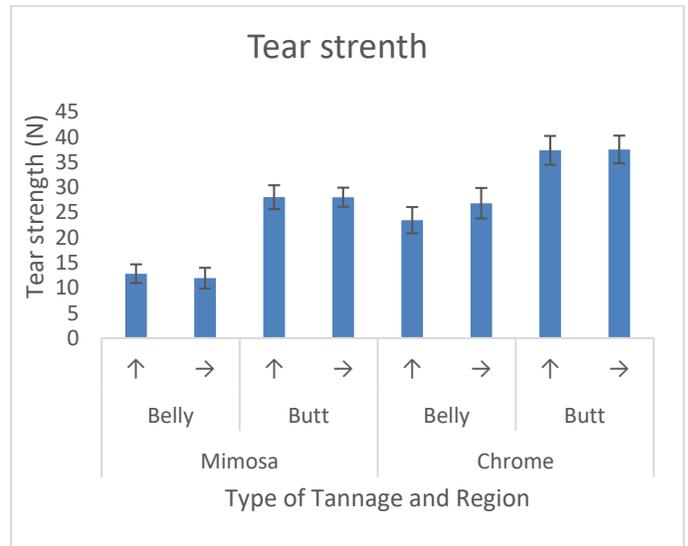
From the results, butt region had the highest tensile strength for both tannages compared to the belly region. However, the strength differed with respect to the direction. This variation could be as a result of leather having difference in fibre weave[23]. The angle of weave usually distresses the degree of stretch[19].

Tensile strength is equal to the number of fibres oriented in that direction and thus it is usually higher in the in the parallel direction as the force is usually applied to a more oriented network of fibres[26]. Parallel orientation of fibers causes minimal friction damage of the fibres and this usually results to an increase in the tensile strength[27]. On the other hand, perpendicular orientation of fibers cause more frictional damage to the fibres and this usually results to a decrease in the tensile strength of the leather[28].

The results for tensile strength were 15.93N/mm<sup>2</sup> and 17.09N/mm<sup>2</sup> for mimosa and chrome tanned leather respectively. This values were higher than is reported in literature[23]. This could be attributed to variations in thickness and processing recipe.

**4. Tear strength**

Tear strength is the measure of the material to resist tearing force[29]. For tear strength, when the samples are obtained in the direction parallel to the backbone, the tearing is usually done in the perpendicular direction[26]. Fig 4. Shows the tear strength of the rabbit leather for chrome and mimosa tannage



**Key** ↑ Samples obtained in the parallel direction  
 → Samples obtained in a perpendicular direction

**Figure 4: Tear strength results**

Tear strength for mimosa tanned leather was lower when sampled from the belly region and in perpendicular direction. Conversely, the butt region of the mimosa tanned leather tear strength was almost similar in both directions.

The tear strength of the chrome tanned leather at the belly region was lower compared to the butt region. These differences were also observed with respect to direction. Samples obtained perpendicularly to the butt showed high tear strength compared to the parallel direction. However, the tear strength at the butt in both directions were almost the same.

The average tear strength for the two different tannages showed that chrome tanned leather (37.4 N/mm<sup>2</sup>) was significantly higher than that of mimosa tanned leather (28 N/mm<sup>2</sup>). The variation in tear strength for the different direction are as a result of angle of weave of the leather fibres in the fibre bundles[19]. The higher tear strength for the samples obtained perpendicularly can be associated with the orientation when performing tensile strength where their samples are usually in the parallel direction and vice versa[26].

**5. Ball burst**

Ball burst is a test used to determine the resistance of the leather to crack when force is applied[30]. Fig. 5 shows the results for grain crack and grain burst for chrome and mimosa tanned leather for both the belly and butt region

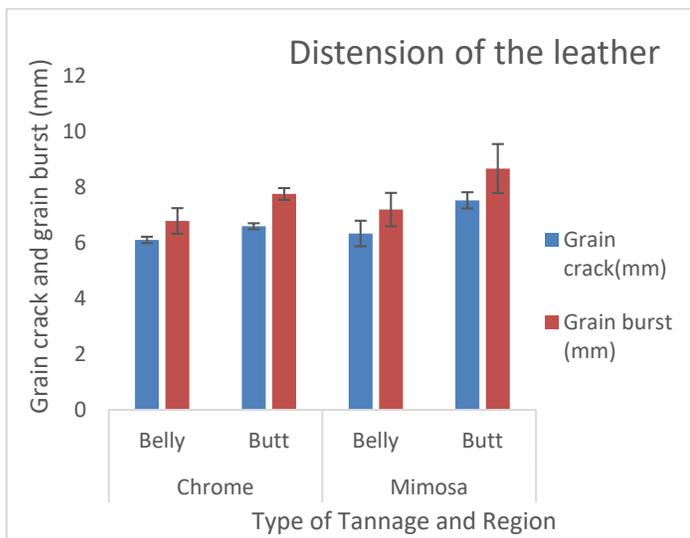


Figure 5: Ball burst results

From the results, the extension of the leather at the belly region for the two tannages is low compared to its extension at the butt region. This can be attributed to the tight packing of fibre structure at the butt region. Mimosa tanned leather showed higher value for the grain crack and grain burst at the belly region compared to chrome tanned leathers. This could be attributed to fullness[31], a property imparted by mimosa tanned leather compared to chrome tanned leather.

### 6. Flex Test

Flex test is a test carried to determine the number of cycles that leather can withstand without having any deformation. The test determines the resistance of the materials to form creases and the resistance of the leather to crack[16]. The test is usually carried out for leathers prone to flexes when in use. In this case all the leather from the three tannages were able to withstand 100, 000 flexes without any deformation.

Flexibility of the leather shows that the material is able to stretch when force is applied. The factors that affect the flex of the leather are the type of tannage and re-tannage. In flex test the defects which are usually considered are; the greying, cracking, shading and detaching of the finish from the leather[15].

### CONCLUSION

The results of the study showed that overall chrome tanned rabbit leather offered good physical properties compared to mimosa tanned leather. Despite this, the rabbit leather can be produced by either tannage with good physical properties. The butt region for all leathers provided the best physical properties compared to the belly. This is an indication of the anisotropic property of rabbit skins. It would be good that future studies focus on the combination tannages as well as structural properties of rabbit leather.

### ACKNOWLEDGEMENT

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# Study of Serum Visfatin Level in Impaired Glucose Tolerance Subjects

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## ABSTRACT

The aim of study was to measure serum level of visfatin in impaired glucose tolerance subjects and compare with healthy control subjects. In this study 120 IGT and 120 healthy subjects (age and gender matched) were enrolled. BMI, Glucose, HbA1c, Insulin and Visfatin were assessed. Serum visfatin levels were higher in impaired glucose tolerance subjects compared with healthy controls ( $4.95 \pm 1.81$  ng/ml vs  $2.91 \pm 1.12$  ng/ml, respectively,  $P < 0.0001$ ). Increased levels of visfatin can assess diabetes at an early stage.

Keywords : Visfatin, IGT,, Diabetes.

## INTRODUCTION

Diabetes Mellitus is one of the main threat to human health in the twenty- first century and therefore should be controlled and managed early to avoid its complication. Type 2 diabetes is preceded by a pre-diabetes (PD) is a dysmetabolic state of glucose level between diabetes mellitus and normal glucose tolerance. This asymptomatic phase may last for years, and about one third of individuals with pre-diabetes finally develop type 2 diabetes.

According to American Diabetes Association (2018), Impaired glucose tolerance (IGT) is defined as two-hour glucose levels of 140 to 199 mg per dL (7.8 to 11.0 mmol/L) on the 75g oral glucose tolerance test. These glucose levels are above normal but below the level that is diagnostic prevention for diabetes. IGT is commonly associated with both obesity and disturbances in insulin secretion and/or insulin resistance. It is characterized by reduced peripheral insulin sensitivity, near normal hepatic insulin sensitivity, and progressive loss of beta cell function.

Visfatin, an adipocytokine has important role in regulation of glucose levels in humans. It has been shown that visfatin has insulin-mimetic effects on glucose metabolism by activating the insulin signal transduction pathway through the direct binding to the insulin receptor at a site different from that of insulin. Recent studies also demonstrated that serum visfatin levels were significantly higher in diabetic compared with non-diabetic group.

Although there are many evidences linking obesity, serum visfatin and type 2 diabetes. Data about serum Visfatin concentration in Impaired Glucose Tolerance is limited. Therefore, present study was undertaken to evaluate serum Visfatin levels in patients with IGT and to compare it with healthy controls.

## MATERIALS & METHODS

120 impaired glucose tolerance subjects were recruited in this study from the OPD of Department of Medicine,

Jawahar Lal Nehru Medical College and Associated group of Hospitals, Ajmer. The subjects were considered as IGT based on the ADA guidelines (2018). Age and gender matched 120 healthy subjects without a family history of diabetes were also recruited in this study to serve as the controls.. On a prescheduled morning, the subjects were requested to arrive after overnight fast (at least 10 hour) to provide a fasting blood sample. After collecting fasting blood samples, the subjects were given 75g of glucose dissolved in 250ml of water. The blood was drawn via venepuncture 2h after glucose load. After 30 mints of collection, the blood sample was centrifuged for 10-15 mints at 3000rpm to obtain the serum.

BMI was determined following standard procedures. Glucose was measured using the glucose oxidase method, (HbA1c) glycosylated hemoglobin was measured by ion exchange resin method (Trivelli et al;1971), Insulin and serum Visfatin were measured using an enzyme linked immunosorbent assay (ELISA) technique.

The quantitative variables were expressed as the Mean  $\pm$  SD (Standard deviation) median (range). The baseline characteristic between IGT and healthy subjects were assessed using student's t-test for continuous variables (as applicable). All P-values were based on a two sided test of statistical significance. Significance was accepted at the level of  $p < 0.05$ .

## RESULTS AND OBSERVATION

In this study, 120 cases of impaired glucose tolerance were compared with 120 healthy controls.

**Table 1- Anthropometric parameters of IGT subjects & Healthy controls**

Parameters	IGT Cases (Mean $\pm$ SD )	Healthy Controls (Mean $\pm$ SD )	P-Value
AGE (yrs)	40.18 $\pm$ 2.8	40.35 $\pm$ 2.9	0.644 (NS)
WEIGHT (kg)	79.99 $\pm$ 3.05	51.58 $\pm$ 4.9	-
HEIGHT (cm)	1.67 $\pm$ 0.05	1.55 $\pm$ 4.39	-

BMI (kg/m <sup>2</sup> )	28.53 ± 1.7	21.34 ± 1.5	<0.001 (HS)
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**Table 2- Biochemical parameters of IGT subjects & Healthy subjects**

Parameters	IGT Cases (Mean ± SD)	Healthy Controls (Mean ± SD)	P-Value
Fasting Plasma Glucose (mg/dl)	117.2 ± 4.5	87.4 ± 11.4	<0.0001 (HS)
HbA1c (%)	6.4 ± 0.4	5.1 ± 0.3	<0.0001 (HS)
Serum Insulin (µIU/ml)	11.9 ± 3.1	9.8 ± 2.2	<0.0001 (HS)
Serum Visfatin (ng/ml)	4.95 ± 1.81	2.91 ± 1.12	<0.0001 (HS)

P value <0.0001 is considered highly significant while p<0.01 is considered significant.

Basic anthropometric parameters of IGT subjects and healthy subjects are summarized in table-1. There was no significant difference between IGT subjects and healthy subjects regarding mean age (40.18±2.8 vs. 40.35±2.9 yrs. ). BMI mean ± SD in kg/m<sup>2</sup> in IGT and healthy subjects was (28.53 ± 1.7 vs. 21.34 ± 1.5) and it was highly significant. Biochemical parameters of IGT subjects and healthy subjects are presented in table-2. IGT subjects had higher visfatin levels compared to healthy subjects (4.95 ± 1.81 vs. 2.91 ± 1.12, P<0.0001). Serum glucose, insulin, HbA1c were significantly high in IGT subjects (P<0.0001).

### DISCUSSION

In the present study, IGT subjects have significantly higher levels of visfatin as compared to healthy control subjects. A number of articles have reported increased levels of serum visfatin in type 2 diabetes and obese patients, but impaired glucose tolerance subjects have not been studied extensively to know whether the increase in the circulating visfatin levels begin before the onset of diabetes. Increased levels of serum visfatin suggests that hyperglycemia and development of type 2 diabetes is delayed through hypersecretion of adipose tissue derived visfatin as it possesses insulin mimetic effects (A. Kaminska et al ; 2015) therefore, increased serum visfatin may be a compensatory mechanism or part of pathophysiology of diabetes mellitus. Wajchenberg et al; 2000 has seen increased visfatin in newly diagnosed type 2 diabetics as a result of β cell deterioration. This study was also supported by Kowalska et al; 2013 who found insulin's inability to suppress visfatin production in insulin resistant conditions. However, Dogru et al; 2007 indicated that hyperglycemia causes an increase in plasma visfatin levels in people with type 2 DM but not with impaired glucose tolerance. This discrepancy can be explained by different subjects characteristics. F. Kabir et al ; 2015 reported that fasting serum visfatin level was significantly higher in IFG, IGT & IFG-IGT subjects compared with healthy controls.

### Limitations of Study

Our sample size was relatively small.

### ACKNOWLEDGEMENTS

NIL

### CONFLICTS OF INTEREST

We have no competing interests.

### FUNDING

NIL

### CONCLUSION

From the present study it is concluded that serum visfatin levels gets increased prior to onset of diabetes. Visfatin serve as a valuable marker along with glucose for early diagnosis of diabetes at pre-diabetic stage. It could be considered among therapeutic agents used in the prevention of diabetes and in the prevention or reduction of its critical complications.

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# Analysis and Synthesis of Elevator Controller Based On VHSIC Hardware Description Language

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**Abstract-** This paper presents a simple design and implementation of an elevator controller based on Very High-Speed Integrated Circuits Description Language (VHDL). The controller is implemented in a FPGA using Altera Quartus II software package version 9.0 (Web Edition). The Altera Quartus II software package is an integrated development environment (IDE) supplied by Altera for the creation of HDL applications. This controller can be implemented for an elevator with the required number of floors by simply changing a control variable in the VHDL code. In the proposed design a VHDL code is developed to control the lift moment based on the request it will get. The design is based on the synchronous input which should be operating with a fixed sort of frequency. Finally the RTL(register transfer level) is verified and implemented in Precision Synthesis Tool. In this paper, the five-floor controller will be modelled with VHDL code using QII software.

**Index Terms-**VHDL, Quartus II, IDE, simulation, controller.

## I. INTRODUCTION

An elevator system is a vertical transport vehicle that efficiently moves people or goods between floors of a building. It can be considered as a complex reactive system which requires parallel event processing with large number of inputs and outputs.

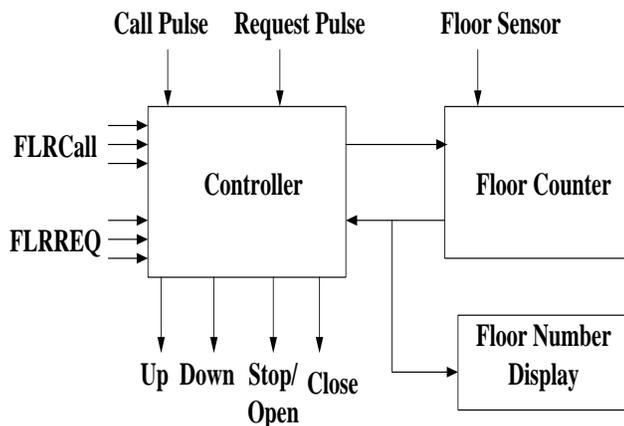


Fig. 1 Block Diagram of Elevator Controller

Fig.1 shows the elevator block diagram, which consists of controller logic, floor counter, and a floor number display. The controller consists of logic that controls the elevator operation, a counter that determines the floor at which the elevator is located at any given time, and a floor number display. For simplicity, there is only one floor call and one floor request for each elevator cycle. A cycle occurs when the elevator is called to a given floor to pick up a passenger and the passenger is delivered to a requested floor. The elevator sequence for one cycle is shown in fig. 2.

## II. OPERATION OF ELEVATOR CONTROLLER

Elevator action is initiated by either a floor call (FLRCALL) or a floor request (FLRREQ). FLRCALL is when a person calls the elevator to come to a particular floor. FLRREQ is when a passenger in the elevator requests to go to a specified floor.

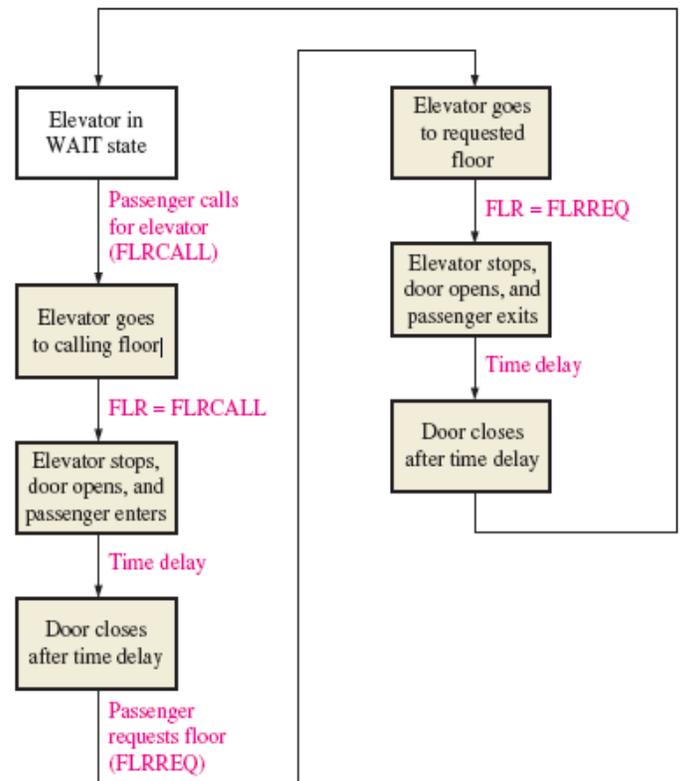


Fig.2 One Cycle of Elevator operation

This simplified operation is based on a CALL/REQ sequence; that is, a call followed by a request followed by a call. FLRCALL and FLRREQ are 3-bit codes representing specific floors. When a person presses a call button on a given floor, the specific 3-bit code for that floor is placed on the inputs to the CALL/REQ code register and a CALL pulse is generated to enter the code into the register. The same process occurs when a request button is pressed inside the elevator. The code is input to the CALL/REQ code register, and a REQ pulse is generated to store the code in the register. The elevator does not know the difference between a call and a request. The comparator determines if the destination floor number is greater than, less than, or equal to the current floor where the elevator is located. As a result of this comparison, either an UP command, a DOWN command is issued to the elevator motor control. As the elevator moves toward the desired floor, the floor counter is either incremented at each floor as it goes up or decremented at each floor as it goes down. Once the elevator reaches the desired floor, a STOP/OPEN command is issued to the elevator motor control and to the door control. After a preset time, the delay timer issues a CLOSE signal to the elevator door control. As mentioned, this elevator design is limited to one floor call and one floor request per cycle.

### III. IMPLEMENTATION OF ELEVATOR CONTROLLER

We can use the Quartus II Block Editor, Text Editor, MegaWizard Plug-In Manager, and EDA design entry tools to create the design files in a project. We can create schematic or block designs with the Block Editor, or we can create AHDL, VHDL, or Verilog HDL designs with the Text Editor. In application of software can also create Block Design Files that contain blocks and symbols that represent logic in the design. The Block Editor incorporates the design logic represented by each block diagram, schematic, or symbol into the project. We can create new design files from the blocks in a Block Design File, update the design files when we want to modify the blocks and the symbols, and generate Block Symbol Files (.bsf), AHDL Include Files (.inc), and HDL files from Block Design Files. And then it can also analyze the Block Design Files for errors before compilation. In our project used the text entry and then create the block symbol.

VHDL is a Hardware Description language. It describes the behavior of an electronic circuit or system, from which the physical circuit or system can be attained (implemented). VHDL is intended for circuit synthesis as well as circuit simulation. A typical VHDL description includes a port contained within an entity statement. The purpose of this paper to practice implementation VHDL codes and performing simulations on various digital logic designs. All the modules described in this section are coded using VHDL which is very useful tool with its degree of concurrency to cope with the parallelism of digital hardware. The top level of module connects all the stages into a higher level at Register Transfer Logic (RTL).

#### A.. Floor Counter



Fig. 3 Top Level of Floor Counter

The floor counter sequentially tracks the number of the floor and always contains the number of the current floor. It can count up or down and can reverse its state at any point under the direction of the state controller and the floor sensor input.

#### B. Floor Comparator

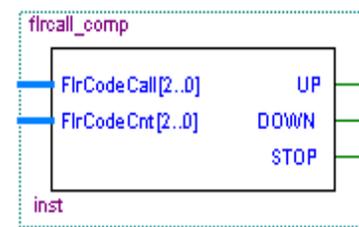


Fig. 4 Top Level Comparator

This block symbol describes the requirements of inputs and outputs in terms of digital logic to execute the desired operations. The declared inputs FlrCodeCall, FlrCodeCnt are std\_logic\_vector data types and the inputs/outputs UP, DOWN, and STOP are std\_logic. This circuit compares the current floor and requested floor and then give the output to move the elevator.

#### C. Code Register

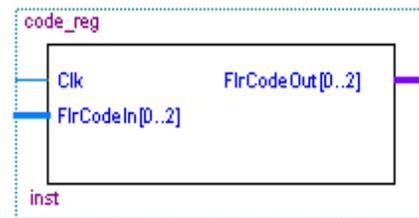


Fig. 5 Top Level of Code Register

Code register stores the floor call code and floor call request. Clock event high pulse sends the FlrCodeIn floor number to FlrCodeOut.

#### D. Timer

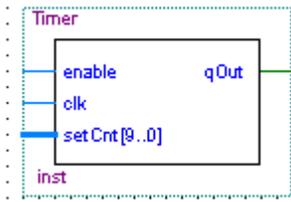


fig. 6 Top level of Timer

In timer code consists of enable, clock, and setCnt inputs. setCnt limits to 1023 for ten bits. Counter output declares as qOut.

E. Flip-flop

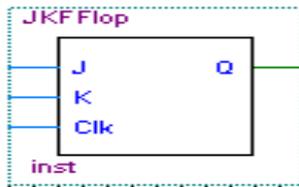


Fig. 7 Top Level of flip-flop

The flip-flop is a JK flip-flop. It gets the clock from timer output. Its output Q goes to code register as clock input.

F. Seven-segment Decoder

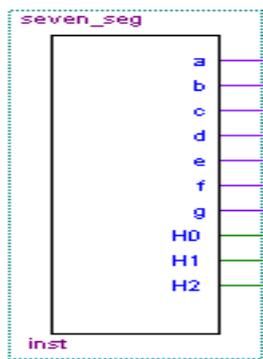


Fig.8 Top Level of Seven-segment decoder

Seven-Segment decoder receives the input from the output of floor comparator and decodes to display as floor number.

G. Elevator Controller

In VHDL, there are three types of modeling design: the data flow level, behavioral level, and structural level. In our project we use the behavioral modeling in each design logic components. And then we create the complete VHDL program code for the elevator controller using the previously defined components by structural modeling method as follows (see fig. 9).

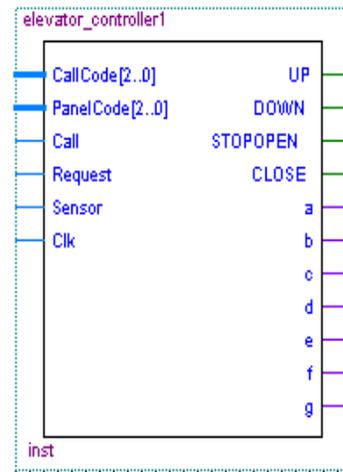


Fig.9 Top Level of Elevator Controller

After compiling the project we got the following compilation report which includes the analysis and synthesis modules. If the report provides the syntax errors and schematic error , and we can change the input design file.

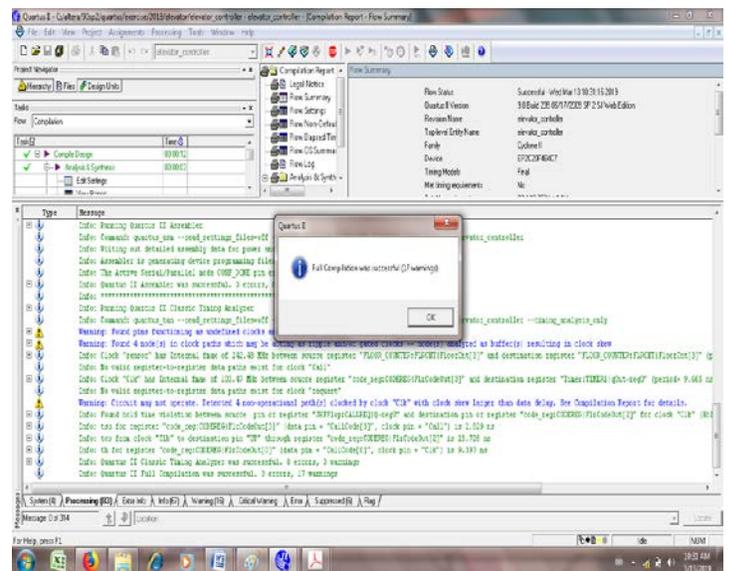


Fig.10 Compilation result for Controller

IV. SIMULATION RESULT ON QII SOFTWARE

A. RTL and Technology Map View

The VHDL coding of this paper design is compiled and simulated using Quartus II version 9.0. The Quartus II development software provides a complete design environment for system-on-a-programmable-chip (SOPC) design. This software not only compiles the given VHDL code but also produces waveform results and Register Transfer Logic (RTL). The RTL Viewer, State Machine Viewer, and Technology Map Viewer allow to view schematic representations of the internal structure of our designs. Each viewer displays a unique view of the netlist, and allows to view different internal structures.

The RTL Viewer allows to view a schematic of the design netlist after Analysis & Elaboration and netlist extraction, but before Quartus II synthesis and fitting optimizations. This view is

not the final structure of the design, because not all optimizations are included; instead it is the closest possible view to the original design. If the design uses integrated synthesis, this view shows how the Quartus II software interprets the design files; if we are using a third-party EDA synthesis tool, this view shows the netlist as written by the EDA synthesis tool. When processing the netlist, the RTL Viewer automatically performs the following optimizations:

- Removes internally used tri-state buses.
- Connects bidirectional pins directly to their sources.
- Removes single input nodes.
- Converts NOT gates to bubble inversions.
- Removes registers without fan-in or fan-out.
- Merges chains of equivalent combinational gates into a single gate.

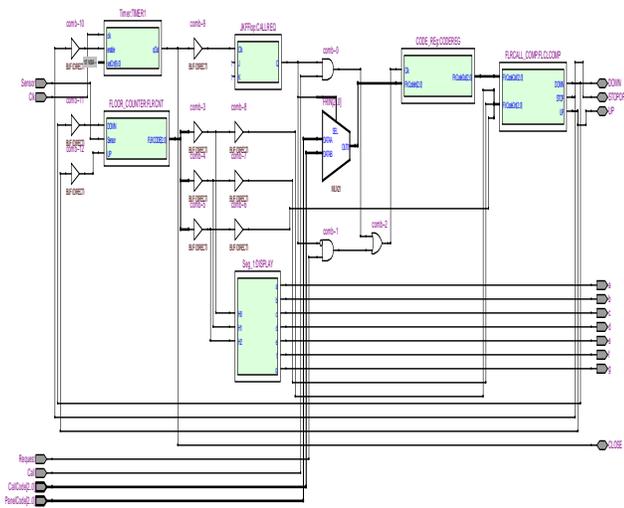


Fig.11 RTL level of Elevator Controller

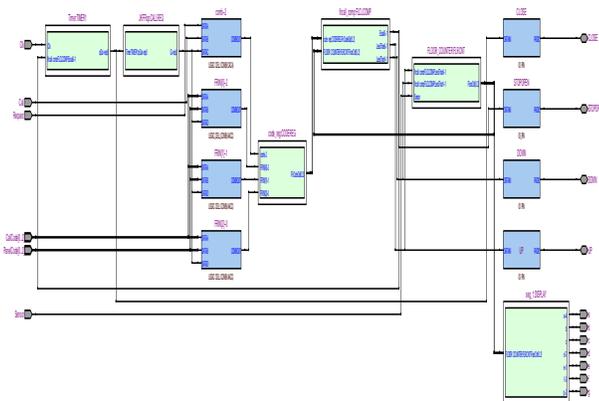


Fig.12 Post Mapping of Elevator Controller

The RTL Viewer and Technology Map Viewer provide a hierarchy list that displays a representation of the project

hierarchy and a schematic view that displays the components of the design element. The hierarchy list expands as we can navigate through the schematic view. we can also open the implementation of a design instance by double-clicking an instance in the hierarchy list. In the schematic view, different default colors are used to discern different design elements. For example:

- All encrypted design and I/O pins instances appear gray.
- All state machine nodes appear yellow (RTL Viewer only).
- All logic cells and I/O cells for which you can view the underlying internal implementation appear blue (Technology Map Viewer only).
- All RAM blocks and DSP blocks appear blue.
- All other design instances appear light green.

*B. Functional Simulation*

In order to simulate the elevator controller design, first open the vector waveform file. The Quartus II Simulator is a tool for testing and debugging the logical operation and internal timing of our design. Graphical waveforms are created to provide the input stimulus to test the elevator controller application. Inputs Call, Request, CallCode, PanelCode, Sensor, and Clk will be created using graphical tools. Output identifiers UP, DOWN, STOPOPEN, CLOSE, and seven-segment outputs 'a' through 'g' require no input stimulus. The timing diagram is developed using software for the proposed system. We set up the inputs data to the file and then saved the file as .vwf. Before starting a simulation, we must generate the appropriate simulation netlist by either compiling the design for timing simulation, or using the Generate Functional Simulation Netlist command for functional simulation.

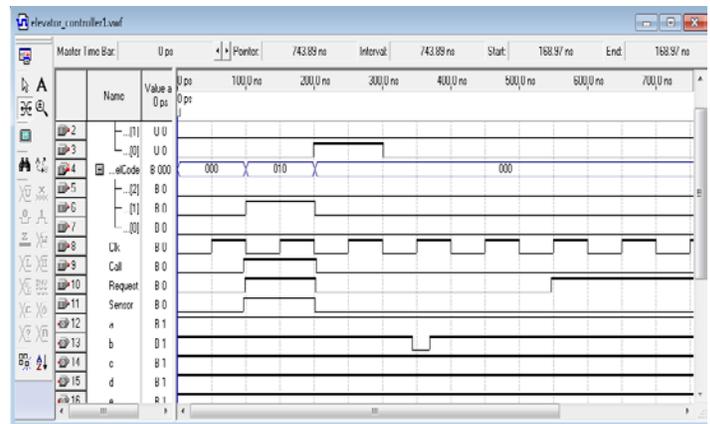


Fig.14 Set up inputs data to the file

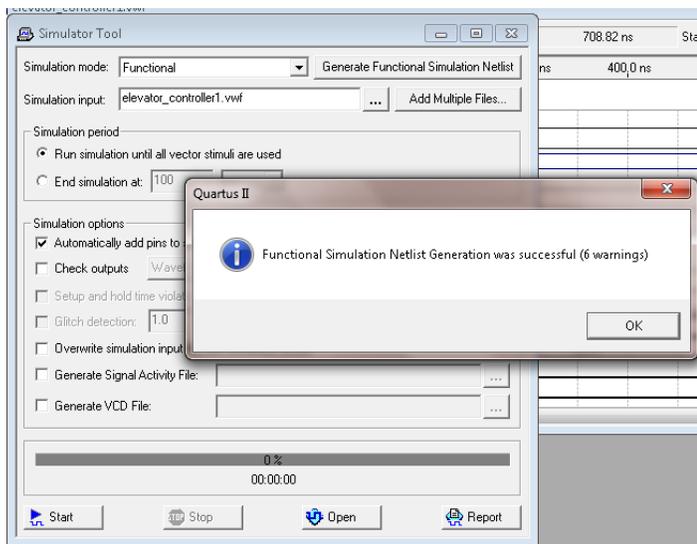


Fig.13 Nestlist file

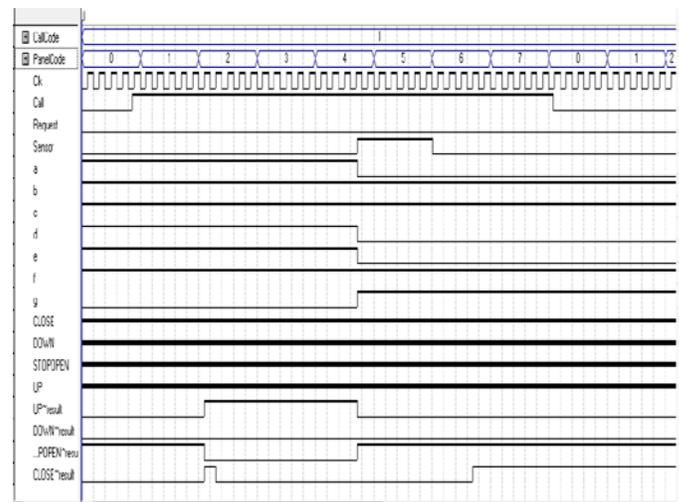


Fig.16 Simulation Result of Controller

### V. CONCLUSION

In this paper, the analysis and synthesis processes of elevator controller was implemented using VHDL code , generating RTL review, verifying the vector waveform by QII software. These processes can be easily to modify the elevator controller program for building with the required floors rather than five. And so the Quartus II software makes it easy to implement a desired logic circuit by using a programmable logic device, such as a field-programmable gate array (FPGA) chip such as Development and Education Board (DE1).

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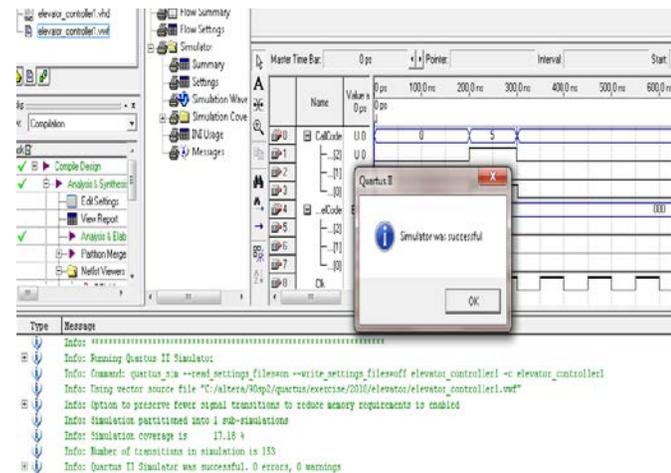


Fig.15 Simulator Report

In the simulation result, we can see the inputs and outputs by vector waveform file. We set the call code (1), panel code (1 to 7), the clk, call, sensor input and request. After the simulation, We found the output identifiers up, down, stopopen, close, and seven-segment

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# Simulation of Three Phase Sine Wave Generation for Pulse Width Modulation (PWM)

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**Abstract-** The sinusoidal pulse width modulation (SPWM) principle is widely used to control the power switches used in DC to AC inverters. In a three phase PWM inverter, three sinusoidal reference waves (each 120° out of phase) are compared with a triangular carrier wave. PWM are used in motor control and inverter application in order to control the operating state of the power switches. In this paper, three phase sine wave generation is presented in detail. It can be used as a component of PWM in 3 phase DC to AC inverters. Simulation is carried out by using PROTEUS (software).

**Index Terms-** SPWM, DC to AC inverter, sinusoidal reference wave, triangular carrier wave.

## I. INTRODUCTION

The PWM technique is one of the most popular new techniques. Harmonics are reduced by this technique for inverter. In PWM, a triangular wave is used as carrier signal and three sine waves displaced with 120° phase difference are used as reference signals for three phase inverter. The frequency of reference signal determines the inverter output frequency and its peak amplitude controls the modulation index and output voltage [1].

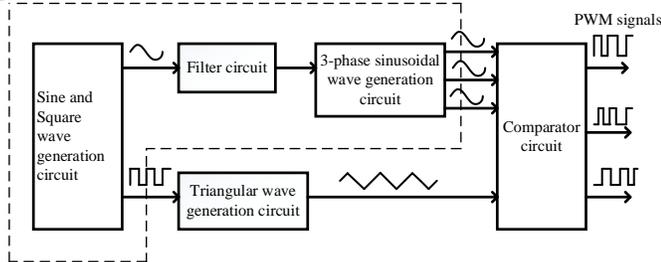


Fig.1. Block circuit diagram of 3-phase PWM control circuit

In figure 1, reference 400Hz waveform signals are generated by the sine and square wave generation circuit [2]. The sine wave signal is applied to the filter circuit to emphasize signals in certain frequency ranges. The output of the filter circuit is applied to the three phase sine wave generation circuit to produce three phase sinusoidal wave signals of 400Hz, 120° out of phase. The square waveform signal is applied to the triangular wave generation circuit to produce a synchronous triangular signal. In comparator circuit, the three phase sinusoidal signals are compared with the triangular signal and the results are PWM signals. In this paper, sine and square wave generation circuit, filter circuit and three phase sine wave generation circuit are presented in detail. Voltage controlled oscillator (VCO) ICL8038

is used in wave generation circuit and TL074 Op-amps are used in filter circuit and three phase sine wave generation circuit.

## II. THREE PHASE SINE WAVE GENERATION

### A. Waveform Generation

The first stage is to produce waveforms. Voltage controlled oscillator (VCO) ICL8038 is used in wave generation circuit. ICL8038 is capable of producing high accuracy sine, square, triangular, sawtooth and pulse waveforms with minimum of external components [3]. Fig.2 illustrates the schematic diagram of ICL8038 for producing a sine wave signal with 400Hz. The frequency of this circuit can be selected externally from 0.001Hz to more than 300KHz. The ICL8038 output is stable over a wide range of temperature and supply voltage.

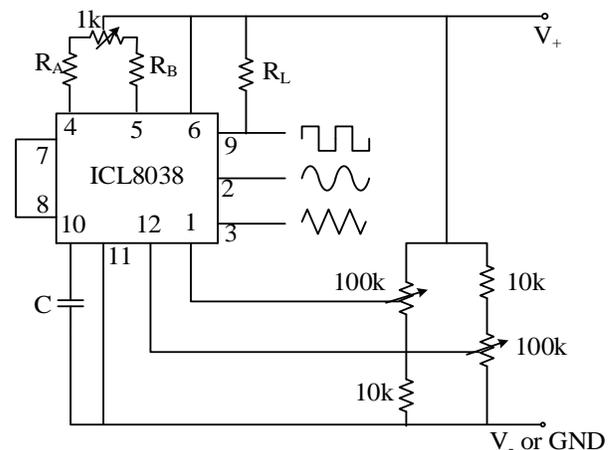


Fig.2 Schematic diagram to achieve minimum sine wave distortion

The symmetry of all waveforms can be adjusted with external timing resistors  $R_A$  and  $R_B$ . Two potentiometers can be connected to pin 12 and pin 1, this reduces sine wave distortion close to 0.5%. In this ICL8038, 50% duty cycle is achieved when  $R_A = R_B$ . A 1KΩ potentiometer may not allow the duty cycle to be adjusted through 50% on all devices. If a 50% duty cycle is required, a 2KΩ or 5KΩ potentiometer should be used. The output frequency of ICL8038 is [3];

For two separate timing resistors,

$$f = \frac{1}{\frac{R_A C}{0.66} \left(1 + \frac{R_B}{2R_A - R_B}\right)} \quad (1)$$

For  $R_A = R_B = R$ ,

$$f = \frac{0.33}{RC} \quad (2)$$

Capacitor, C should be chosen in possible range. The magnitude of the charging current is;

$$I = \frac{0.22(V_+ - V_-)}{R_A} \quad (3)$$

If  $I < 1\mu A$ , circuit leakages will contribute significant errors at high temperature. If  $I > 5mA$ , saturation voltages will contribute increasingly larger errors. Optimum performance will be obtained between  $10\mu A$  and  $1mA$ .

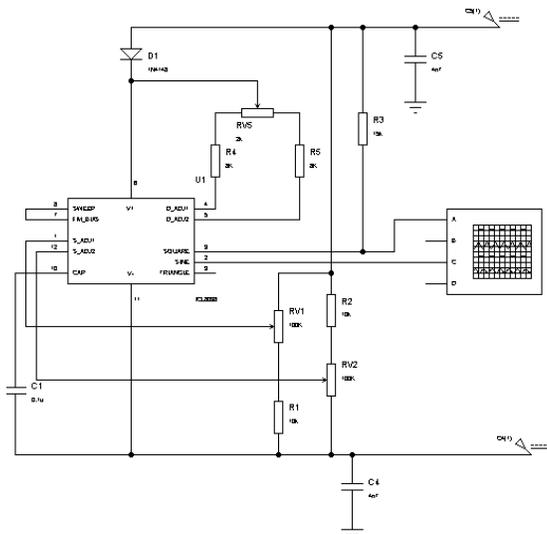


Fig 3. Simulation diagram of waveform generation circuit

### B. Filter Circuit

Filters are often used in electronic systems to emphasize signals in certain frequency ranges. This allows us to completely separate signals at different frequencies from one another. There are five types of filters namely; low pass filter, high pass filter, band pass filter, band reject filter (notch filter) and all pass filter. The band pass filter is used for filtering in this paper.

Band pass filter is a combination of high pass and low pass filter [4]. It is used to separate a signal at one particular frequency, or a range of signals that lie within a certain "band" of frequencies from signals at all other frequencies.

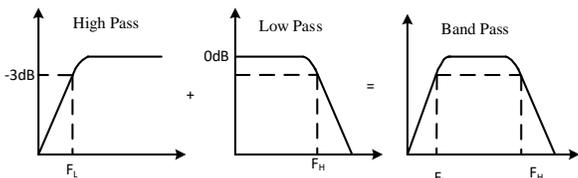


Fig 4. High pass, Low pass and Band pass filter

It can pass a band of frequencies between a lower cut-off frequency,  $F_L$  and upper cut-off frequency,  $F_H$  and rejects at other frequencies. The bandwidth is the difference between the upper and lower -3dB points.

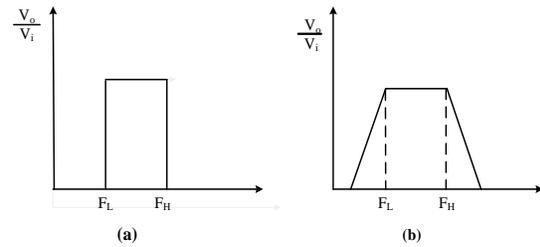


Fig 5. Frequency responses curves for band pass filter

(a) Ideal case

(b) In practical

In band pass filter circuit, TL074 op-amps are used. The TL074 op-amps are high speed JFET input single operational amplifiers [5]. These devices features are high slew rates, low input bias and offset current, low noise, low harmonic distortion and low offset voltage. The values of capacitors and resistors in the circuit are calculated from,

$$f = \frac{1}{2\pi\sqrt{R_1 R_2 C_1 C_2}} \quad (4)$$

$$\text{And } A_v (\text{dB}) = 40 \log_{10} \left( \frac{V_o}{V_i} \right) \quad (5)$$

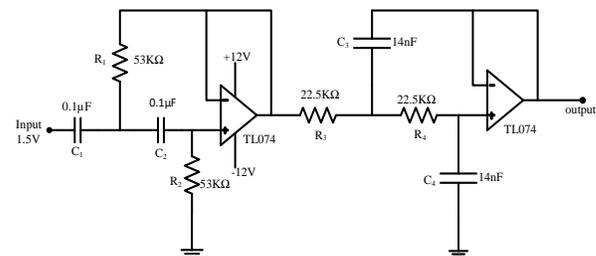


Fig.6 Second order band pass filter

### C. Three Phase Sine Wave Generation

All pass filters can be used to generate three phase sinusoidal signals that are  $120^\circ$  out of phase. These output signals are compared with the triangular signal to produce PWM signals. All pass filter let all frequencies pass and their amplitude is unity for all frequencies. Each frequency has a certain phase shift at the output, compared with the input signal. The phase response of all pass filters can be changed between  $0^\circ$  and  $360^\circ$  as necessary.

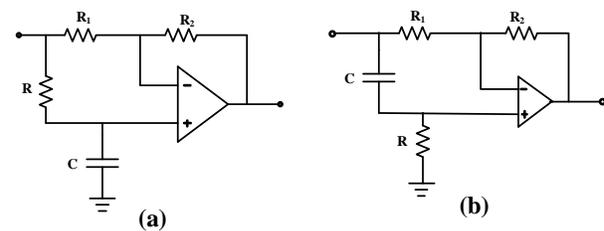


Fig 7. All pass filter

(a) For phase shift from  $0^\circ$  to  $+180^\circ$

(b) For phase shift from  $-180^\circ$  to  $0^\circ$

Resistor and capacitor can be calculated from this equation [6],

$$\Phi = \tan^{-1}\left(\frac{2\omega}{\omega^2 - \left(\frac{1}{RC}\right)^2}\right) \quad (6)$$

Where;  $\omega = 2\pi f$

$\phi$  = Phase shift in degree

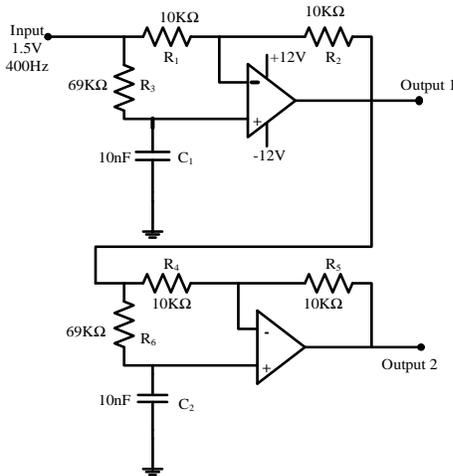


Fig. 8 Three phase sine wave generation circuit

### III. SIMULATION AND RESULTS

Figure.9 shows the simulation result diagram from waveform generation circuit and fig.10 is the simulation result diagram for band pass filter and Fig.11 illustrates the frequency response curve for band pass filter. In any case, the pass band limits are usually assumed to be the frequencies where the gain has dropped by 3dB. These frequencies are therefore called -3dB or the cut-off frequencies. From the simulation result curve, the maximum is -16.4dB. So, the cut-off frequency is -19.4dB and the pass band range is between 270Hz and 590Hz. Fig.13 is the simulation result diagram for three phase sine wave generation circuit and fig.14 shows the cascading diagram of waveform generation, filter and phase shift circuits.

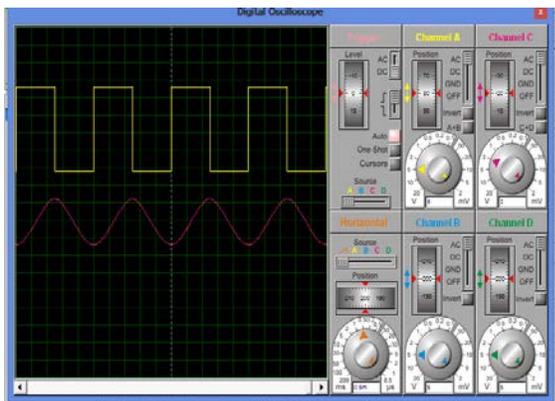


Fig. 9 Simulation result for waveform generation circuit

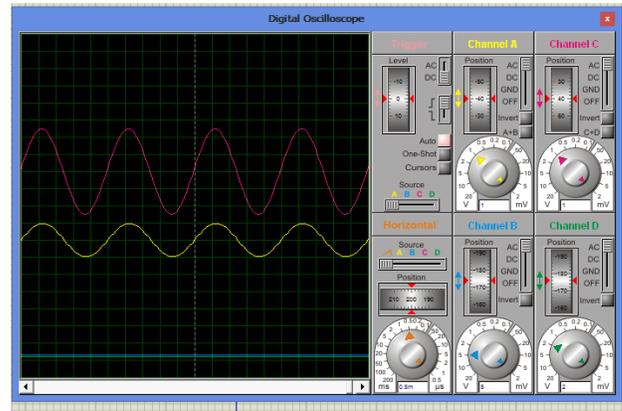


Fig. 10 Simulation for band pass filter

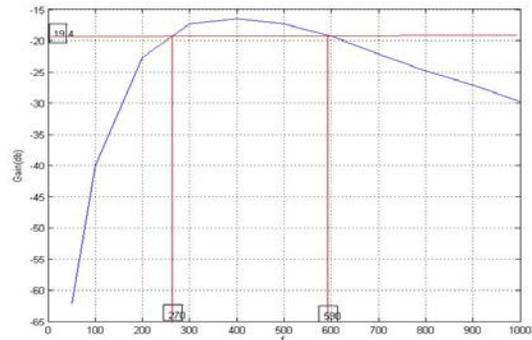


Fig. 11 Frequency response curve (frequency versus gain)

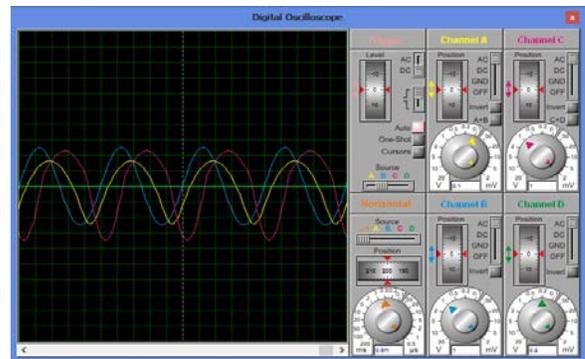


Fig. 12 Simulation result from phase shift circuit for the former design

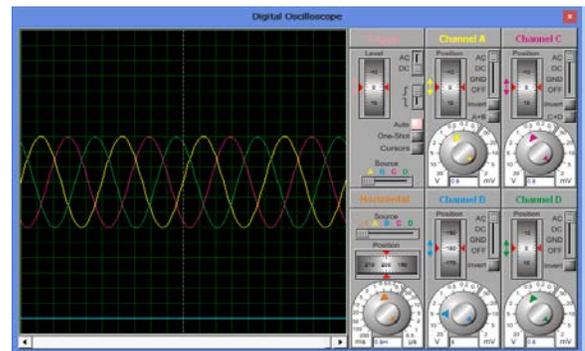


Fig.13 Simulation result for three phase sine wave generation with all pass filter

#### IV. CONCLUSION

Simple RC passive filters can be used for filter circuits. The main disadvantage of passive filter is that the amplitude of the output signal is less than that of the input signal, i.e., the gain is never greater than unity and the load impedance affects the filter characteristics. Active filters contain active components such as Op-amps, transistors or FETs within their circuit design. These active components draw their power from an external power source and use it to boost or amplify the output signal. Active filters are generally much easier to design than passive filters, they produce good performance characteristics, very good accuracy with a steep roll-off and low noise. Active filters use an op-amp for amplification and gain control.

The low pass filter passes all frequency below its cut-off frequency and attenuates all frequency above. The high pass filter passes only those frequencies that lie above designated cut-off frequency. The band pass filter passes only those frequencies lying within a range specified by upper and lower cut-off limits. So the band pass filter is suitable for filtering a range of signal/frequency.

For phase shift transformation, other phase shift circuits can also be used. But 120 degree cannot be provided definitely by these circuits and the output amplitude is not unity. All pass filters are suitable for any phase shift and their amplitude is unity for all frequencies. It can get definitely degree as necessary. It has simple design and easy to use.

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# Compound-Complex Problem: A Study of Mathematical Salvation To Language

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**ABSTRACT:** Sentences are the important part of human expression. There are different types of sentences like simple, compound, complex and compound-complex sentence. The last is comparatively more important than the first three sentences due to the making of long sentence by joining simply. The process of simplified joining sentences (compound-complex form) in Grammar are shown as the traditional way. The joining process can be shown in another process by the use of mathematical way. Marcov Chain, a stochastic process in Statistics is commonly regarded as branching process. In this mathematical process each event or incidence waves a number of corresponding events related to the principle. Thus a Marcov Chain consists with pace denoted by state,  $(0, 1, \dots, 1)$  and the set of positive integers. In the Marcov Chain the first state is regarded as a recurrent state and other finite sets are treated as transient state because the state makes a transitional form from one neighbouring state to another whereas in the recurrent state  $i=1$ . Marcov Chain in this paper for the sentence formation where numbers of simple sentences are changed to a single sentence is applied. Marcov Chain is a chain in which number of sentences / events are congregated with this process. The process is also called Marcov process. What is the role of Marcov process in the study of syntax? The process is a unique presentation of formation of a number of sentences into one. The aim of focusing of the process to the study of syntax is interesting to present a new approach. Now let us observe the analysis of syntax how enumerable events or sentences turn into one event. So I have observed that in the presence of joining of sentences the chain or Marcav process in followed its application to the joining of sentences shows how it is possible to analyse.

From the statistical point of view, there are two forms of sentences: one is closed sentence and the rest open sentence. Any sentence in general may be treated as both the closed sentence and open sentence. In this section I want to show how a sentence from the statistical point of view behaves like measurable components. Like components or things, it is possible to show that sentences can be measured or estimated. And at the same time we shall see how sentences with its several forms behave like measurable things. Actually it is an absolute idea by which sentence can be estimated. First of all we should clearly make out to do this that there are two sorts of Languages (language in general and language of infinitum) in which contains the elements of the particular sentence.

**Key Note: Compound-complex form, Marcov Chain, Branching Process, Recurrent State, Close and Open Sentence**

## a. Marcov Chain

**1.1 Introduction:** Marcov Chain known as a stochastic process in Statistics in which a wide variety of incidence or events are presented. This process of Marcov Chain is commonly regarded as branching process, too. In this mathematical process each event or incidence waves a number of corresponding events related to the principle. It is supposed that each event is extended to a new event  $j$  with probability  $P_j$ , where  $j \geq 0$  and where other incidence or events of the number are treated as independent. Now it is, also, assumed that  $P_j < 1$  for all  $j \geq 0$ . The number of subsidiary events present in given context, denoted by  $X_0$  that is the size of  $0^{\text{th}}$  event. All subsidiary events of the  $0^{\text{th}}$  events make the first representation or expression and their subsidiary events indicated by  $X_1$ . It is, of course, at the same time, assumed that  $X_n$  suggests the size of the  $n^{\text{th}}$  events and it follows  $\{X_n, n = 0, 1, \dots\}$ . Thus a Marcov Chain consists with pace denoted by state,  $(0, 1, \dots, 1)$  and the set of positive integers. In the Marcov Chain the first state is regarded as a recurrent state and other finite sets are treated as transient state because in this state  $i < 1$  and makes a transition from one neighbouring state to another whereas in the recurrent state  $i = 1$ . I introduce Marcov Chain in this chapter for the sentence formation where number of simple sentences are changed to a single sentence. To make out easily I use five simple sentences into one showing how the finite or countable number of possible values would be. It is finite or countable number for it represents 5 states as 1, 2, 3, 4 and 5.

Now it is discussed on Marcov Chain, a chain is number of sentences / events congregated with this process. The process is called Marcov process. What is the role of Marcov process in the study of syntax? The process is a unique presentation of formation of a number of sentences into one. The aim of focusing of the process to the study of syntax is interesting to present a new approach. Now let us observe the analysis of syntax how enumerable events or sentences turn into one event. So I have observed that in the presence of joining of sentences the chain or Marcav process in followed its application to the joining of sentences shows how it is possible to analyse. To present to process I here point into 5 simple sentences assumed as five distinctive events gives in below:

**1.2 Example –  $Mc_1$**

- He was poor.* ----- I
- He was weak* ----- II
- He stood by his friend.* ----- III
- This friend was in danger.* ----- IV
- He had none else to help him.* ----- V

After assimilation or joining of five sentences into one we get -

**To help his friend || in danger || being poor || and weak || he stood by || for he had none else.**

The combination consists in the following like

$$5 \rightarrow 4 \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow 5$$

Now this expression can be presented the following table:

Set of sentence	V→IV	IV→I	I→II	II→III	III→V
No. of State	1	2	3	4	5
Value of each state	1	1	1	1	1

**1.3. Solution:** And after arranging the given chart into Matrix we get a **Transitional Matrix  $R_1$**  that is mentioned in below:

Transitional form of the sentence

$$\begin{pmatrix}
 1 & 0 & 0 & 0 & 1/2 \\
 2 & 1/2 & 0 & 0 & 1/2 \\
 3 & 1/2 & 1/2 & 0 & 0 \\
 4 & 0 & 1/2 & 1/2 & 0 \\
 5 & 0 & 0 & 1/2 & 0
 \end{pmatrix}
 \begin{matrix}
 1/2 \\
 0 \\
 0 \\
 0 \\
 1/2
 \end{matrix}
 =
 \begin{matrix}
 1 \\
 1 \\
 1 \\
 1 \\
 1
 \end{matrix}$$

1      1      1      1      1

$P_1$

We shall now approach the given matrix into the ways of multiplication obtaining result --

$$P_2 = P_1 \times P_1$$

We get result of  $P_2$  matrix from the multiplication of the initial matrix  $P_1$  after reaching to a single step

$$\begin{pmatrix}
 0 & 1/4 & 2/4 & 0 & 1/4 \\
 0 & 1/4 & 1/4 & 1/4 & 1/4 \\
 1/4 & 0 & 0 & 2/4 & 1/4 \\
 1/4 & 1/4 & 0 & 1/4 & 0 \\
 1/4 & 1/4 & 1/4 & 0 & 1/4
 \end{pmatrix}$$

$P_2$

After approaching of two steps by multiplication what we get result from the matrix  $P_2$  is  $P_4$

That is  $P_4 = P_2 \times P_2$

$$\begin{pmatrix}
 3/16 & 2/16 & 2/16 & 5/16 & 4/16 \\
 4/16 & 3/16 & 2/16 & 4/16 & 3/16 \\
 4/16 & 4/16 & 3/16 & 2/16 & 2/16 \\
 2/16 & 4/16 & 5/16 & 2/16 & 2/16 \\
 2/16 & 3/16 & 4/16 & 3/16 & 4/16
 \end{pmatrix}$$

$P_4$

After reaching of five steps we get  $P_5$  Matrix mentioned in below:-

$$\begin{pmatrix}
 4/32 & 7/32 & 9/32 & 5/32 & 7/32 \\
 5/32 & 6/32 & 7/32 & 7/32 & 7/32 \\
 7/32 & 5/32 & 4/32 & 9/32 & 7/32 \\
 9/32 & 7/32 & 5/32 & 6/32 & 5/32 \\
 7/32 & 7/32 & 7/32 & 5/32 & 6/32
 \end{pmatrix}$$

$P_5$

**1.4. Solution:** After that we approach to explain the given composition in the **Steady State Probability** in the Markov Chain.

And from this calculation in the steady state probabilities what we obtain as result in that –

$$\pi_1 \pi_2 \pi_3 \pi_4 \pi_5 \begin{bmatrix} 0 & 0 & 0 & \frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & 0 & 0 & \frac{1}{2} & 0 \\ \frac{1}{2} & \frac{1}{2} & 0 & \frac{1}{2} & 0 \\ 0 & \frac{1}{2} & \frac{1}{2} & 0 & 0 \\ 0 & 0 & \frac{1}{2} & 0 & \frac{1}{2} \end{bmatrix}$$

$P_1$

$$\pi_1 = \frac{1}{2} \pi_2 + \frac{1}{2} \pi_3 \quad \text{i}$$

$$\pi_2 = \frac{1}{2} \pi_3 + \frac{1}{2} \pi_4 \quad \text{ii}$$

$$\pi_3 = \frac{1}{2} \pi_4 + \frac{1}{2} \pi_5 \quad \text{iii}$$

$$\pi_4 = \frac{1}{2} \pi_1 + \frac{1}{2} \pi_2 \quad \text{iv}$$

$$\pi_5 = \frac{1}{2} \pi_1 + \frac{1}{2} \pi_5 \quad \text{v}$$

$$\pi_4 = \frac{1}{2} \pi_1 + \frac{1}{2} \pi_2 \quad \text{---iv}$$

or  $\pi_4 = \frac{1}{2} (\frac{1}{2} \pi_2 + \frac{1}{2} \pi_3) + \frac{1}{2} \pi_3$  (putting  $\pi_1$ 's value)

or  $\pi_4 = \frac{1}{4} \pi_2 + \frac{1}{4} \pi_3 + \frac{1}{2} \pi_3$

or  $\pi_4 = \frac{\pi_2 + \pi_3 + \pi_3}{4}$

or  $\pi_4 = \frac{\pi_2 + \pi_3}{4}$  (and placing  $\pi_2$ 's value)

or  $\pi_4 = \frac{1}{4} \pi_2 + \frac{3}{4} \pi_3$

or  $\pi_4 = \frac{1}{4} (\frac{1}{2} \pi_3 + \frac{1}{2} \pi_4) + \frac{3}{4} \pi_3$

or  $\pi_4 = \frac{1}{8} \pi_3 + \frac{1}{8} \pi_4 + \frac{3}{4} \pi_3$

or  $\pi_4 - \frac{1}{8} \pi_4 = \frac{1}{8} \pi_3 + \frac{3}{4} \pi_3$

or  $\frac{8\pi_4 + \pi_4}{8} = \frac{\pi_3 + 6\pi_3}{8}$

or  $\frac{7}{8} \pi_4 = \frac{7}{8} \pi_3$

or  $\pi_4 = \pi_3$

$\pi_3 = \frac{1}{2} \pi_4 + \frac{1}{2} \pi_5$  -----iii

or  $\pi_3 = \frac{1}{2} \pi_3 + \frac{1}{2} \pi_5$  (putting  $\pi_4$ 's value)

or  $\pi_3 = \frac{1}{2} (\pi_3 + \pi_5)$

or  $2\pi_3 - \pi_3 = \pi_5$

or  $\pi_3 = \pi_5$

$\pi_2 = \frac{1}{2} \pi_3 + \frac{1}{2} \pi_4$  -----ii

or  $\pi_2 = \frac{1}{2} \pi_4 + \frac{1}{2} \pi_4$  (putting  $\pi_4$ 's value)

or  $\pi_2 = \pi_4$

$\pi_5 = \frac{1}{2} \pi_1 + \frac{1}{2} \pi_5$  -----v

or  $\pi_5 = \frac{1}{2} (\pi_1 + \pi_5)$  (putting  $\pi_4$ 's value)

or  $2\pi_5 = \pi_1 + \pi_5$

or  $2\pi_5 - \pi_5 = \pi_1$

or  $\pi_5 = \pi_1$

As we know  $\pi_1 + \pi_2 + \pi_3 + \pi_4 + \pi_5 = 1$

$\pi_2 = \frac{1}{2}, \pi_3 = \frac{1}{5}, \pi_4 = \frac{1}{5}$

or  $\pi_1 + \pi_1 + \pi_1 + \pi_1 + \pi_1 = 1$   $\pi_5 = \frac{1}{5}$

or  $5\pi_1 = 1$

or  $\pi_1 = \frac{1}{5}$

Putting values of all this we get

$\pi_1 + \pi_2 + \pi_3 + \pi_4 + \pi_5 = (\frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5}) = (\frac{1+1+1+1+1}{5}) = \frac{5}{5} = 1$

**2.1 Example:  $Mc_2$**

*The old man had been once very rich. ----- I*

*But he was now deserted by all. ----- II*

*He was lying on sick bed.* ----- **III**  
*It was in his lonely hut.* ----- **IV**  
*I could not but feel sorry for him.* ----- **V**

After assimilation or joining of five sentences into one we get —

**I could not (for) the old man, once very rich; but now, deserted by all, (as well as) lying on sick bed in his lonely hut (made me) felling sorry.**

The composition is built with in the following way

$$3. \rightarrow 1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5$$

**2.2 Solution:**

And in a chart this composition can be presented as

Set of Sentence	V→I	I→II	II→III	III→IV	IV→V
No of State	1	2	3	4	5
Value of Each State	1	1	1	1	1

After arranging the given chart into Matrix we get a **Transitional Matrix**  $P_{i1}$  that in mentioned in below:

Transitional form of the composition

$$\begin{matrix}
 & & 1 & 1 & 1 & 1 & 1 \\
 \begin{matrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{matrix} & \left( \begin{matrix} 1/2 & 0 & 0 & 0 & 1/2 \\ 1/2 & 1/2 & 0 & 0 & 0 \\ 0 & 1/2 & 1/2 & 0 & 0 \\ 0 & 0 & 1/2 & 1/2 & 0 \\ 0 & 0 & 0 & 1/2 & 1/2 \\ 1 & 1 & 1 & 1 & 1 \end{matrix} \right) & \begin{matrix} = 1 \\ = 1 \\ = 1 \\ = 1 \\ = 1 \end{matrix}
 \end{matrix}$$

$P_{i1}$

We shall further approach the given matrix into steps by multiplication obtaining results  $-P_{i2} = P_{i1} \times P_{i1}$

$$\left( \begin{matrix} & & 1 & 1 & 1 & 1 & 1 \\ & 1/4, & 0, & 0, & 1/4, & & \\ 2/4 & 1/4, & 0, & 0, & & 1/4 & = 1 \\ 1/4, & 2/4, & 1/4, & 0, & & 0 & = 1 \\ 0, & 1/4, & 2/4, & 1/4, & & 0 & = 1 \\ 0, & 0, & 1/4, & 2/4, & & 1/4 & = 1 \end{matrix} \right)$$

$P_{i2}$

Now we get result  $P_{i1}$  Matrix from the multiplication of the initial matrix  $P_{i1}$  after approaching of the single step –

$$P_{i4} = P_{i2} \times P_{i2}$$

After approaching of next step what we get result from the matrix  $P_{i2}$  is  $P_{i4}$

$$\left( \begin{matrix} & & 1/16, & 1/16, & 4/16, & 6/16, & 4/16 \\ & 4/16, & 1/16, & 1/16, & 4/16, & 6/16 & \\ & 6/16, & 4/16, & 1/16, & 1/16, & 4/16 & \\ & 4/16, & 6/16, & 4/16, & 1/16, & 1/16 & \\ & 1/16, & 4/16, & 6/16, & 4/16, & 1/16 & \end{matrix} \right)$$

$P_{i4}$

And we, now, get  $P_5$  Matrix just after reaching of five steps

$$P_{i5} = P_{i4} \times P_{i1}$$

$$\left( \begin{matrix} & & 2/32, & 5/32, & 10/32, & 10/32, & 5/32 \\ & 5/32, & 3/32, & 5/32, & 10/32, & 10/32 & \\ & 10/32, & 5/32, & 2/32, & 5/32, & 10/32 & \\ & 10/32, & 10/32, & 5/32, & 2/32, & 5/32 & \\ & 5/32, & 10/32, & 10/32, & 5/32, & 2/32 & \end{matrix} \right)$$

$P_{i5}$

**2.3. Solution:**

Next moment we approach to explain the given composition in the light of the steady state probabilities in the Markov Chain. And from this calculation in **the steady state probabilities** what we obtain as result is that →

$$\pi_1 \pi_2 \pi_3 \pi_4 \pi_5 \left( \begin{matrix} 1/2 & 0 & 0 & 0 & 1/2 \\ 1/2 & 1/2 & 0 & 0 & 0 \end{matrix} \right)$$

$$\begin{matrix}
 0 & \frac{1}{2} & \frac{1}{2} & 0 & 0 \\
 0 & 0 & \frac{1}{2} & \frac{1}{2} & 0 \\
 0 & 0 & 0 & \frac{1}{2} & \frac{1}{2}
 \end{matrix}$$

$P_{i1}$

$$\begin{aligned}
 \pi_1 &= \frac{1}{2} \pi_1 + \frac{1}{2} \pi_2 & \text{i} \\
 \pi_2 &= \frac{1}{2} \pi_2 + \frac{1}{2} \pi_3 & \text{ii} \\
 \pi_3 &= \frac{1}{2} \pi_3 + \frac{1}{2} \pi_4 & \text{iii} \\
 \pi_4 &= \frac{1}{2} \pi_4 + \frac{1}{2} \pi_5 & \text{iv} \\
 \pi_5 &= \frac{1}{2} \pi_1 + \frac{1}{2} \pi_5 & \text{v}
 \end{aligned}$$

$$\begin{aligned}
 \pi_1 &= \frac{1}{2} \pi_1 + \frac{1}{2} \pi_2 \quad \text{----} \quad \text{---} & \text{i} \\
 \text{Or } \pi_1 &= \frac{1}{2} (\pi_1 + \pi_2) \\
 \text{Or } 2\pi_1 &= \pi_1 + \pi_2 \\
 \text{Or } 2\pi_1 - \pi_1 &= \pi_2 \\
 \text{Or } \pi_1 &= \pi_2 \\
 \pi_2 &= \frac{1}{2} \pi_2 + \frac{1}{2} \pi_3 \quad \text{-----} \quad \text{----} & \text{ii} \\
 \text{Or } \pi_2 &= \frac{1}{2} (\pi_2 + \pi_3) \\
 \text{Or } 2\pi_2 &= \pi_2 + \pi_3 \\
 \text{Or } 2\pi_2 - \pi_2 &= \pi_3 \\
 \text{Or } \pi_2 &= \pi_3 \\
 \pi_3 &= \frac{1}{2} \pi_3 + \frac{1}{2} \pi_4 \quad \text{----} \quad \text{---} & \text{iii} \\
 \text{Or } \pi_3 &= \frac{1}{2} (\pi_3 + \pi_4) \\
 \text{Or } 2\pi_3 &= \pi_3 + \pi_4 \\
 \text{Or } 2\pi_3 - \pi_3 &= \pi_4 \\
 \text{Or } \pi_3 &= \pi_4 \\
 \pi_4 &= \frac{1}{2} \pi_4 + \frac{1}{2} \pi_5 \quad \text{----} \quad \text{---} & \text{iv} \\
 \text{Or } \pi_4 &= \frac{1}{2} (\pi_4 + \pi_5) \\
 \text{Or } 2\pi_4 &= \pi_4 + \pi_5 \\
 \text{Or } 2\pi_4 - \pi_4 &= \pi_5 \\
 \text{Or } \pi_4 &= \pi_5 \\
 \pi_5 &= \frac{1}{2} \pi_1 + \frac{1}{2} \pi_5 \quad \text{----} \quad \text{---} & \text{v} \\
 \text{Or } \pi_5 &= \frac{1}{2} (\pi_1 + \pi_5) \\
 \text{Or } 2\pi_5 &= \pi_1 + \pi_5 \\
 \text{Or } 2\pi_5 - \pi_5 &= \pi_1 \\
 \text{Or } \pi_5 &= \pi_1
 \end{aligned}$$

We see  $\pi_1 = \pi_2 = \pi_3 = \pi_4 = \pi_5$   
 And we know  $\pi_1 + \pi_2 + \pi_3 + \pi_4 + \pi_5 = 1$

Putting value except  $\pi_1 = 1$

$$\begin{aligned}
 \text{We get } \pi_1 + \pi_1 + \pi_1 + \pi_1 + \pi_1 &= 1 \\
 \text{Or } 5\pi_1 &= 1 \\
 \text{Or } \pi_1 &= \frac{1}{5}
 \end{aligned}$$

That means  $\pi_2 = \frac{1}{5}, \pi_3 = \frac{1}{5}, \pi_4 = \frac{1}{5}, \pi_5 = \frac{1}{5}$

And placing all  $\pi$ 's value we get

$$\pi_1 + \pi_1 + \pi_1 + \pi_1 + \pi_1 = \left(\frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5} + \frac{1}{5}\right) = \frac{(1+1+1+1+1)}{5} = \frac{5}{5} = 1$$

**Conclusion:** Markov Chain is a stochastic process in Statistics in which the varieties of elements are shown. Being regarded as a branching process the chain denotes state and the finite set of positive integers. The states are of two forms (the first state is the recurrent state and the later, the transient state. It is important to form a larger sentence from the number of shorter sentences which is also called in Grammar as joining. To analyse Markov Chain on the given examples (2.2.1 and 2.3.1) is presented with the **Transitional Matrix** and the **Steady State Probability** showing intimate compactness between them.

**b. Statistics**

**3.1 Introduction:** Next it is described how sentences are formed from the statistical point of view. From the statistical point of view, there are two forms of sentences: one is closed sentence and the rest open sentence. Any sentence in general may be treated as both the closed sentence and open sentence. In this section I want to show how a sentence from the statistical point of view behaves like measurable components. Like components or things, it is possible to show that sentences can be measured or estimated. And at the same time we shall see how sentences with its several forms behave like measurable things. Actually it is an absolute idea by which sentence can be estimated. First of all we should clearly make out to do this that there are two sorts of Languages (**language in general** and **language of infinitum**) in which contains the elements of the particular sentence.

**3.2 Example: Rabin loves Mina**

**3.3 Description:** Let us draw a simple example to exhibit how it is possible measuring a sentence from this view. To do this I mention earlier that any sort of sentence has been forms (**closed** and **open**) with several variables.

**Rabin loves Mina.....** (General)

The following example is no doubt a simple one because it is constructed with three components (subject, verb and object). We, of course, see that the given instance has two variables - ('Rabin' and 'Mina') consisting the sentence constructions. Now let us go through the discussion. The example 'Rabin loves Mina' is a closed sentence of a particular language assumed namely Language with simple recognition.

Closed sentence - Rabin loves Mina.

Open sentence - W loves Mina.

**Open Sentences:** In the open sentences 'W loves Mina' is a sentence in which one and only one individual variable 'Rabin' of  $L^N$  is free. Now the probability of Statistics of the open sentences can be exhibited in a way:

$$\sum_{i=1}^N (W^N(W_i), P_S^N(W_i \text{ loves Mina}))$$

Where for each i from 1 to N,  $W_i$  is the ith individual constant or variable 'W' of  $L^N$ ;  $W^N(W_i)$  is the weight of  $W_i$  in  $L^N$  and  $P_S^N(W_i \text{ loves Mina})$  is the statistical probability in  $L^N$  measured as either I or O by the above reconing of the closed sentence

**W loves Mina' of  $L^N$**

**Close Sentences:** I further, point out open sentence adopted from the closed sentence =

'W loves x' is a sentence of  $L^N$  is which two and only two individual variables 'W' (Rabin) and 'x' (Mina) of  $L^N$  are free. Here two individual constants or variables of  $L^N$ , the weights are allotted normally to the pairs of individuals designated by those constants and take  $P_S^N(W \text{ loves x})$  to be the sum --

$$\sum_{i=1}^{N^2} (W^N(W_{i1}, W_{i2}), P_S^N(W_i \text{ loves } W_{i2}))$$

Where, for each i from 1 to  $N^2$ ,  $W_{i1}, W_{i2}$  are  $i^{\text{th}}$  one of the pairs just mentioned  $W^N(w_{i1}, w_{i2})$  is weight of  $w_{i1}, w_{i2}$  in  $L^N$ ; and  $P_S^N(w_{i1} \text{ loves } w_{i2})$  is the statistical probability in  $L^N$  measured as I or O again of the closed sentence.

**$W_{i1} \text{ Loves } W_{i2} \text{ of } L^N$**

The procedure can easily be applied to open sentence of  $L^N$  where three or more individual variables of  $L^N$  are free.

Again the statistical probabilities of closed sentences are also found in the following instances like —

**3.4 Example and Description:**

1. **John Doe owns a station wagon** = 1 if he does not = 0
2. **John Does is a suburbanite** = 1 if he is not = 0
3. **John Doe is a suburbanite and owns a station wagon** = 1 ; if John is a suburbanite and doesn't own a station wagon = 0 if John isn't a suburbanite = 1

According to Kemeny's hands — open sentences P of the form  $F(W) = X$

Where F = one place factor the size of /the temperature of

W = individual constant

X = individual variable

**Sentences in Sigma Notation:** Human expression takes sometimes mathematical form. There are so many instances in co-ordinating expression adopting mathematical way related to either Algebra or Statistics. It is also very clear to say that all expressions of us are possible to analyse from the proper mathematical method. To show this it is mentioned some examples, and at the same time it is to say how expressions are possible to form in this way. With the help of statistical implementation I try to show how a sentence or an expression is constructed. An expression related to this is given from D. Tagore's *Simplified Syntax* as —

**3.5 Example and Description:**

**His younger brother is a lawyer, --  $a^1$**   
**his elder brother is a doctor, --  $a^2$**   
**his sister is a teacher --  $a^3$**   
**and he himself is a magistrate. --  $a^4$**

This expression can be presented statistically as —

$$S = \sum_{i=1}^n a^i \\ = a^1 + a^2 + a^3 + a^4$$

And at the same time another instance is given to show how a sentence is formed from the pointed of sigma notation where two sigma notations are separated by a negative substance.

$$S = \sum_{i=1}^n a^i + \sum_{i=1}^n b^i$$

$$= (a^1 + a^2) + (a^3 + a^4)$$

= {(His elder brother became a doctor) and  
 (his younger brother became a lawyer)}, but  
 {(his sister worked in a laundry) and  
 (he himself worked as a sweeper.)}

To clarify about the expression it is assumed that

	‘His elder brother became a doctor’	— $a^1$
(and)	‘his younger brother became a lawyer’	— $a^2$
(but)	‘his sister worked in a laundry’	— $a^3$
(and)	‘he himself worked as a sweeper.’	— $a^4$

The congregated form of expression may be written as in the following manner:

$$S = \{(a^1 + a^2) + (a^3 + a^4)\}$$

$$S = (\sum_{i=1}^n + \sum_{i=1}^n)$$

The co-ordinating expression, of course, takes algebraic form.

Example: His elder brother became a doctor  
 and his younger brother became a lawyer,  
 but he himself remained a humble sweeper all his life.

This is again assumed as:

	His elder brother became a doctor	— $a^1$
(and)	his younger brother became a lawyer	— $a^2$
(but)	he himself remained a humble sweeper all his life.	— $a^3$

The congregated form of the given example has been presented algebraically as

$$S = \{(a^1 + a^2) + a^3\}$$

So it is clear that all co-ordinating expressions have formed either sigma or algebra in presentation.

**Conclusion:** The study of Statistics is a branch of Mathematics and is important to the description of sentence. A sentence is of two forms (Close Sentence and Open Sentence) with variables (mingling with individual or subjective variable and others) in the statistical point of view. The probability of sentences is pointed out consequently as they are treated in the grammatical form. Besides the sigma notation is used to describe compound sentence. The relevant examples (3.2.1, 3.3.1 and 3.4.1) mentioned in the above discussion are, of course, analysed with the statistical point of view

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# A Comparative Study of Interpolation Using the Concept of Mathematical Norm With a Proposed Model

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## ABSTRACT

Interpolation is a method of constructing new data point within the range of a discrete set of known data points. Different methods have been developed to construct useful interpolation formulae, for evenly as well as unevenly spaced data points. This paper is aimed at developing a central difference interpolation formula which is derived from Gauss's Backward Formula and another formula in which we retreated the subscript in Gauss's Forward Formula by two units and replacing  $u$  by  $u+2$ . Also we made the comparisons of the developed interpolation formula with the existing interpolation formulae based on differences. The result from the error analysis carried out using the concept of Mathematical Norm, shows that the New (proposed) formula is much more efficient and have good accuracy for resolving functional values between given data.

**Keywords:** Interpolation, Central Difference, Mathematical Norm, Gauss's Formula.

## 1. INTRODUCTION

Interpolation is an estimation of a value within two known values in a sequence of values. Polynomial interpolation is a method of estimating values between known data points. When graphical data contains a gap, but data is available on either side of the gap or at a few specific points within the gap, interpolation allows for estimation of the values within the gap.

Over the years, many methods have been devised to build expedient interpolation formulae for even and unevenly spaced data points. Such methods include: Newton's divided difference formula (e.g. Atkinson, 1989; Carl and Boor, 1980) and Lagrange's formula (e.g. Burden, and Faires, 2001; Suli and Mayers, 2003;) are the most popular interpolation formulae for polynomial interpolation to any arbitrary degree with finite number of points.

Muthumalai(2008) studied new iterative methods for interpolation of, numerical differentiation and numerical integration formular for evenly and unevenly spaced data using Neville's and Aitken's concept of algorithms.

Muthumala and Uthra(2014) examined a new interpolation formular that generalized both Newton's and langrange's interpolation formula and futher derived new other ones based on differences and divided differences. The modified formulas, when compared with the former interpolation formulas (Newton's,Guass's, Sterling's, Bessel's) were more efficient and of good accuracy.

Garnero and Godone(2013) compared different interpolation tecniques to analyse the digital terrain models which are used for environment and land-related applications.

Das and Chakrabarty(2016) derived a formular from Langrange's interpolation method and this was used to obtain a numerical data for total population of India.The work was extended by deriving other methods for the same purpose. See Das and Chakrabarty(2016) and Das and Chakrabarty(2016). Abdulla et al. (2004), Proposed a new central difference interpolation formula which was gotten from difference interpolation formula and ours is derived from Gauss's Backward Formula and another formula in

which we retreat the subscripts in Gauss's Forward Formula by one unit and replacing  $u$  by  $u+1$ . Also, we make the comparisons of the developed interpolation formula with the existing interpolation formulas based on differences. Results show that the new formula is very efficient and possess good accuracy for evaluating functional values between given data.

Singh and Bhadauria. (2009), used Lagrange's Interpolation Formula to develop Finite Difference Formulae for unequal Sub-interval. General finite difference formulae and corresponding error terms were derived considering unequally spaced grid points, and using Lagrange's interpolation formula. Further, the finite difference formulae and the error terms for equally spaced sub-intervals were obtained as their special case of study.

Bater et al. (2009), used interpolation in evaluating errors associated with Lidar-Derived DEM. They discovered that light detecting and ranging (lidar) technology is capable of precisely measuring a variety of vegetation matrices, the estimates of which are usually based on relative heights above a digital elevation model (DEM). They tested seven interpolation routines, using small footprint lidar data, collected over a range of vegetation classes on Vancouver island.

Reuter et al. (2007), proposed an evaluation of void-filling Interpolation method for Shuttle Radar Topography Mission (SRTM). Based on a sample of 1304 artificial but realistic voice across six terrain types are eight void size classes, they found that the choice of void-filling algorithm is dependent on both size and terrain type of the data.

Liu et al. (2006), proposed a radial point interpolation based on finite difference method (FRDM). In their novel method, radial points interpolation using local irregular nodes is used together with the convolutional finite difference procedure to achieve both adaptability to irregular domain and the stability in the solution that is often encountered in the collection method. A least-square technique was adopted, which lead to a system matrix with good properties such as symmetry and positive definiteness.

Fritsch et al. (1980), derived a necessary and sufficient conditions for a cubic to be monotone on an interval. These conditions are used to develop an algorithm which constructs a visually pleasing monotone piecewise cubic interpolant to monotone data. Several examples were given which compares the algorithm with other interpolation methods.

Akima (1970), developed a new mathematical method for interpolation from a given set of data points in a plane and for fitting a smooth curve to the point. The method was developed in such a way that the resultant curve will pass through the given point and will appear smooth and natural. In this method, the slope of the curve was determined at each given point locally, and each polynomial representing a portion of the curve between a pair of given point, was determined by the coordinates of the slope at that point. Comparison indicates that the curve obtained by the new method was closer to a manually drawn curve than those drawn by other mathematical methods.

In this paper, we try to develop a central difference interpolation formula which is derived from Gauss's Backward Formula and another formula in which we retreated the subscript in Gauss's Forward Formula by two units and replacing  $u$  by  $u+2$ . Also we will carry out a comparisons of the developed interpolation formula with the existing interpolation formulae, (Gauss's, Stirling's and Bessel's etc) based on differences and use the concept of mathematical norm to select which method is best suitable for evaluating functional values between data.

## 2. NEW (PROPOSED) AND EXISTING INTERPOLATION FORMULAE

Given below are the Gauss's Central-Difference Formulae (see James B. Scarborough, 1966)

### Gauss's Forward Formula:

$$y = y_0 + u\Delta y_0 + u(u-1)\frac{\Delta^2 y_{-1}}{2!} + u(u^2-1)\frac{\Delta^3 y_{-1}}{3!} + u(u^2-1)(u-2)\frac{\Delta^4 y_{-2}}{4!} + u(u^2-1)(u^2-2^2)\frac{\Delta^5 y_{-2}}{5!} + \dots (1)$$

### Gauss's Backward Formula

$$y = y_0 + u\Delta y_{-1} + u(u+1)\frac{\Delta^2 y_{-1}}{2!} + u(u^2-1)\frac{\Delta^3 y_{-2}}{3!} + u(u^2-1)(u-2)\frac{\Delta^4 y_{-2}}{4!} + u(u^2-1)(u^2-2^2)\frac{\Delta^5 y_{-3}}{5!} + \dots \quad (2)$$

**Sterling Interpolation Formula**

We have the Sterling Interpolation Formula by taking the mean of the Gauss’s Forward and Gauss’s Backward Formula i.e. adding equations (1) and (2) and dividing by 2 (check James B. Scarborough, 1966):

$$y = y_0 + u\frac{(\Delta y_{-1} + \Delta y_0)}{2} + \frac{u^2}{2!}\Delta^2 y_{-1} + \frac{u(u^2-1)}{3!}\frac{(\Delta^3 y_{-2} + \Delta^2 y_{-1})}{2} + \frac{u^2(u^2-1)}{4!}\Delta^4 y_{-2} + \frac{u(u^2-1)(u^2-2^2)}{5!}\frac{\Delta^5 y_{-3} + \Delta^5 y_{-2}}{2} + \dots \quad (3)$$

**Bessel’s Interpolation Formula**

To derive the Bessel’s Interpolation Formula, we take the Gauss’s Formula. To derive this formula, we take the third and advance the subscripts in Gauss’s Backward Formula (i.e. Equation (1)) by one unit and replace  $u$  by  $u-1$  to obtain:

$$y = y_1 + (u-1)\Delta y_0 + u(u-1)\frac{\Delta^2 y_{-1}}{2!} + u(u-1)(u-2)\frac{\Delta^3 y_{-2}}{3!} + u(u^2-1)(u-2)\frac{\Delta^4 y_{-2}}{4!} + u(u^2-1)(u-2)(u-3)\frac{\Delta^5 y_{-2}}{5!} + \dots \quad (4)$$

The mean of the Gauss’s Forward Formula and Third Gauss’s Formula gives the Bessel’s Formula as

(see, James B. Scarborough, 1966):

$$y = \frac{y_0 + y_1}{2} + \left(u - \frac{1}{2}\right)\Delta y_0 + \frac{u(u-1)}{2!}\frac{(\Delta^2 y_{-1} + \Delta^2 y_0)}{2} + \frac{u\left(u - \frac{1}{2}\right)(u-1)}{3!}\Delta^3 y_{-1} + \frac{u(u^2-1)(u-2)}{4!}\frac{(\Delta^4 y_{-2} + \Delta^4 y_{-1})}{2} + \frac{u\left(u - \frac{1}{2}\right)(u^2-1)(u-1)}{5!}\Delta^5 y_{-2} + \dots \quad (5)$$

Equation (5) is the derived Bessel’s Interpolation Formula

**Previously Proposed Formula by Abdulla et al.**

This formula was derived by retreating the subscripts in Gauss’s Forward Formula by one unit and replacing  $u$  by  $u+1$ , to obtain a third Gauss’s Formula and then, the mean of the third formula and the Gauss’s Backward Formula, to obtain the New Formula.

$$y = \frac{y_{-1} + y_0}{2} + \left(u + \frac{1}{2}\right)\Delta y_{-1} + \frac{u(u+1)}{2!}\frac{(\Delta^2 y_{-2} + \Delta^2 y_{-1})}{2} + \frac{u\left(u + \frac{1}{2}\right)(u+1)}{3!}\Delta^3 y_{-2} + \frac{u(u^2-1)(u+2)}{4!}\frac{(\Delta^4 y_{-3} + \Delta^4 y_{-2})}{2} + u\frac{\left(u + \frac{1}{2}\right)(u^2-1)(u+2)\Delta^5 y_{-3}}{5!} + \dots \quad (6)$$

**New (Proposed) Interpolation Formula**

To derive the proposed formula, we retreat the subscript in Gauss’s Forward Interpolation Formula by two units and replacing  $u$  by  $u+2$ .

Recall from equation (1) above

$$y = y_0 + u\Delta y_0 + u(u-1)\frac{\Delta^2 y_{-1}}{2!} + u(u^2-1)\frac{\Delta^3 y_{-1}}{3!} + u(u^2-1)(u-2)\frac{\Delta^4 y_{-2}}{4!} + u(u^2-1)(u^2-2^2)\frac{\Delta^5 y_{-2}}{5!} + \dots \quad (7)$$

So we obtain,

$$y = y_{-2} + (u+2)\Delta y_{-2} + (u+1)(u+2)\frac{\Delta^2 y_{-3}}{2!} + (u+1)(u+2)(u+3)\frac{\Delta^3 y_{-3}}{3!} + u(u+1)(u+2)(u+3)\frac{\Delta^4 y_{-4}}{4!} + u(u+1)(u+2)(u+3)(u+4)\frac{\Delta^5 y_{-5}}{5!} + \dots \quad (8)$$

Also recall from equation (2) above,

$$y = y_0 + u\Delta y_{-1} + u(u+1)\frac{\Delta^2 y_{-1}}{2!} + u(u^2-1)\frac{\Delta^3 y_{-2}}{3!} + u(u^2-1)(u-2)\frac{\Delta^4 y_{-2}}{4!} + u(u^2-1)(u^2-2^2)\frac{\Delta^5 y_{-3}}{5!} + \dots \quad (9)$$

Taking the mean of equations (8) and (9) we get the New (proposed) Interpolation Formula

$$y = \frac{y_{-2} + y_0}{2} + \left[ 1 - \frac{u}{2} \left( 1 + \frac{\Delta y_{-1}}{\Delta y_{-2}} \right) \right] \Delta y_{-2} + \frac{(u+1)}{2!} \left[ \frac{(u+2)(\Delta^2 y_{-3}) + u\Delta^2 y_{-1}}{2} \right] + \frac{(u+1)}{3!} \left[ \frac{(u+2)(u+3)\Delta^2 y_{-3} + u(u-1)\Delta^3 y_{-2}}{2} \right] + \frac{u(u+1)(u+2)}{4!} \left[ \frac{(u+3)\Delta^4 y_{-4} + (u-1)\Delta^4 y_{-2}}{2} \right] + \frac{u(u+1)(u+2)}{5!} \left[ \frac{(u+3)(u+4)\Delta^5 y_{-5} + (u-1)(u-2)\Delta^5 y_{-3}}{2} \right] + \dots \quad (10)$$

### 3. Comparisons of the Formulas by Examples

In order to compare our proposed formula of interpolation with the existing formulas we consider different examples. They are discussing in below.

#### Problem 1:

Consider the function  $y = 3x^2 + 2x + 1$  whose value of  $y$  for some equidistantly spaced values of  $x$

$x$	1	3	5	7	9	11
$y = 3x^2 + 2x + 1$	6	34	86	162	262	386

**Table 1:** Difference Table for Problem 1

$x$	$y$	$\Delta y$	$\Delta^2 y$
1	6		
		28	
3	34		24
		52	
5	86		24
		76	
7	162		24

	100	
<b>9</b>	262	24
	124	
<b>11</b>	386	24
	148	
<b>13</b>	534	

Here we take  $x = 6, x_0 = 7, h = 2$ , and  $u = \frac{x-x_0}{h} = \frac{6-7}{2} = -0.5$

Actual value is:  $y(6) = 3(6)^2 + 2(6) + 1 = 121$

Gauss's Forward Interpolation Formula gives

$$y(6) = 162 + (-0.5)(100) + \frac{(-0.5)(-0.5 - 1)(24)}{2!} = 121$$

Gauss's Backward Interpolation Formula gives:

$$y(6) = 162 + (-0.5)(76) + \frac{(-0.5)(-0.5 + 1)(24)}{2!} = 121$$

Stirling's Interpolation Formula gives:

$$y(6) = 162 + (-0.5) \frac{(100 + 76)}{2} + \frac{(-0.5)^2}{2!} (24) = 121$$

Bessel's Interpolation Formula gives:

$$y(6) = \frac{162 + 262}{2} + \left(-0.5 - \frac{1}{2}\right)(100) + \frac{(-0.5)(-0.5 - 1)}{2} \left(\frac{24 + 24}{2}\right) = 121$$

Previously Proposed Formula by Faruq Abdulla et. al. gives:

$$y(6) = \frac{86 + 162}{2} + \left(-0.5 + \frac{1}{2}\right)(76) + \frac{(-0.5)(-0.5 + 1)}{2!} \left(\frac{24 + 24}{2}\right) = 121$$

Proposed Interpolation Formula gives:

$$y(6) = \frac{34 + 162}{2} + \left[1 - \frac{0.5}{2} \left(1 + \frac{76}{52}\right)\right] (52) + \frac{(-0.5 + 1)}{2!} \left[\frac{(-0.5 + 2)(24) - (0.5)24}{2}\right] = 121$$

**Problem 2:**

The following table gives the value of the function  $y = x^3 - 2x^2 + 7x - 3$  for certain equidistant values of  $x$

$x$	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
$y = x^3 - 2x^2 + 7x - 3$	-3	3	11	27	57	107

**Table 2:** Difference Table for Problem 3

x	$y = x^3 - 2x^2 + 7x - 3$	$\Delta y$	$\Delta^2 y$	$\Delta^3 y$
0	-3			
		6		
1	3		8	
		8		6
2	11		8	
		16		6
3	27		14	
		30		6
4	57		20	
		50		
5	107			

Here we take  $x = 2.3$ ,  $x_0 = 3$  and since  $h = 1$ , we have,  $u = \frac{x - x_0}{h} = \frac{2.3 - 3}{1} = -0.7$

Actual value is:  $y = x^3 - 2x^2 + 7x - 3 = (2.3)^3 - 2(2.3)^2 + 7(2.3) - 3 = 14.687$

Again, Gauss's Forward Formula gives:

$$y(2.3) = 27 + (-0.7)(30) + (-0.7)(-0.7 - 1) \left( \frac{14}{2!} \right) + \frac{(-0.7)((-0.7)^2 - 1)(6)}{3!} = 14.687$$

Gauss's Backward Interpolation Formula gives

$$y(2.3) = 27 + (-0.7)(16) + (-0.7)(-0.7 + 1) \left( \frac{14}{2!} \right) + \frac{(-0.7)((-0.7)^2 - 1)(6)}{3!} = 14.687$$

Stirling's Interpolation Formula gives:

$$y(2.3) = 27 + (-0.7) \frac{16 + 30}{2} + \frac{(-0.7)^2}{2!} (14) + \frac{(-0.7)((-0.7)^2 - 1) \left( \frac{6 + 6}{2} \right)}{3!} = 14.687$$

Bessel's Interpolation Formula gives

$$y(2.3) = \frac{57 + 27}{2} + \left( -0.7 - \frac{1}{2} \right) 30 + \frac{-0.7(-0.7 - 1)}{2!} \frac{(14 + 20)}{2} + \frac{-0.7 \left( -0.7 - \frac{1}{2} \right) (-0.7 - 1)(6)}{3!} = 14.687$$

Previously Proposed Formula by Abdulla et. al. gives:

$$y(2.3) = \frac{11+27}{2} + \left(-0.7 - \frac{1}{2}\right)(16) + \frac{-0.7(-0.7-1)}{2!} \frac{(8+14)}{2} + \frac{(-0.7)\left(-0.7 - \frac{1}{2}\right)(-0.7+1)(6)}{3!} = 14.687$$

Proposed Interpolation Formula gives:  $y(2.3) = \frac{3+27}{2} + \left[1 - \frac{-0.7}{2} \left(1 + \frac{16}{8}\right)\right] 8 + \frac{(-0.7+1)}{2!} \left[\frac{(-0.7+2)(2) + (-0.7)(14)}{2}\right] +$   
 $\frac{(-0.7+1)}{3!} \left[\frac{(-0.7+2)(-0.7+3)(6) + (-0.7)(-0.7-1)(6)}{2}\right] = 14.687$

**Problem 3:**

Consider the function  $y = \sin x$  for some equidistantly spaced values of  $x$

$x$	$45^0$	$50^0$	$55^0$	$60^0$
$y = \sin x$	0.7071	0.7660	0.8192	0.8660

**Table 3:** Difference Table for Problem 4

$x$	$y = \sin x$	$\Delta y$	$\Delta^2 y$	$\Delta^3 y$
$45^0$	0.7071			
		0.0589		
$50^0$	0.7660		-0.0057	
		0.0539		-0.0007
$55^0$	0.8192		-0.0064	
		0.0468		
$60^0$	0.8660			

Here we take  $x = 52^0$ ,  $x_0 = 55$  and since  $h = 5$ , we have,  $u = \frac{x - x_0}{h} = \frac{52 - 55}{5} = -0.6$

Actual value is:  $\sin 52^0 = 0.788010$

Gauss's Forward Interpolation Formula gives:

$$y(52^0) = 0.8192 + (-0.6)(0.0468) + (-0.6)((-0.6)^2 - 1) \left( \frac{-0.0064}{2!} \right) + \frac{(-0.6)((-0.6)^2 - 1)(0)}{3!} = 0.7898912$$

Gauss's Backward Formula gives:

$$y(52^0) = 0.8192 + (-0.6)(0.00539) + (-0.6)(-0.6 + 1) \left( \frac{-0.0064}{2!} \right) + \frac{(-0.6)((-0.6)^2 - 1)(-0.0007)}{3!} = 0.787583$$

Stirling's Interpolation Formula gives:

$$y(52^0) = 0.8192 + (-0.6) \frac{0.0539 + 0.0468}{2} + \frac{(-0.6)^2}{2!} (-0.0064) + \frac{(-0.6)((-0.6)^2 - 1)}{3!} \left( \frac{-0.0007 + 0}{2} \right) = 0.7877036$$

Bessel's Interpolation Formula gives:

$$y(52^2) = \frac{0.8660 + 0.8192}{2} + \left( -0.6 - \frac{1}{2} \right) (0.0468) + \frac{-0.6(-0.6 - 1)}{2!} \frac{(-0.0064 + 0)}{2} + \frac{-0.6 \left( -0.6 - \frac{1}{2} \right) (-0.6 - 1)(-0.0007)}{3!} = 0.7897072$$

Previously Proposed Formula by Faruq Abdulla et al. gives:

$$y(52^0) = \frac{0.7660 + 0.8192}{2} + \left( -0.6 + \frac{1}{2} \right) (0.0539) + \frac{-0.6(-0.6 + 1)}{2!} \frac{(-0.0057 - 0.0064)}{2} + \frac{(-0.6) \left( (-0.6)^2 - \frac{1}{2} \right) (-0.6 + 1)(-0.0007)}{3!} = 0.78866172$$

Proposed Formula gives:

$$y(2.3) = \frac{0.7071 + 0.8192}{2} + \left[ 1 - \frac{0.6}{2} \left( 1 + \frac{0.0539}{0.0589} \right) \right] 0.0589 + \frac{(-0.6 + 1)}{2!} \left[ \frac{(-0.6 + 2)(0) + (-0.6)(-0.0064)}{2} \right] + \frac{-0.6 + 1}{3!} \left[ \frac{(-0.6 + 2)(-0.6 + 3)(0) + (-0.6)(-0.6 - 1)(-0.0007)}{2} \right] = 0.7885492$$

**Problem 4:**

The following table, gives the value of  $e^x$  for certain equidistant values of  $x$ . We find the value of  $x$  when  $x = 1.7489$

$x$	1.72	1.73	1.74	1.75	1.76	1.77	1.78
$y = e^x$	5.5845285	5.6406539	5.6973434	5.7546027	5.8124374	5.8708534	5.9298564

**Table 4:** Difference Table for Problem 2

x	y = e <sup>x</sup>	Δy	Δ <sup>2</sup> y	Δ <sup>3</sup> y	Δ <sup>4</sup> y
1.72	5.5845285				
		0.056125444			
1.73	5.6406539		0.00056407		
		0.056689514		0.000005669	
1.74	5.6973434		0.000569739		0.0000005697
		0.057259253		0.00000572597	
1.75	5.7546027		0.000575465		0.0000005755
		0.057834718		0.00000578352	
1.76	5.8124374		0.000581249		0.0000005813
		0.058415967		0.00000584165	
1.77	5.8708534		0.00058709		
		0.059003057			
1.78	5.9298564				

Here we take  $x = 1.7489$ ,  $x_0 = 1.75$  and since  $h = 0.01$ , we have,  $u = \frac{x - x_0}{h} = \frac{1.7489 - 1.75}{0.01} = -0.11$

Actual value is:  $y = e^x = e^{1.7489} = 5.748276093$

Now, Gauss's Forward Interpolation Formula gives

$$y(1.7489) = 5.7546027 + (-0.11)(0.057834718) + (-0.11)(-0.11 - 1) \left( \frac{0.000575465}{2!} \right) +$$

$$+ (-0.11)((+0.11)^2 - 1) \left( \frac{0.00000578352}{3!} \right) + (-0.11)((+0.11)^2 - 1)(-0.11 - 2) \left( \frac{0.0000005755}{4!} \right) = 5.748277091$$

Gauss's Backward Interpolation Formula gives

$$y(1.7489) = 5.7546027 + (-0.11)(0.057259253) + (-0.11)(-0.11 + 1) \left( \frac{0.000575465}{2!} \right) +$$

$$+ (-0.11)((+0.11)^2 - 1) \left( \frac{0.00000572597}{3!} \right) + (-0.11)((+0.11)^2 - 1)(-0.11 + 2) \left( \frac{0.0000005813}{4!} \right) = 5.748271047$$

Stirling's Interpolation Formula gives:

$$y(1.7489) = 5.7546027 + (-0.11) \frac{(0.057259253 + 0.07834718)}{2} + \frac{(-0.11)^2}{2!} (0.000575465) +$$

$$\frac{+(-0.11)((-0.11)^2 - 1)\left(\frac{0.0000057259+0.0000057835}{2}\right)}{3!} + \frac{(-0.11)^2((-0.11)^2 - 1)}{4!}(0.0000000575) = 5.748276106$$

Bessel's Interpolation Formula gives:

$$y(1.7489) = \frac{5.7546027+5.8124374}{2} + \left(-0.11 - \frac{1}{2}\right)0.057834718 + \frac{-0.11(-0.11-1)}{2!} \frac{(0.000575465+0.000581249)}{2} + \frac{-0.11\left(-0.11 - \frac{1}{2}\right)(0.11-1)}{3!} (0.0000057838) + \frac{(-0.11)((-0.11)^2 - 1)(-0.11-2)}{4!} \frac{(0.0000000575+0.0000000581)}{2} = 5.748276093$$

Previously Proposed Formula by Faruq Abdulla et al. gives:

$$y(1.7589) = \frac{5.7546027+5.8124374}{2} + \left(-0.11 + \frac{1}{2}\right)(0.057834718) + \frac{-0.11(-0.11+1)}{2!} \frac{(0.000575465+0.000581249)}{2} + \frac{(-0.11)\left((-0.11)^2 - \frac{1}{2}\right)(-0.11+1)(0.00000578352)}{3!} + \frac{(-0.11)((-0.11)^2 - 1)(-0.11+2)}{4!} \left(\frac{0+0.813 \times 10^{-8}}{2}\right) = 5.806047233$$

Proposed Interpolation Formula gives:

$$y(1.7589) = \frac{5.6406539+5.7546027}{2} + \left[1 - \frac{-0.11}{2} \left(1 + \frac{0.05725953}{0.056689514}\right)\right] 0.056689514 + \frac{(-0.11+1)}{2!} \left[\frac{(-0.11+2)(0.00056407)+(-0.11)(0.000575465)}{2}\right] + \frac{(-0.11+1)}{3!} \left[\frac{(-0.11+2)(-0.11-3)(0.000005669)+(-0.11)(-0.11-1)(0.000569739)}{2}\right] + \frac{(-0.11)(-0.11+1)(-0.11+2)}{4!} \left[\frac{(-0.11+3)(0)+(-0.11-1)(0.00000005755)}{2}\right] = 5.748276011$$

**Problem 5:**

The following table gives the value of the function  $y = \sqrt{x}$  for some equidistantly spaced values of  $x$

$x$	<b>1</b>	<b>3</b>	<b>5</b>	<b>7</b>	<b>9</b>
$y = \sqrt{x}$	0.1	1.73205	2.23607	2.64575	3

**Table 5:** Difference Table for Problem 5

$x$	$y = \sqrt{x}$	$\Delta y$	$\Delta^2 y$	$\Delta^3 y$	$\Delta^4 y$
-----	----------------	------------	--------------	--------------	--------------

<b>1</b>	1.0			
		0.73205		
<b>3</b>	1.73205		-0.22803	
		0.50402		1.3694
<b>5</b>	2.23607		-0.09434	-0.03935
		0.40968		1.33039
<b>7</b>	2.64575		1.23605	
		1.64573		
<b>9</b>	3			

Here we take  $x = 3.8$ ,  $x_0 = 5$  and since  $h = 2$ , we have,  $u = \frac{x - x_0}{h} = \frac{3.8 - 5}{2} = -0.6$

Actual value is:  $y = \sqrt{x} = \sqrt{3.8} = 1.949358869$

Gauss's Forward Interpolation Formula gives:

$$y(3.8) = 2.23607 + (-0.6)(0.40968) + (-0.6)(-0.6 - 1) \left( \frac{-0.09434}{2!} \right) + \frac{(-0.6)((-0.6)^2 - 1)(1.33039)}{3!} + \frac{(-0.6)((-0.6)^2 - 1)(-0.6 - 2)(-0.03935)}{4!} = 2.044588174$$

Gauss's Backward Interpolation Formula gives:

$$y(3.8) = 2.23607 + (-0.6)(0.50402) + (-0.6)(-0.6 + 1) \left( \frac{-0.09434}{2!} \right) + \frac{(-0.6)((-0.6)^2 - 1)(1.36974)}{3!} + \frac{(-0.6)((-0.6)^2 - 1)(-0.6 + 2)(-0.03935)}{4!} = 2.03173096$$

Stirling's Formula Interpolation gives:

$$y(3.8) = 2.23607 + (-0.6) \frac{0.50402 + 0.40968}{2} + \frac{(-0.6)^2}{2!} (-0.22803) + \frac{(-0.6)((-0.6)^2 - 1)}{3!} \left( \frac{1.3694 + 1.33039}{2} \right) + \frac{(-0.6)^2 ((-0.6)^2 - 1)(-0.03935)}{4!} = 1.96563288$$

Bessel's Interpolation Formula gives:

$$y(3.8) = \frac{2.64575 + 2.23607}{2} + \left( -0.6 - \frac{1}{2} \right) (0.40968) + \frac{-0.6(-0.6 - 1)}{2!} \frac{-0.09434 + 1.23605}{2} + \frac{-0.6 \left( -0.6 - \frac{1}{2} \right) (-0.6 - 1)}{3!} (1.33039) +$$

$$+ \frac{(-0.6)((-0.6)^2 - 1)(-0.6 - 2)}{4!} \left( \frac{-0.03935 + 0}{2} \right) = 2.03094224$$

Previously Proposed Formula by Faruq Abdulla et. al. gives:

$$y(3.8) = \frac{1.73205 + 2.23607}{2} + \left(-0.6 + \frac{1}{2}\right)(0.50402) + \frac{-0.6(-0.6+1)}{2!} \frac{(-0.22808 - 0.9434)}{2} + \frac{(-0.6)\left((-0.6)^2 - \frac{1}{2}\right)(-0.6+1)(-0.03935)}{3!} = 2.00362644$$

Proposed Interpolation Formula gives:

$$y(3.8) = \frac{1 + 2.2360}{2} + \left[ 1 - \frac{-0.6}{2} \left( 1 + \frac{0.50402}{0.73205} \right) \right] 0.73205 + \frac{(-0.6+1)}{2!} \left[ \frac{(-0.6+2)(0) + (-0.6)(1.33039)}{2} \right] + \frac{(-0.6+1)}{3!} \left[ \frac{(-0.6+2)(-0.6+3)(0) + (-0.6)(-0.6-1)(1.36974)}{2} \right] + \frac{(-0.6)(-0.6+1)(-0.6+2)}{4!} \left[ \frac{(0.6+3)(0) + (-0.6-1)(-0.03935)}{2} \right] = 1.94283156$$

**Table 5: Summary/Comparison Table**

Problem	Gauss's Forward Formula	Gauss's backward Formula	Stirling's Formula	Bessel's formula	Proposed Formula by Abdulla et al.	New(proposed)	True Value
Problem 1	70.75	70.75	70.75	70.75	70.75	70.75	70.75
Problem 2	14.687	14.687	14.687	14.687	14.687	14.687	14.687
Problem 3	0.7898912	0.787583	0.7877036	0.7897072	0.78866172	0.7885492	0.7885492
Problem 4	5.748277	5.748271	5.7482761	5.7482761	5.806047233	5.748276	5.748276
Problem 5	2.0445882	2.031731	1.9656329	2.0309422	2.0036244	1.9428316	1.9493589

**Error Analysis:**

We shall now carry out an error analysis using the concept of mathematical *norm*, to determine which numerical method of interpolation from **Table 5** above, is best.

**Table 6:** Comparing the Actual Values of the functions and the values obtained using Gauss's Forward Interpolation Formula:

Actual(A)	Gauss's Forward(P <sub>1</sub> )	K <sub>1</sub> =  A-P <sub>1</sub>	%Error
70.75	70.75	0	0
14.687	14.687	0	0
0.788549	0.7898912	0.001342	0.170186
5.748276	5.748277	9.98E-07	1.74E-05

1.949359	2.0445882	0.095229	4.88516
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$$\|K_1\|_1 = \left[ |70.5 - 70.5| + |14.687 - 14.687| + |0.7885492 - 0.7898912| + |5.74827601 - 5.748277009| + |1.94935887 - 2.044588174| \right]$$

$$= 0.096572$$

$$\|K_1\|_2 = \sqrt{(|70.5 - 70.5|)^2 + (|14.687 - 14.687|)^2 + (|0.7885492 - 0.7898912|)^2 + (|5.74827601 - 5.748277009|)^2 + (|1.94935887 - 2.044588174|)^2}$$

$$= 0.095239$$

$$\|K_1\|_\infty = \max \left[ |70.5 - 70.5| + |14.687 - 14.687| + |0.7885492 - 0.7898912| + |5.74827601 - 5.748277009| + |1.94935887 - 2.044588174| \right]$$

$$= 0.095229$$

**Table 7:** Comparing the Actual Values of the functions and the values obtained using Gauss's

Backward Interpolation Formula

Actual(A)	Gauss's Backward(P <sub>2</sub> )	K <sub>2</sub> =  A- P <sub>2</sub>	%Error
70.75	70.75	0	0
14.687	14.687	0	0
0.788549	0.787583	0.000966	0.122529
5.748276	5.748271	4.96E-06	8.64E-05
1.949359	2.031731	0.082372	4.225599

$$\|K_2\|_1 = \left[ |70.5 - 70.5| + |14.687 - 14.687| + |0.7885492 - 0.787583| + |5.74827601 - 5.748271047| + |1.94935887 - 2.03173096| \right]$$

$$= 0.083343$$

$$\|K_2\|_2 = \sqrt{(|70.5 - 70.5|)^2 + (|14.687 - 14.687|)^2 + (|0.7885492 - 0.787583|)^2 + (|5.74827601 - 5.748271047|)^2}$$

$$= 0.082378$$

$$\|K_2\|_\infty = \max \left[ \begin{aligned} &|70.5 - 70.5| + |14.687 - 14.687| + |0.7885492 - 0.787583| + \\ &+ |5.74827601 - 5.748271047| + |1.94935887 - 2.03173096| \end{aligned} \right]$$

$$= 0.082372$$

**Table 8:** Comparing the Actual Values of the functions and the values obtained using Stirling’s Formula:

Actual(A)	Stirling’s Formula(P <sub>3</sub> )	K <sub>3</sub> =  A- P <sub>3</sub>	%Error
70.75	70.75	0	0
14.687	14.687	0	0
0.788549	0.7877036	0.000846	0.107235
5.748276	5.7482761	9.50E-08	1.65E-06
1.949359	1.9656329	0.016274	0.834839

$$\|K_3\|_1 = \left[ \begin{aligned} &|70.5 - 70.5| + |14.687 - 14.687| + |0.7885492 - 0.7877036| + |5.74827601 - 5.748276106| + \\ &+ |1.94935887 - 1.96563288| \end{aligned} \right]$$

$$= 0.01712$$

$$\|K_3\|_2 = \sqrt{\begin{aligned} &(|70.5 - 70.5|)^2 + (|14.687 - 14.687|)^2 + (|0.7885492 - 0.7877036|)^2 \\ &+ (|5.74827601 - 5.748276106|)^2 + (|1.94935887 - 1.96563288|)^2 \end{aligned}}$$

$$= 0.016296$$

$$\|K_3\|_\infty = \max \left[ \begin{aligned} &|70.5 - 70.5| + |14.687 - 14.687| + |0.7885492 - 0.787583| + \\ &+ |5.74827601 - 5.748271047| + |1.94935887 - 1.96563288| \end{aligned} \right]$$

$$= 0.016274$$

**Table 9:** Comparing the Actual Values of the functions and the values obtained using Bessel’s Interpolation Formula:

Actual(A)	Bessel's Formula(P <sub>4</sub> )	K =  A-P <sub>4</sub>	%Error
70.75	70.75	0	0
14.687	14.687	0	0
0.788549	0.7897072	0.001158	0.146852
5.748276	5.7482761	8.20E-08	1.43E-06
1.949359	2.0309422	0.081583	4.185139

$$\|K_4\|_1 = \left[ |70.5 - 70.5| + |14.687 - 14.687| + |0.7885492 - 0.7897072| + |5.74827601 - 5.748276093| + |1.94935887 - 2.03094224| \right]$$

$$= 0.082741$$

$$\|K_4\|_2 = \sqrt{(|70.5 - 70.5|)^2 + (|14.687 - 14.687|)^2 + (|0.7885492 - 0.7897072|)^2 + (|5.74827601 - 5.748276093|)^2 + (|1.94935887 - 2.03094224|)^2}$$

$$= 0.081592$$

$$\|K_4\|_\infty = \max \left[ |70.5 - 70.5| + |14.687 - 14.687| + |0.7885492 - 0.7897072| + |5.74827601 - 5.748276093| + |1.94935887 - 2.03094224| \right]$$

$$= 0.081583$$

**Table 10:** Comparing the Actual Values of the functions and the values obtained using the proposed interpolation formula by Faruq Abdulla et al.

Actual(A)	Formula by Faruq Abdulla et. al (P <sub>5</sub> )	K =  A-P <sub>5</sub>	%Error
70.75	70.75	0	0
14.687	14.687	0	0
0.7885492	0.78866172	0.000113	0.014269
5.74827601	5.806047233	0.057771	1.005018
1.94935887	2.0036244	0.054266	2.783763

$$\|K_5\|_1 = \left[ |70.5 - 70.5| + |14.687 - 14.687| + |0.7885492 - 0.78866172| + |5.74827601 - 5.806047233| + |1.94935887 - 2.0036244| \right]$$

$$= 0.112149$$

$$\|K_5\|_2 = \sqrt{(|70.5 - 70.5|)^2 + (|14.687 - 14.687|)^2 + (|0.7885492 - 0.78866172|)^2 + (|5.74827601 - 5.806047233|)^2 + (|1.94935887 - 2.0036244|)^2}$$

$$= 0.079261$$

$$\|K_5\|_\infty = \max \left[ |70.5 - 70.5| + |14.687 - 14.687| + |0.7885492 - 0.7885492| + |5.74827601 - 5.748276011| + |1.94935887 - 1.94283156| \right]$$

$$= 0.057771$$

**Table 11:** Comparing the Actual Values of the functions and the values obtained using the New (proposed) Interpolation Formula:

Actual(A)	Proposed Formula (P <sub>6</sub> )	K =  A-P <sub>6</sub>	%Error
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70.75	70.75	0	0
14.687	14.687	0	0
0.788549	0.7885492	0	0
5.748276	5.748276	0	0
1.949359	1.9428316	0.006527	0.334844

$$\|K_6\|_1 = \left[ |70.5 - 70.5| + |14.687 - 14.687| + |0.7885492 - 0.7885492| + |5.74827601 - 5.748276011| + |1.94935887 - 1.94283156| \right]$$

$$= 0.006527$$

$$\|K_6\|_2 = \sqrt{(|70.5 - 70.5|)^2 + (|14.687 - 14.687|)^2 + (|0.7885492 - 0.7885492|)^2 + (|5.74827601 - 5.748276011|)^2 + (|1.94935887 - 1.94283156|)^2}$$

$$= 0.006527$$

$$\|K_6\|_\infty = \max \left[ |70.5 - 70.5| + |14.687 - 14.687| + |0.7885492 - 0.7885492| + |5.74827601 - 5.748276011| + |1.94935887 - 1.94283156| \right]$$

$$= 0.006527$$

**Table 11: Error Comparison**

Norm	Gauss's Forward	Gauss's Backward	Stirling's Formula	Bessel's Formula	Formula by Abdulla et al.	Proposed Formula
$\ 1 - norm\ $	0.096572	0.083343	0.01712	0.082741	0.112149	0.006527
$\ 2 - norm\ $	0.095239	0.082378	0.016296	0.081592	0.079261	0.006527
$\ \infty - norm\ $	0.095229	0.082372	0.016274	0.081583	0.05771	0.006527

#### 4. CONCLUSION

This paper is on a New (proposed) Formula for Interpolation and Comparison with existing models of interpolation, using the concept of mathematical norm. The new model given in equation (8), is center based i.e. when the value to be interpolated is from the centre region in a given data set. The New formula was obtained by retreating the subscript in Gauss's Forward Interpolation Formula by two units and replacing  $u$  by  $u+2$ , then the resulting equation was added to the Gauss's Backward Interpolation Formula and the mean taken to obtain the New (proposed) Model. The New (proposed) Formula for Interpolation was then tested against the existing Formulae which includes: Gauss's Forward Interpolation Formula, Gauss's Backward Interpolation Formula, Stirling's Interpolation

Formula, and Bessel's Interpolation Formula and a Formula previously proposed by Faruq Abdulla et al. The results obtained, was analyzed using the concept of *Mathematical Norm*, and it was discovered that the New model has the minimum errors with respect to *1-norm*, *2-norm* and *infinity-norm*. Therefore, the New (proposed) model, is best for central difference based Interpolation

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# Effect of Dimethoate on the Acid Phosphatase Activity and Protein Metabolism in the Fresh Water Fish *Anabas Testudineus*

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## ABSTRACT

The protein level of blood, liver and muscle in *Anabas testudineus* exposed to sublethal and median lethal concentrations of pesticide, dimethoate showed gradual decrease, which was statistically significant. The acid phosphatase activity in the blood, liver and muscle of *Anabas testudineus* was found to increase on exposure to sublethal and median lethal concentrations of dimethoate. The changes were concentration and duration dependent. Rise in the activities of acid phosphatase along with a reduction in protein content in the different tissues suggests enhanced protein catabolism to meet energy demands.

**Key words:** Protein, Acid phosphatase, Dimethoate, *Anabas*

## INTRODUCTION

Stress due to anthropogenic contaminants such as pesticides and fertilizers could affect the health and performance of non - target species. Animals in the natural environment are usually exposed to low concentrations of these contaminants, which are sublethal. Fishes are important component of the food chain and are sensitive to a great number of contaminants such as pesticides, heavy metals, PCBs etc. Pesticides are receiving increased attention as a potential cause of biodiversity declines. Surveys on natural populations of many animals have shown correlations between population declines and proximity to agricultural lands (Birge *et al* 2000).

## MATERIALS AND METHODS

Healthy, adult individuals of *Anabas testudineus* were collected from their habitats, brought to the laboratory and acclimatized to laboratory conditions for a week. Specimens weighing 40 to 50 g were used for the experiment. Commercial formulation of dimethoate, an organophosphate pesticide (30% EC) was used for toxicity studies. The 96 hour LC<sub>50</sub> value for the pesticide was determined using bioassay methods (Doudoroff *et al* 1951) and Probit analysis (Finny 1971). From LC<sub>50</sub> value a sublethal concentration (1/10th of LC<sub>50</sub>) and a median lethal concentration (1/2 of LC<sub>50</sub>) were calculated and fixed as the experimental concentrations. The experiment was maintained up to 30 days along with a control. *Anabas testudineus* were force fed with pieces of earthworms to ensure equal availability of food before and during the course of the experiment. Six individuals from each concentration were sacrificed on 5<sup>th</sup>, 10<sup>th</sup>, 15<sup>th</sup>, 20<sup>th</sup>, 25<sup>th</sup> and 30<sup>th</sup> days for collecting blood, liver and muscle. Total protein was estimated in blood, liver and muscle using Biuret method (Gornall *et al* 1949). Acid phosphatase activity was estimated in these tissues by Kind and King method (1954). Data obtained were subjected to statistical analysis using analysis of variance (ANOVA).

## RESULTS

The 96 hour LC<sub>50</sub> value for dimethoate for *Anabas testudineus* was found as 0.1 ppm and the experimental concentrations were fixed as 0.01 ppm (sublethal) and 0.05 ppm (median lethal). In experimental fishes control values showed no significant variations for blood protein. Control values ranged from 8.38 to 8.63 mg /100ml blood. In sublethal concentrations of dimethoate lowest value recorded was 2.7 mg /100ml on the thirtieth day of exposure (Table 1). Similarly in median lethal concentration this was 1.11 mg / 100 ml.(Table 2). Liver protein showed same trend as that of blood protein. Control values ranged between 11.50 and 11.75 mg / g wt. of tissue. In sublethal concentrations of nuvacron the lowest value recorded was 4.58 mg / g wt. of tissue (Table 1) and in median lethal concentrations it was 1.97 mg / g wt. of tissue (Table 2). Muscle protein also showed declining trend. Control values ranged between 10.5 and 12.16 mg / g wt. of tissue. In sublethal concentrations the muscle protein recorded the lowest value 1.53 mg / g wt. of tissue on the thirtieth day. In median lethal concentration, this was 1.03 mg / g wt. of tissue (Table 2). Statistical analysis of the data showed significant difference between control and treated values in all the treatments of sublethal and median lethal concentrations of the pesticide.

The acid phosphatase activity in the blood, liver and muscle of *Anabas testudineus* was found to increase on exposure to sublethal and median lethal concentrations of dimethoate. In blood the control values ranged between 37.93 and 40.12 micromol phenol produced/min/l. In sublethal concentration there was a significant elevation of value, reaching up to 73.65 micromol phenol produced/min/l.(Table 3). Median lethal concentration elicited more sharp increase in value, reaching up to 79.82 micromol phenol produced/min/l.(Table 4). Similar results were obtained in liver and muscle acid phosphatase values. In liver the control values were between 7.42 and 8.07 micromol phenol produced/min/l., whereas the sublethal concentrations induced an increase up to 14.32 micromol phenol produced/min/l.(Table 3). Median lethal concentration raised the values, up to 23.4 micromol phenol produced/min/l. (Table 4). In muscle the control values were 12.3 and 12.8 micromol phenol produced/min/l. and the sublethal value reached up to 24.0. In median lethal concentration the value reached up to 28.4 micromol phenol produced/min/l. (Table 4). Throughout the experiment, control values showed no significant differences. But in the treatment with the pesticide, the values showed statistically significant differences from control even on the fifth day. This difference was time and duration dependent. These enzymatic changes are indicative of the cellular toxicity and tissue damage induced by the pesticide in fish, probably by imposing an alteration in the specific metabolic pathways. It is well known that acid and alkaline phosphatases play a significant part in various metabolic processes, especially protein and carbohydrate metabolism.

## DISCUSSION

The protein level of blood, liver and muscle in *Anabas testudineus* exposed to sublethal and median lethal concentrations of pesticide, dimethoate showed gradual decrease, which was statistically significant. The decline was more pronounced in median lethal treatments in all the tissues indicating a dose dependent effect. The decrease in protein content in the various tissues of the treated *Anabas testudineus* indicates the physiological adaptability of the animal to compensate for pesticide stress. This energy demand might have led to stimulation of protein catabolism. Protein content in tissue is dependent on the dynamic equilibrium between the rates of its synthesis and degradation. The pesticide exposure might have accelerated proteolytic process to liberate aminoacids to overcome the metabolic stress. Pesticide induced reduction in protein content in the tissues of different animals were reported by a number of workers (Pan and Dutta, 2000, Das and Mukherjee, 2001 Luskova *et al.*, 2002, Naveed *et al.* 2004).

Rise in the activities of this enzyme along with a reduction in protein content in the different tissues suggests enhanced protein catabolism to meet energy demands. This inference is further supported by the findings of Das and Mukherjee (2000) who reported an increase in acid phosphatase activity and a decrease in protein and RNA levels in *Labeo rohita* fingerlings exposed to quinalphos. Hence, the increased level of acid phosphatase in blood, liver and muscle of treated frogs indicates enhanced metabolic activity, perhaps to meet the stress induced by the pesticides.

Table 1. Effects of sublethal concentration of dimethoate on the blood, liver and muscle protein of *Anabas testudineus*.

Tissue	5 <sup>th</sup> Day		10 <sup>th</sup> Day		15 <sup>th</sup> Day		20 <sup>th</sup> Day		25 <sup>th</sup> Day		30 <sup>th</sup> Day	
	Control	Expt	Control	Expt	Control	Expt	Control	Expt	Control	Expt	Control	Expt
Blood	8.38	4.57	8.58	4.52	8.63	4.10	8.40	3.65	8.50	3.21	8.45	2.7
Liver	11.75	11.27	11.52	10.22	11.67	9.15	11.50	7.22	11.72	5.73	11.78	4.58
Muscle	10.67	5.00	10.83	4.23	10.50	3.31	12.83	2.62	12.12	2.01	12.16	1.53

VR\*\*  
 CD(5%)=0.30

Table 2. Effects of median lethal concentration of dimethoate on the blood, liver and muscle protein of *Anabas testudineus*.

Tissue	5 <sup>th</sup> Day		10 <sup>th</sup> Day		15 <sup>th</sup> Day		20 <sup>th</sup> Day		25 <sup>th</sup> Day		30 <sup>th</sup> Day	
	Control	Expt	Control	Expt	Control	Expt	Control	Expt	Control	Expt	Control	Expt
Blood	8.38	3.70	8.58	3.25	8.63	2.82	8.40	2.18	8.50	1.55	8.45	1.11
Liver	11.75	9.82	11.52	8.05	11.67	6.15	11.50	3.90	11.72	2.68	11.78	1.97
Muscle	10.67	5.03	10.83	4.40	10.50	3.60	12.83	2.20	12.12	1.32	12.16	1.03

VR\*\*  
 CD(5%)=1.89

Table 3. Effects of sublethal concentration of dimethoate on the acidphosphatase concentration in the blood, liver and muscle of *Anabas testudineus*.

Tissue	5 <sup>th</sup> Day		10 <sup>th</sup> Day		15 <sup>th</sup> Day		20 <sup>th</sup> Day		25 <sup>th</sup> Day		30 <sup>th</sup> Day	
	Control	Expt	Control	Expt	Control	Expt	Control	Expt	Control	Expt	Control	Expt
Blood	39.2	43.50	38.12	45.10	40.12	47.63	39.68	53.75	37.93	61.22	39.83	73.65
Liver	7.62	8.57	7.52	9.12	8.07	9.68	7.42	10.68	7.68	12.40	7.62	14.32
Muscle	12.33	13.48	12.47	14.35	12.82	15.62	12.5	17.58	12.45	20.18	12.43	24.03

VR \*\*

CD (5%) = 2.73

Table 4. Effects of median lethal concentration of dimethoate on the acidphosphatase concentration in the blood, liver and muscle of *Anabas testudineus*

Tissue	5 <sup>th</sup> Day		10 <sup>th</sup> Day		15 <sup>th</sup> Day		20 <sup>th</sup> Day		25 <sup>th</sup> Day		30 <sup>th</sup> Day	
	Control	Expt	Control	Expt	Control	Expt	Control	Expt	Control	Expt	Control	Expt
Blood	39.2	47.83	38.12	51.53	40.12	55.18	39.68	60.98	37.93	67.83	39.83	79.82
Liver	7.62	9.15	7.52	10.45	8.07	12.13	7.42	14.30	7.68	18.12	7.62	23.42
Muscle	12.33	15.32	12.47	16.27	12.82	18.40	12.5	21.47	12.45	24.60	12.43	28.35

VR \*\*

CD (5%) = 0.62

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# Effect of Dimethoate on the Acid Phosphatase Activity and Protein Metabolism in the Fresh Water Fish *Anabas Testudineus*

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## ABSTRACT

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Healthy, adult individuals of *Anabas testudineus* were collected from their habitats, brought to the laboratory and acclimatized to laboratory conditions for a week. Specimens weighing 40 to 50 g were used for the experiment. Commercial formulation of dimethoate, an organophosphate pesticide (30% EC) was used for toxicity studies. The 96 hour LC<sub>50</sub> value for the pesticide was determined using bioassay methods (Doudoroff *et al* 1951) and Probit analysis (Finny 1971). From LC<sub>50</sub> value a sublethal concentration (1/10th of LC<sub>50</sub>) and a median lethal concentration (1/2 of LC<sub>50</sub>) were calculated and fixed as the experimental concentrations. The experiment was maintained up to 30 days along with a control. *Anabas testudineus* were force fed with pieces of earthworms to ensure equal availability of food before and during the course of the experiment. Six individuals from each concentration were sacrificed on 5<sup>th</sup>, 10<sup>th</sup>, 15<sup>th</sup>, 20<sup>th</sup>, 25<sup>th</sup> and 30<sup>th</sup> days for collecting blood, liver and muscle. Total protein was estimated in blood, liver and muscle using Biuret method (Gornall *et al* 1949). Acid phosphatase activity was estimated in these tissues by Kind and King method (1954). Data obtained were subjected to statistical analysis using analysis of variance (ANOVA).

## RESULTS

The 96 hour LC<sub>50</sub> value for dimethoate for *Anabas testudineus* was found as 0.1 ppm and the experimental concentrations were fixed as 0.01 ppm (sublethal) and 0.05 ppm (median lethal). In experimental fishes control values showed no significant variations for blood protein. Control values ranged from 8.38 to 8.63 mg /100ml blood. In sublethal concentrations of dimethoate lowest value recorded was 2.7 mg /100ml on the thirtieth day of exposure (Table 1). Similarly in median lethal concentration this was 1.11 mg / 100 ml.(Table 2). Liver protein showed same trend as that of blood protein. Control values ranged between 11.50 and 11.75 mg / g wt. of tissue. In sublethal concentrations of nuvacron the lowest value recorded was 4.58 mg / g wt. of tissue (Table 1) and in median lethal concentrations it was 1.97 mg / g wt. of tissue (Table 2). Muscle protein also showed declining trend. Control values ranged between 10.5 and 12.16 mg / g wt. of tissue. In sublethal concentrations the muscle protein recorded the lowest value 1.53 mg / g wt. of tissue on the thirtieth day. In median lethal concentration, this was 1.03 mg / g wt. of tissue (Table 2). Statistical analysis of the data showed significant difference between control and treated values in all the treatments of sublethal and median lethal concentrations of the pesticide.

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## DISCUSSION

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Table 1. Effects of sublethal concentration of dimethoate on the blood, liver and muscle protein of *Anabas testudineus*.

Tissue	5 <sup>th</sup> Day		10 <sup>th</sup> Day		15 <sup>th</sup> Day		20 <sup>th</sup> Day		25 <sup>th</sup> Day		30 <sup>th</sup> Day	
	Control	Expt	Control	Expt	Control	Expt	Control	Expt	Control	Expt	Control	Expt
Blood	8.38	4.57	8.58	4.52	8.63	4.10	8.40	3.65	8.50	3.21	8.45	2.7
Liver	11.75	11.27	11.52	10.22	11.67	9.15	11.50	7.22	11.72	5.73	11.78	4.58
Muscle	10.67	5.00	10.83	4.23	10.50	3.31	12.83	2.62	12.12	2.01	12.16	1.53

VR\*\*  
 CD(5%)=0.30

Table 2. Effects of median lethal concentration of dimethoate on the blood, liver and muscle protein of *Anabas testudineus*.

Tissue	5 <sup>th</sup> Day		10 <sup>th</sup> Day		15 <sup>th</sup> Day		20 <sup>th</sup> Day		25 <sup>th</sup> Day		30 <sup>th</sup> Day	
	Control	Expt	Control	Expt	Control	Expt	Control	Expt	Control	Expt	Control	Expt
Blood	8.38	3.70	8.58	3.25	8.63	2.82	8.40	2.18	8.50	1.55	8.45	1.11
Liver	11.75	9.82	11.52	8.05	11.67	6.15	11.50	3.90	11.72	2.68	11.78	1.97
Muscle	10.67	5.03	10.83	4.40	10.50	3.60	12.83	2.20	12.12	1.32	12.16	1.03

VR\*\*  
 CD(5%)=1.89

Table 3. Effects of sublethal concentration of dimethoate on the acidphosphatase concentration in the blood, liver and muscle of *Anabas testudineus*.

Tissue	5 <sup>th</sup> Day		10 <sup>th</sup> Day		15 <sup>th</sup> Day		20 <sup>th</sup> Day		25 <sup>th</sup> Day		30 <sup>th</sup> Day	
	Control	Expt	Control	Expt	Control	Expt	Control	Expt	Control	Expt	Control	Expt
Blood	39.2	43.50	38.12	45.10	40.12	47.63	39.68	53.75	37.93	61.22	39.83	73.65
Liver	7.62	8.57	7.52	9.12	8.07	9.68	7.42	10.68	7.68	12.40	7.62	14.32
Muscle	12.33	13.48	12.47	14.35	12.82	15.62	12.5	17.58	12.45	20.18	12.43	24.03

VR \*\*

CD (5%) = 2.73

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Tissue	5 <sup>th</sup> Day		10 <sup>th</sup> Day		15 <sup>th</sup> Day		20 <sup>th</sup> Day		25 <sup>th</sup> Day		30 <sup>th</sup> Day	
	Control	Expt	Control	Expt	Control	Expt	Control	Expt	Control	Expt	Control	Expt
Blood	39.2	47.83	38.12	51.53	40.12	55.18	39.68	60.98	37.93	67.83	39.83	79.82
Liver	7.62	9.15	7.52	10.45	8.07	12.13	7.42	14.30	7.68	18.12	7.62	23.42
Muscle	12.33	15.32	12.47	16.27	12.82	18.40	12.5	21.47	12.45	24.60	12.43	28.35

VR \*\*

CD (5%) = 0.62

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# Helminthes of Synantropic Rodents of the Northeast Part of Uzbekistan

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**Annotation:** For the first time we registered 21 species of helminthes belonging to the classes - cestodes, trematodes, and nematodes - that are parasites of the house mice (*Mus musculus*, Linnaeus, 1758) (18 species) and the gray rat (*Rattus norvegicus*, Berkenhaut, 1769) (11 species) in the territory of Northeastern of Uzbekistan. The total infection of synanthropic rodents was 46.2%. The intensity of invasion by helminthes ranged from 1 to 32 individuals.

**Key words:** cestodes, nematodes, trematodes, mouse-like, rodents, synanthropic, Uzbekistan.

## Introduction

The role of mouse-like individuals in the biocenosis is significant. They consume primary products and invertebrates; constitute the food base of predatory mammals. The epidemiological and epizootological role of mouse-like rodents is well known. Thanks to the work of many scientists, in recent decades, research on parasitic worms of rodents has advanced significantly. In this regard, it was increased interest in the study of helminthes of mouse-like rodents in the general theoretical aspect. The uneven study of the helminthes of mouse-like rodents in certain regions of the world attracts attention. Many regions of Uzbekistan are considerable of interest from the point of view of biogeography, little studied or almost completely unexplored data are still been remained. All this makes, which it is possible to consider the work carried out by us as expedient and relevant. Small mammals, among which the leading place belongs to rodents, from an environmental point of view, are one of the main components of the ecosystem. They beneficial effect to the soil structure and the grass-shrub tier of vegetation; they are the primary production of predatory birds, mammals and many reptiles. However, from a parasitological point of view, mice and rats, which play a negative role in the transmission of viruses and endoparasites, not only animals, but also to humans. Representatives of the family of mouse-like rodents of Muridae Gray, 1821 is an essential biological component of terrestrial ecosystems. In the biogeocenoses of Uzbekistan, they will form stable communities, consisting of 5 species: *Apodemus sylvaticus* Pallas, 1811, *Mus musculus* (Linnaeus, 1758), *Rattus norvegicus* (Berkenhaut, 1769), *Rattus turkestanicus* (Satunin, 1903), *Nesokia indica* (Gray et Hardwicke, 1830), (Shernazarov and others, 2006). They are final and intermediate hosts of a number of parasitic worms (Ryzhikov et al., 1978, 1979).

Helminthological studies of rodents in Uzbekistan were conducted by Davlatov (1970), Koshchanov (1972) and Bykova (2002). The information, given in these works, in the first case, refers to the fauna of the rodent worms of the North-Western region; in the second case they represent the systematic aspects of studying the parasites of house mice and the gray rat of urbanized territories. On peculiar ecosystems of the Northeast region, similar studies of rodents have not been conducted. In this

regard, the study of mouse-like helminthes and their role in the epizootology of helminthases is an important task of zoology and parasitology.

### Materials and methods

The material for this work was the collection of parasitic worms from house mice and a gray rat of the Northeast part of Uzbekistan, covering three major administrative regions (Djizak, Syrdarya and Tashkent).

Mice-like rodents were captured by using standard cylinder-shaped trap grooves and traps with live traps (Krivopalov, 2011). Helminthological material was collected during 2016-2019 years by outstanding methods (Scriabin, 1928) of the rodent populations of the studied region.

126 of individuals of *Mus Musculus* species and 108 of individuals of *Rattus norvegicus* individuals were investigated by the method of complete autopsies. The collected worms were studied in the laboratory of the General Parasitology of the Academy of Sciences of the Republic of Uzbekistan. Species identification of parasitic worms is made in accordance with the determinants given in the works of foreign researchers (Ryzhikov et al., 1978, 1979; Anderson, 2000).

When assessing the degree of infestation of rodents with parasites, standard parasitological indicators were used: extensiveness of invasion — EI (%), intensity of invasion — II (species).

### Results and discussion

For the mouse-like rodents (*Mus musculus* and *Rattus norvegicus*) in the studied territory of the Northeast of Uzbekistan, we first registered 21 types of helminthes belonging to the classes - cestodes, trematodes and nematodes (table 1).

**Table 1**

#### Species composition of helminthes of mouse-like rodents in the studied region

№	Species	Host	
		House mouse	Gray rat
Class <i>Cestoda</i> Rudolphi, 1808			
1.	<i>Catenotaenia cricetorum</i> (Kirschenblatt, 1949)	+	+
2.	<i>Catenotaenia pusilla</i> (Goeze, 1782)	+	+
3.	<i>Mathevotaenia symmetrica</i> (Baylis, 1927)	-	+
4.	<i>Hymenolepus diminuta</i> (Rudolphi, 1819)	+	+
5.	<i>Dipylidium caninum</i> (L., 1758)	-	+
6.	<i>Taenia hydatigena</i> (Pallas, 1766)	+	+
7.	<i>Taenia pisiformis</i> (Bloch, 1780)	+	+
8.	<i>Hydatigera taeniaformis</i> (Batsch, 1786)	+	+
9.	<i>Mesocostoides lineatus</i> (Goeze 1782)	+	+
Class Trematoda Rudolphi, 1808			
10.	<i>Brachylaemus aequans</i> (Looss 1899)	+	-
11.	<i>Brachylaemus recurvus</i> (Dujardin 1845)	+	-
Class Nematoda Rudolphi, 1808			
12.	<i>Heligmosoides ryjikovi</i> (Nadtochyi et. al., 1971)	+	-
13.	<i>Heligmosoides polygyrus</i> (Dujardin, 1845)	+	-
14.	<i>Ganguleterakis spumosa</i> (Schneider, 1866)	-	+
15.	<i>Aspicularis schulzi</i> (Popov et Nasarova, 1930)	+	+
16.	<i>Aspicularis tetroptera</i> (Nitsch, 1821)	+	-

17.	<i>Syphacia obvelata</i> (Rudolphi 1802)	+	-
18.	<i>Syphacia stroma</i> (Linstow 1884)	+	-
19.	<i>Gongylonema problematicum</i> (Schulz, 1924)	+	-
20.	<i>Gongylonema neoplasticum</i> (Fibiger et ditlevsen 1914)	+	-
21.	<i>Trichopcephalus muris</i> (Schrank, 1788)	-	+
Total		18	11

The data shows in the table, that house mice turned out to be infected with 18 species, and gray rats with 11 species of helminthes.

The total infection of synanthropic rodents was 46.2%. The intensity of invasion by helminthes varied from 1 to 32 samples.

In the structure of parasites fauna as studied animals, cestodes (4 species) and nematodes (10 species) prevail. Trematodes are represented by only two species (*Brachylaemus aequans* and *Brachylaemus recurvus*), which were infected only populations of house mice from Zaamin and Bakhmal regions of Jizzakh region.

Some species of parasitic worms, found in rodents of Northeastern Region - *Dipylidium caninum*, *H. diminuta*, *T. hydatigena*, *T. pisiformis*, *H. taeniaformis*, *A. tetraoptera* - can parasitize in the human body (Ryzhikov and et al., 1978, 1979 ; Matchanov M.N. and et al., 1984; Bykova and et al., 2002).

Thus, it is possible to confirm the special role of the studied rodents in the epizootology and epidemiology of some helminthases of animals and humans.

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# Child Sexual Abuse

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**Abstract-** Child sexual abuse is a particularly menacing type of trauma. It can lead victims to post-traumatic stress disorder (PTSD). Child sexual abuse is prevailing significantly worldwide. Child sexual abuse can be identified under different types and settings. Signs and symptoms of child sexual abuse can be divided into four groups as physical, behavioural, emotional and sexual. PTSD, dissociative disorder, anxiety disorders, drug and alcohol addiction, conduct disorders and high-risk sexual behaviours can be identified as chronic effects of child sexual abuse. Cognitive behavioural therapy, Child-centred therapy, Trauma-focused cognitive behavioural therapy, imagery rehearsal therapy and eye movement desensitisation are effective interventions in treating child sexual abuse.

**Index Terms-** Child sexual abuse, Trauma, Post-traumatic stress disorder (PTSD)

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## I INTRODUCTION

Child sexual abuse is a kind of trauma which shows situation specific responses additionally with the common trauma responses. Child sexual abuse arises significantly worldwide. Prevalence rates are reaching between 8-31 % for women and 3-17 % for men (Barth, Bermetz, Heim, Trelle, & Tonia, 2013). (Another narrative study shows that 8.4-67.7 % of women and 3.8-35 % of men have been sexually abused in their childhood) (Boyce, & Harris, 2011). (The purpose of this essay is to study on child sexual abuse in the context of trauma counselling.

## II DEFINITIONS OF CHILD SEXUAL ABUSE

There are some definitions of child sexual abuse. They are varied by the author and organization. It is difficult to identify a common definition of child sexual abuse as it is varying by the variables as the severity of abuse, availability of social support and attributional styles for an adverse life event (Mannon, & Leitschuh, 2002). (As well as significant variables as age, the gender of the child, relationship to offender, frequency and duration of abuse can considerably affect when defining the child sexual abuse) (Mannon, & Leitschuh, 2002). (World health organisation) 2006 (defines child sexual abuse as “the involvement of a child in sexual activity that he or she does not fully comprehend, is unable to give informed consent to, or for which the child is not developmentally prepared, or else that violates the laws or social taboos of society.” According to the American Academy of paediatrics) 2006 (“any sexual act with a child performed by an adult or an older child” can be identified as child sexual abuse. Child sexual abuse can be identified under different types and settings). 1 (Familial abuse) 2 (extra-familial abuse) 3 (pressured sex) 4 (forced sex) (Ford, 2001). (Familial abuse is which is done by a blood relative in a domestic setting. Extra-familial abuse is which is done by someone outside the victim’s family — pressured sexual abuse, which is done by persuading or enticing the child. Forced sex abuse is which is done by forcing or threatening the child. Although the types of child sexual abuse differ from each other, definitely it can be a traumatic experience for both the child and the entire family.

## III SIGNS AND SYMPTOMS

Signs and symptoms related to the child sexual abuse depend on several factors as, duration of the abuse, the child’s age when the abuse happened, the child relationship to the offender and reaction and responses of the adult caregiver. However, signs and symptoms of child abuse can be categorized into four groups as physical, behavioural, emotional and sexual. Swelling or rashes in the genital areas, chronic stomach ache, urine infections and sexually transmitted diseases can be mentioned as physical symptoms. Anger, anxiety, agitation, depression and suicidal ideation are common among emotional symptoms. Behavioural symptoms of child sexual abuse are bed wetting, disordered eating patterns, masturbation, refusal to go school, unexplained fear for people and places, nightmares, withdrawal, secretiveness and running away from home. Seductive behaviours, abnormal liking or avoidance in sexual ideas, drawing of sexual acts and motivate other children to do sexual acts.

Researches have pointed out some contexts that trauma occurs in greatest level )Sanderson, 2006) .(1 (when the child is abused by the person who closely relates to her or him, )2 (when the abuse is recurrent and prolonged, )3 (when the abuse comprise penetration, )4 (if the abuse happened violently and aggressively, )5 (the nature of the attachment to the non-abusing parents )6 (pre-experience in sexual activities, and )7( influence of the parental attitudes to disclosure.

#### IV IMPACT OF CHILD SEXUAL ABUSE

Effects of child sexual abuse can be considered as three categories as behavioural, interpersonal and psychological .Although they have divided into different categories, effects can occur in all categories .Some effects can be limited for a short period and resolved without any therapeutic intervention .But others continue through adolescence than into later life) Parry, & Simpson, 2016 .(Research reveals that older children who sexually abused can to be more traumatized than younger children )Parry, & Simpson, 2016 .(That is because of matured cognitive development and awareness of cultural attitudes.

PTSD, dissociative disorder, anxiety disorders, drug and alcohol addiction, conduct disorders and high-risk sexual behaviours can be identified as chronic effects of child sexual abuse. As research proved sexually abused, children have severe PTSD than the children who experienced other forms of trauma )Olafson, 2011.( The burden of sexual abuse leads them to stress-sensitivity )Kendler, Kuhn, & Prescott, 2004(, multiple mental and somatic disorders and health problems later in their life) Fergusson, Mcleod, & Horwood, 2013( and suicide) Colangelo, & Keefe-Cooperman, 2012.(

Moreover, many studies argued that major issue to the number of complications is the loss of trust in the security of significant relationships )Parry, & Simpson, 2016 .(The sexually abused child often fails to keep in trust and sense of safety with others . Therefore, maintaining relationships with others makes more difficulties for them .The difficulty of continuing safe relationship in adulthood makes a significant challenge when they occupy in psychotherapy .

As well as child sexual abuse survivor can experience complications with their emotions, especially in anger and other predominant emotions. This situation also can be impacted by the therapeutic alliance between the therapist and client .Therefore, creating an effective therapeutic alliance is the most significant aspect of the therapy for the adult survivor in child sexual abuse.

Adult survivors of childhood sexual abuse possibly will experience many problems in interpersonal relationships and intimacy )Barber, 2012 .(Adult survivors might aspire disloyalty from others and therefore meet complications with making trusting attachments, as an effect of the abuse experience .It is assumed that being subject to childhood sexual abuse, can make strong ambivalence in survivors when being close to others — at the same time desiring intimacy is also mistrusting and frightening the possibility of being guided for their interests) Abdulrehman, & De Luca, 2001.( This can be made the communication problems in survivors too.

#### V INTERVENTION AND TREATMENT

There are some therapeutic approaches which can be used to treat the impacts of child sexual abuse .They are cognitive behavioural therapy, child-centred therapy, Trauma-Focused Cognitive Behavioural Therapy, imagery rehearsal therapy and eye movement desensitisation. Cognitive behavioural therapy is considered to address emotional distress, sufferings, anxiety, and behavioural issues .Cognitive Behavioural Therapy assists clients in dealing effectively with their stressful emotions.

Moreover, children and their parents are educated to label their feelings and talk them to others .Also, CBT shows children and parents how to identify the symptoms of anxiety and the stimuli which generate anxiety .Then they can progressively replace their anxious responses with positive ones .Lastly, CBT demonstrates to parents how behaviour is caused, formed and maintained by consequences .Also, CBT teaches parents about the impact of sexual abuse and how to improve the child's behaviour .

The primary stage of therapy with an adult survivor in child sexual abuse should focus on creating trust between the therapist and the client with the aim of preparing the client for the therapeutic process. Throughout this stage, the client is encouraged to tell his/her story that helps the therapist to decide the helpful therapeutic techniques he needed .For some survivors, it's hard to disclose their story .At this stage, specific tools needed to help the survivor to recall their childhood back together by focusing on specific incidents and happenings to create their stories .At the later stages of therapy, it is needed to reprocess the trauma . Processing the trauma of child sexual abuse consist of )1 (recognising the circumstance of sexual abuse and its impacts) .2( releasing the repressed feelings of the trauma) .3 (discovering the thoughts and feelings headed for the abuser, and significant

others in the client's life) .4 (Constructing cognitive reassessment of the abuse. Furthermore, an individual's sense of self is permanently transformed through child sexual abuse .Through cognitive restructuring sense of self can be uplifted from low self-esteem to high self-esteem .

Imagery rehearsal therapy is another type of cognitive behavioural treatment can be effectively used for child sexual abuse .The many sexually abused children experience deep-rooted nightmares that comprise recalling their painful experience .Imagery rehearsal therapy is used to support them to relieve the traumatised nightmares )Reece, Sargent, Hanson, Mondale, Amstadter, & Amstadter, 2014.( According to this therapy, clients are asked to recall their nightmares and write them down in a less threatening content, with a view to alleviating their posttraumatic symptoms .

Eye movement desensitisation and reprocessing )EDMR (is a new treatment approach which can be used for severely traumatised individuals )Edmond, Rubin, & Wambach, 1999.( EDMR be made up as eight-phase treatment approach .The eight phases include )1 (keeping a detailed history of client and by using it making a comprehensive treatment plan;) 2 (client provide for EMDR;) 3 (assessing the issues to be talked;) 4 (desensitizing the target issues with eye movements;) 5 (fixing the preferred positive cognition;) 6 (body scanning to confirm any remain target issues;) 7 (termination; and )8 (re-evaluation )Reece et al., 2014 .(According to Reece et al., )2014 (Eye movement desensitization and reprocessing are efficient with adult female survivors of child sexual abuse. As they recommended, EDMR should be used a combination with other therapeutic methods and techniques for its 'efficacy.

Comparing with the other forms of childhood trauma, child sexual abuse is the area that the most extensive research has been conducted .Some studies have suggested Trauma-Focused Cognitive Behavioural Therapy as a pioneering intervention for child sexual abuse) Olafson, 2011 .(Trauma-Focused Cognitive Behavioural Therapy concluded some components as psycho-education for child and parents regarding child sexual abuse, stress management strategies, affect expression and modulation and graded exposure directed of a trauma narrative by the child via drawing, language using and poetry )Olafson, 2011 .(Both parent's and child's irrational and obstructive trauma-related cognitions are subtly confronted questioning and using other techniques . Finally, the session ended up with a sharing of the trauma narrative and safety planning .

As many types of research revealed, a search for meaning is described by all child sexual abuse survivors )Hartley, Johnco, Hofmeyr, & Berry, 2016.( Sexually abused people always question 'why me?' Existential therapy provides a space for child abuse survivors to regain their identities in a way as they expected .The existential therapist needs to understand how each distinguishes their self and existence .Existential therapy is beneficial to the clients to understanding their choices to reclaim power and undertake accountability for their future.

In conclusion, the essay reviews the child sexual abuse literature as it relates to definitions, types of sexual abuse, symptoms, impact and treatment and intervention .Since the late 20<sup>th</sup> century, prevention, disclosure, intervention and treatment of child sexual abuse have developed remarkably .But as the area is still new, much more studies need to be done on prevention .Because according to the many types of research the majority of children do not reveal or disclose behind a time .

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# The Effects of Servant Leadership on Organizational Citizenship Behaviour: Moderation of Proactive Personality

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**Abstract- Introduction:** Servant leadership is not only a tool for management but it's an inner feeling of a person to serve others in best way. At the same time the association between servant leadership and organizational citizenship behavior has been recognized, the single-level channels underlying this connection and its limited conditions exist poorly understood. In this study, we inquire the mediating mechanisms of servant leadership and organizational citizenship behaviour in explaining the procedure by which servant leaders elicit discretionary Organizational citizenship behavior among followers. We also examine the role of followers' proactive personality in moderating the indirect consequence of servant leadership and Organizational citizenship behaviour.

**Methodology:** Quantitative non-experimental co-relational research design was used to check the association between servant leadership and organizational citizenship behavior and the effects of proactive personality as behavior.

**Results:** the results revealed that there is significant relationship between servant leadership and organizational citizenship behavior ( $\beta = .72, p < .05$ ). on the other hand, there are no comparison significance transformation points within the perceived Range of the moderator.

**Conclusion:** Findings demonstrate that servant leadership leads followers to engage in Organizational Citizenship Behavior by enhancing the quality of their relationship with their supervisor. In addition, we found that followers and servant leadership low in proactive personality.

**Index Terms-** Behaviour, Citizenship, Leadership, Personality

## I. INTRODUCTION

Servant leadership is not only a tool for management but it's an inner feeling of a person to serve others in best way. Servant leadership can be defined as "The servant-leader is serves first. It starts with the natural and inner feeling of a leader that he wants to serve, to motivate the characteristics of their followers by serving first". The servant leadership is a philosophy and determines the methods that improve the lives of the people, build better organizations and finally create another and only world care. Leadership always exists as a hot issue for researchers.

On the other hand, servant leadership can be characterized as a way to deal with administration, with solid liberal and moral suggestions that request that and requires pioneers be mindful to the necessities of their supporter and offer with them, they should

deal with them by ensuring, they wind up more beneficial, more astute, more motivated and more self-deciding, so they also can move toward becoming worker pioneers (North House, 2004).

[1] Servant leadership is an empowerment towards their employs and as well as organization. Servant Leadership theory has been upgraded commonly authenticated leadership establish similar to the global leadership and organizational behaviour effectiveness (Brubaker et al. 2016).

[2] Organizational citizenship behaviour is defined as the positive and constructive approach of employees with their own voluntary actions and agreements. Organizational citizenship behaviour (OCB) has experience fine clarity modification since the term was originated in the late 1980s, but manufacture continues the same as its depth. OCB mentioned to anything that subordinate select to do voluntarily and of their own agreement or protocol, which usually lies outside of their identified contractual responsibility. In other words, it is an optional OCB may not always straight and formally validate or recompense by the company, by means of salary increments or promotions for example despite of course OCB may be considered in complimentary supervisors and co-worker categories, or better presentation assessment. In this way it can make easy future rewarding obtain incidentally, finally and seriously, OCB must stimulate successful operating of organization (Zhang 2011).

[3] Proactive personality as initiated usually a commonly known development factor, which is relatively dependent on economic forces and affects its surroundings. Proactive individuals find an opportunity to demonstrate one's aspect and until they bring about the new desired end state. In Ray words, they enjoy having an adventure and enjoy solving problems, and as a result they affect them. The reason behind this idea is that these people will be able to prevent their environment from being able to prevent serious effects of seriousness and change the barriers. However, some other authors argue that proactive personality is not strong for the nature of any person as presented earlier. His work was transformed into proactive personality by job autonomy and was therefore declared that he could not be praised as a strong personality (W. Liguori, D. McLarty, and Muldoon 2013).

**Significance:**

**Health Care Provider:** Improved understanding of servant leadership and organizational citizenship may result in improved skill in the areas of assessment, planning, and intervention. The

study finding, will help the health care provider to think positively and display positivism in their working environment in this way, they will begin to feel better about their career.

**Organization:** The Finding of the study might be helpful for the organization to develop the strategies to improve leadership skills through training session, workshop, and seminar in result organizational citizenship will be improve and ultimately this will improve the working environment and quality of work. It will be suitable for the hospital management to take necessary steps to find the weak factors which produce poor leadership and take suitable remedial steps to control and prevent adverse events.

**Policy Maker:** The present study in the affairs of servant leadership and organizational citizenship behavior dedication will give understanding regarding this aspect and develop policies about organizational citizenship behavior and polices making in organization.

**Future Research:** The result of this study will give direction to the future researcher to utilize this study as a literature and guidance. Additionally, study will help them to identify the study gap. The study will also provide deep sense of servant leadership as well as proactive personality that support OCB

#### **Problem statement:**

Studies have shown that servant leadership and organizational citizenship behaviour have specific and strong relationships. But the problem is the lacking of servant leadership. If servant leadership will be strong the outcome of organizational citizenship behaviour will be increased. But in our society servant leadership exist in very small numbering, that why the productivity of organizational citizenship behaviour is very less. There is also a big factor of proactive personality which strongly affects the relationship between servant leadership and organizational citizenship behaviour, it may be positive or may be negative. In this study we analysis these relationships and effect on each other's.

However, researchers reported different leadership style including servant leadership which effect differently on organizational citizenship behaviour and also on proactive personality of employs.

#### **Objectives:**

To find out relationship between servant leadership and organizational citizenship behaviour

To find out the effect of proactive personality on the relationship between servant leadership and organizational citizenship behaviour

#### **Aims of study:**

The basic aim of this study is to look at the relationship between hireling administration and authoritative citizenship practices (OCBs) alongside moderating impact of proactive identity in SL – OCB interface.

## II. LITERATURE REVIEW

The present investigation has not just included esteem and essentialness by investigating the moderating impact of proactive identity in the linkage into servant leadership and OCB, however has additionally expanded our comprehension and information by

concentrate these ideas in a collectivist culture of Nurses. The present investigation will likewise help the medical facility division of organization in Pakistan to feature certain managing standards which will help with creating methodologies to advance OCB among employees.

**Servant leadership:** According to personal experience of author of the default literature and leadership, he developed a conceptual framework for measuring four dimensions based leadership. 1) Character orientation, 2) people orientation, 3) task orientation, 4) process orientation. The success of leadership is decided or not as a person as a person increase wide range of qualities explained by Greenleaf as display in servant leadership. These qualities are listening with attention, ability to understand, curative, realization, convincing, conceptualization, vision, stewardship, commitment to people's development and building community (Zehir, Akyuz et al. 2013).

Servant leadership belong to seven emotions, as a relationship with the subordinates to authorized them, serving them, grow and succeed, behaving ethically, having conceptual expertise, preference the subordinates and by submitting the subordinates to generate values for these organization. Similarly servant leadership prominence the upgraded services to other people and motivate their subordinates to take part in betterment of an organizations (Shahzad et al. 2013).

As associations move far from the conventional summon and control way to deal with administration, another and developing style of leadership or authority has surfaced, in particular worker initiative called servant leadership. However, on account of generally late course of events and measure of research information accessible, much research has been led on the hypothetical approach and on creating estimation instruments through which to investigate worker authority inside associations (McCann, Graves, and Cox 2014).

**Organizational citizenship behaviour:** The term Organizational Citizenship Behaviour (OCB) is anything positive, empowering and pragmatic which representatives exhibit at their own will, bolsters partners and advantages the general profitability of an association. Authoritative citizenship conduct isn't all the time formally recognized or remunerated by the association and ideas like collaboration or kind disposition are likewise difficult to gauge. The normal cases of OCB incorporate demonstrating inspirational disposition, offering to enable an amateur to get comfortable with his/her activity at the workplace, helping associate who might be under worried because of due dates, and definitive related works, for instance, working for accomplices and after some time without want of reward. So likewise consider agents who are relentless with their leaders/managers and accomplices, willing to make retributions, are set up to partake and are less requesting to work with these practices are through and altogether included inside OCB (Shahzad, 2013).

OCB will probably be perceived as occupation execution and conduct of representatives. OCB is frequently alluded to as additional part execution, or relevant execution of workers. Then again, some different analysts have characterized OCB thusly conduct of representatives that is past formal occupation obligations, for example, working for additional hours, helping or helping associates, and offering proposals to administration for making changes (Abid, Gulzar, and Hussain 2015).

The possibility of various leveled citizenship isn't one of the task implications of teachers, rather, they are the exercises that they perform of their own through and through freedom. They described affiliation citizenship direct as the individual's lead that is discretionary, not particularly or unequivocally saw by the formal reward system, and that in the aggregate advances the convincing working of the affiliation. Additionally they proposed an extended scientific classification of authoritative citizenship conduct that included: charitableness, which is characterized as optional practices that particularly help someone else in the association with a hierarchically important issue (Zehir, Akyuz et al. 2013).

Moreover, the authoritative citizenship conduct (OCB) is business related direct focused on individuals and the affiliation with everything taken into account outside the region of regular business clarifications (to some degree lead) and expert various leveled remunerate structures that, all in all, enables and progresses the capable and effective working of the affiliation. The outflow of Organizational Citizenship Behaviour (OCB) is such a positive, engaging and practical which delegates appear at their own particular will, supports accomplices and favorable circumstances the general benefit of an affiliation (Shahzad et al. 2013).

**Proactive personality:** Earlier research has demonstrated that workers with high proactive identity are more prone to encourage the advancement of superb authority. To begin with, nearly by definition, proactive representatives are inclined to impact their surroundings. Along these lines, adding to writing that upholds the view that representatives get more noteworthy profitable social and financial assets through incessant social trades with their leaders (Zhang, Wang et al. 2012).

Study shows that proactive workers would all the more regularly look for and effectively follow up on chances to connect with their administrators in order to maintain a strategic distance from potential issues when they confront a possibly negative social condition. Second, as pointed out above, workers with large amounts of proactive are fit for acquiring political information and aptitudes that they use much of the time to interface with their leaders, understanding the need to build solid systems with their directors and accomplishing flexibility that encourages a positive association with their leaders (Newman et al. 2017).

Thusly, worker pioneer has a solid foundation of respectability and qualities to such an extent that the adherents trust their pioneer to be good example for themselves. The social trade hypothesis recommends that when there is top notch trade amongst subordinate and pioneer, there is dependable connection between them (Abid, Gulzar, and Hussain 2015).

Proactive character is a "respectably stable slant to affect characteristic change that isolates people in perspective of how much they make a move to affect their environment (Fuller, Marler, and Hester 2012).

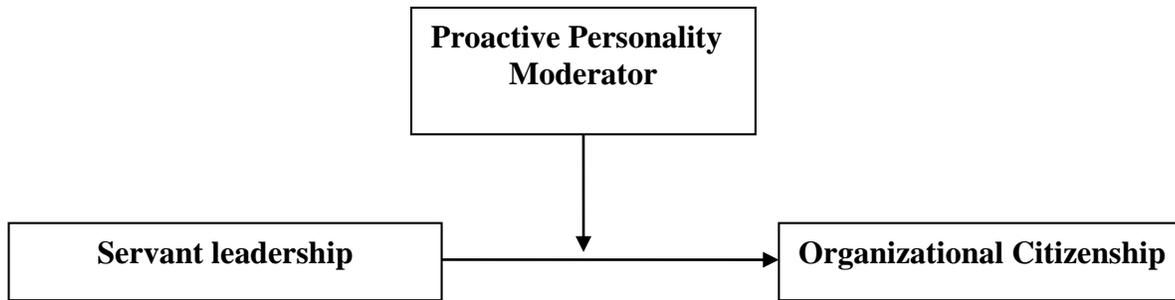
On the other hand, some researchers take organizational citizenship behaviour as a conduct past the pre-determined organizational roles, which is intrinsic and its reward is not always protected within the formal reward system of the organization as well as being very crucial in promoting the effectiveness and successful functioning of the organization. Trust in administration assumes a critical part to consider the workers to perform over their ideal execution levels. The significance of trust in authority upgrades the efficiency of workers which persuades them to serve more than their legitimate commitment (Ja'afaru Bambale 2014). According to Vigoda et al in 2007 trust that organizational citizenship conduct includes different casual and optional helping behaviours which are performed or held back by the employee as a free individual with no respect to the formal prizes and punishment. Walumbwa et al in 2010, in view of their findings perceived that leadership authority raises the probability of organizational citizenship practices. According to them, servant leaders positively affect the workplace and a mutual feeling of justice (i.e. procedural equity), and this mutual sense prompts the expansion of organizational citizenship behaviour.

To start with, by inspecting the relative significance of proactive identity as moderators of the connection between hiring initiative and OCB, the present examination builds up the remarkable quality of two contending instruments that have been recognized in the writing as potential middle people by which worker authority transmits its belongings. Rather than past work on transformational authority, which features the significance of proactive identity as a component that conveys the impacts of such authority approach on devotee work results?

Proactive individuals are more attractive towards servant leadership and support to enhance the organizational citizenship behaviour positively. In this situation servant leadership should take a part in supporting their workers. This may result in positive increase in organizational citizenship behaviour that is more supportive and helpful for their organization success. There is a positive force of proactive personality that builds the good and strong relationship between the servant leadership and organizational citizenship behaviour (Newman et al. 2017).

Proactive personality strongly supports the relationship between organizational citizenship behaviour and the servant leadership. If proactive personality characteristics are found in employs of organization it will be beneficial for organizational success and for its ranking, and on the other hand if proactive personality exist in the leader it will contribute the great performances and achievements for both the employs and as well as for organizations. Proactive personality acts as a strong moderator in the association between OCB and the servant leadership. Proactive personality enhance and support the relationship between OCB and servant leadership either the characteristics are present in employs or as well as in leaders (Liguori, 2013).

**Conceptual frame work:**



**III. MATERIALS AND METHODS**

**Research Design:**

A descriptive cross sectional research design were used for this study.

**Total population and size:**

The population of the study was 150 employees selected from specific department of sheikh Zayed hospital Lahore.

**Research instrument:**

A self-administered and modified version questionnaire was adopted from the different article “relationship between servant leadership and organizational citizenship behavior and impact of proactive personality” used to collect data from the participants.

**Independent tool:**

**Demographic:** The data which include Name (optional) Age, Gender, institute, department, employees and leaders or in charge of the department.

**Servant leaderships:** composed of the questions regarding the servant leaderships which include 14 items, adopted from the (Ehrhart and Naumann 2004).

**Dependent tool:**

**Organizational citizenship:** Questions regarding organizational citizenship behavior which includes 17 items adopted from (Lee and Allen 2002).

**Moderator:**

**Proactive personality:** The last 10 questions regarding the assessment of Proactive personality 10 questions adopted from (Seibert, Crant, and Kraimer 1999).

**Sampling techniques:**

Data were collected from the nurses through random sampling technique.

**Sample Size:**

Sample size was calculated via Solvins formula. n = 110

**Data Analysis:**

Inferential statistics of Chi-square(x2) were used to analyze the association between the variable. Reliability assessed by the use of Cronbach’s Alpha and its value of 0.65 was demonstrated that the questionnaire was reliable. Regression analyses was carried out to determine whether there was the linear trend between the variables. And validity analyses were used to examine the results. In the end, all the data were put into the software SPSS 21 version and the findings and results were drawn on the basis of statistical procedures.

**Including Criteria:**

- ✓ Employees of sheikh Zayed hospital.
- ✓ Female Nurses
- ✓ Admin office staff
- ✓ Willing to participate
- ✓ Those who understands English

**Time Framework:**

This study time duration is approximately take 2-3 months.

**Informed Consent:** Consents taken from all the participants and free hand will be given to the participants to take part in the study or refused to participate, participants will have also be the right to mentioned name or not.

**Ethical consideration:** Enough information of research will be provided to participants with help of full consent and this will be achieved via a consent form attach to the questionnaire. Confidentiality will be considered by informing participants. The right of participants will be protected by Nuremberg Code of Ethics.

**IV. RESULTS**

This study is conducted at Sheikh Zayed hospital to regulate and find out the relationship between servant leadership and organizational citizenship and how the proactive personality effect as moderator. The result of this study distributed into two sections, first section is statistics of demographic factors. Second section is relationship between, independent and dependent tools.

**Table 1: Demographic factors frequencies**

Demographic Variable	Frequency	Valid Percent
<b>Gender:</b>	Female	100%
	<b>Total</b>	<b>100%</b>
<b>Marital Status</b>	Married.	70.9%
	Unmarried	29.1%
	<b>Total</b>	<b>100%</b>
<b>Age:</b>	18-25 years	17.3%
	26-35 years	59.1%
	36-50 years	21.8%
	Above 50 years	1.8%
	<b>Total</b>	<b>100</b>
<b>Qualification:</b>	Diploma in general nursing	80%
	Post RN BSN	18.8%
	MSN	1.8%
	<b>Total</b>	<b>100%</b>

Table 1 shows that the frequency of demographic variables and the results revealed that the total sample (n=110) was participate in this study. The marital status of the participants was majority 78 (70.9%) were married and 32 (29.1%) were unmarried. The age group of participants was, majority 65 (59.1%) were 26-35 year old, 24 (21.8%) were 36-50 years old and only 2 (1.8%) were above 50 years old. Data was analyzed to the SPSS software for the analysis. The Kaiser-Meyer Olkin (KMO) qualification of participants was, majority 88 (80%) were hold diploma in general nursing, 20 (18.8%) were holding the degree of bachelors sciences in nursing (Post RN), and only 2 (1.8%) were holding the degree of masters sciences in nursing. Factors include, servant leadership, Organizational citizenship and proactive personality was analyzed individually.

**Validity of Self-Administered Questionnaire**

**Correlations  
 Table 2  
 Correlation**

Likert scale questionnaire		SL	OCB	PP
Servant Leadership (SL)	Pearson Correlation	1	.722**	.828**
	Sig. (2-tailed)		.000	.000
	N	110	110	110
Organizational citizenship behavior (OCB)	Pearson Correlation	.722**	1	.661**
	Sig. (2-tailed)	.000		.000
	N	110	110	110
Proactive personality (PP)	Pearson Correlation	.828**	.661**	1
	Sig. (2-tailed)	.000	.000	
	N	110	110	110

**Note: \*\*. Correlation is significant at the 0.01 level (2-tailed).**

Table 2 shows that the Pearson correlation test was used to check the significant level and results revealed that there is significant correlation between servant leadership, organizational citizenship behaviour and proactive personality and  $p \leq 0.01$ .

**Table 3**  
**ANOVA<sup>a</sup>**  
Model Summary

R	R-sq	MSE	F	df1	df2	p
.7331	.5374	.0792	41.0524	3.0000	106.0000	.0000

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	9.475	1	9.475	117.864	.000 <sup>b</sup>
Residual	8.682	108	.080		
Total	18.157	109			

a. Dependent Variable: OCB\_ALL. b. Predictors: (Constant), SL\_ALL

Table 3 shows the interpretation of ANOVA and results revealed that there is significant relationship between dependent and independent variable and  $p=.000$

**Relationship between servant leadership and organizational citizenship**

**Table 4**  
**Coefficients**

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	1.102	.266		4.148	.000
Servant Leadership	.692	.064	.72	10.857	.000

**Note: a. Dependent Variable: Organizational citizenship behaviour All.**

As shown in Table 4, Model 1, there was a strong positive relationship between servant leadership and organizational citizenship behaviour ( $\beta = .72, p < .05$ ). Hence, alternative Hypothesis 1 that was Servant leadership behaviour has positive effect on organizational citizenship behaviour) supported. It is discovered that the indirect or incidental effect of servant leadership on OCB through.

**Table 5sEffects of proactive personality on servant leadership and organizational citizenship behaviour**

PP_ALL	Effect	se	t	p	LLCI	ULCI
3.8055	.5677	.1210	4.6898	.0000	.3277	.8077
4.2709	.5137	.1153	4.4552	.0000	.2851	.7422
4.7363	.4597	.1445	3.1819	.0019	.1732	.7461

Table 5 shows that the effects of proactive personality on servant leadership and organizational citizenship behaviour. Level of confidence for all confidence intervals in output is 95.00 and sample size is 110.and results revealed that there are no statistical significance transition points within the observed Range of the

moderator. There for alternative hypotheses 2 is rejected. R-square increase due to interaction (s). Values for quantitative moderators are the mean and plus/minus one SD from mean. Values for dichotomous moderators are the two values of the moderator.

**Model Summary**  
**Table 6**

	coeff	se	t	p	LLCI	ULCI
Constant	-.7031	2.1377	-.3289	.7429	-4.9413	3.5352
PP-ALL	.6006	.5347	1.1233	.2639	-.4595	1.6606
SL-ALL	1.0094	.6008	1.6799	.0959	-.1819	2.2006
Int-1	-.1161	.1436	-.8081	.4208	-.4008	.1687

Table 6 shows that total variation of .5374% in dependent (OCB) variable has explained by independent variable that is S.L. Similarly, moderator has insignificant relationship within dependent variable (SL) as well as with dependent variable (OCB). Independent variable also has insignificant relationship with dependent variable that's why interaction is also insignificant with dependent variable.

**Table 7**  
**Conditional effect of X on Y at values of the moderator**

PP_ALL	Effect	se	t	p	LLCI	LLCI
3.8055	.5677	.1210	4.6898	.0000	.3277	.8077
4.2709	.5137	.1153	4.4552	.0000	.2851	.7422
4.7363	.4597	.1445	3.1819	.0019	.1732	.7461

**R-square increase due to interaction(s):**

	R2-Chng	F	df1	Df2	p
Int-1	.0028	.6530	1.0000	106.0000	.4208

Table 7 shows that if we checked the conditional effects of lower values which is near about 3.80 then the moderator is going to significant between the relationship of independent and dependent variables. When it goes to 4.73 its starts going towards insignificance.

study conducted in 2010 in USA and the results were different from present study (Vondey 2010).

**V. DISCUSSION**

Leaders are important personals in organizations in terms of their effects on subordinates and organizations. Similarly, their relationship with the followers is one of the most major part for organizations. Correspondingly, the quality of this relationship is also one of the key element of employee behaviours. In this research, it is noticed that the role of servant leadership and organizational citizenship behaviour r by prominent the role of leaders and their relations with the subordinates.

Servant leadership might be forward to lead to greater desires of empowerment in employees for different reasons. First of all, by considering the needs of subordinates and allocate them with circumstances for development (Earhart 2004; Liden et al. 2008; Stone et al. 2004), servant leaders should lead followers in perceiving their jobs as having value. In addition, by treating their followers with respect rather than simply using them for their own gain, servant leaders lead followers to experience a heightened sense of meaning in their jobs. Second, by treating followers with benevolence and responding to their individual developmental needs (Van Dierendonck 2011).

In related studies it was discovered that servant leadership is easy to talk but difficult to practice. The result of the study was near to similar to study conducted in Saudi Arabia published in 2016 regarding servant leadership and organizational citizenship behavior (Al-Amri, Al Hajji, and Alawaji 2016). Another study conducted in 2017 regarding how servant leadership effects on organizational citizenship behavior and the results are same to present study (Newman et al. 2017).

Recently a study conducted in 2018 regarding leadership and organizational citizenship behavior and the results are again same with the present study (Yang and Wei 2018). Eight year back a

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# The Impact of the Implementation of CLT On Students' Speaking Skills

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**Abstract-** One of the most influential theoretical developments in language teaching and learning especially among ESL students is the idea of communicative competence as it is believed to help in redefining the target of second language (L2) instruction in the classroom. Although most teachers recognise the importance of CLT, many of them do not have much confidence in practicing it effectively in the classroom. Thus, this paper attempts to identify the teachers' and students' perceptions on the implementation of CLT in the SBELC as an effective approach to enhance students speaking skills and looking into teachers' challenging in using CLT in the classroom. Next, this paper also aims to identify the impacts of implementation of CLT in the SBELC to enhance speaking skills among students as well as to recognise the ways of implementation of CLT to enhance students speaking skills. The role of CLT approach in enhancing the speaking skills among students was examined through quasi-experimental by collecting data using methods like interview sessions with teachers, an observation, the pre-test and post-test methods etc. The analysis and interpretations were based on learners' pre-post English speaking test scores, speaking observation comments and feedback as well as the teachers' and students' opinion. The findings show a slight increase in the students overall speaking skills after CLT implementation. Teachers' and students' interviews find that despite vast knowledge on CLT, its implementation is disrupted due to the lack of facilities and focus on exams. Moreover, it was found that students still lack of appropriate words and grammar during the speaking practices, and the teachers' role as the facilitator, the guide and the corrector of their weaknesses in speaking were highly recommended. The implication of these factors are implementation of CLT would be disrupted in schools to enhance speaking skills. The study recommends authorities and schools to provide enough facilities and reduce the focus on exams to elevate speaking skills.

**Index Terms-** Speaking Skill, CLT, Implementation, Classroom

## I. INTRODUCTION

In the world, teachers' role and responsibilities in educating students are crucially important in any schools regardless their subjects to teach. In term of teaching English as a Second Language (ESL), the roles of teachers are primarily to focus on the development and the practise of the language to improve various skills of the language. The skills are including reading and comprehension, writing, grammar, listening and speaking. The aim of the education within 21<sup>st</sup> century era is comprehensively excellent, not only in academic, but also in other fields such as entrepreneurship, volunteer works, and fluent in communicative practice. English is one of the most important language in the world. It is considered as a universal language (BB. Bohdanska, 2012) which can be used and understood by all people around the world. The importance of English language which is being promoted by most countries in the world to bridge the gap in terms of economic and political interest has increased the awareness in educators and students. Amizura H. Mohd. Radzi et al., (2007) also stated the same view, English is an important and crucial medium of communication among people whether intra-national or international levels. It demands the related parties to master the language as soon as possible. It cannot be denied that English has become equally important in many fields apart from the education and language studies as the science, technology and business fields have started to fully utilise the medium which could increase their capacity respectively.

According to Anca SIRBU (2015), language is fundamentally a tool of communication within the society and in the country or even around the world, and it is a fundamental aspect in expressing one's culture. And, English is the universal and international language which is widely used around the world. Notably, teachers in Malaysia face many hinders and challenges from the multilingual students in the classroom, so the objective to teach English language communication fluently seems too hard to achieve. English teachers in Malaysia have encountered situations in which learners are not willing to communicate and are not able to communicate well in English. One main problem may derive from the mother-tongue clash. They are non-native speakers of the language. Similarly, Previous studies and observations found that most of students may in a situation of shyness and chose to remain silent in the classroom because they

knew they will be fail or nearly fail to speak English well such as in remote area of Kenya (Mwamba, 2005). Similarly, Alharbi (2015) in Saudi Arabia, students there also show low oral skills of English language as it is related to the absence of authentic situation of language learning whether outside or inside the classroom. This shows that most of non-native speakers are comfortable in using their first language in the classroom rather than the second language. Thus, the objectives of the study are; to recognise the ways of implementation of CLT to enhance students speaking skills, to identify the effectiveness of implementation of CLT in the SBELC to enhance speaking skills among students, and to identify the teachers' and students' perceptions on the implementation of CLT in the SBELC as an effective approach to enhance students speaking skills.

## II. LITERATURE REVIEW

### 2.1 Communicative Language Teaching (CLT)

Littlewood (2007) considered Communicative Language Teaching (CLT) which has been introduced in ESL settings can reimburse the limitations of traditional language teaching. In Malaysia, the introduction of KSSM in 2012 to replace the formerly placed KBSM is a change that aims to improve the growth of students' thinking skills up to the higher level as well as focus on acquiring the expected competencies to established standards in the curriculum, including the approach of student-centred learning such CLT (MoE 2015). It is parallel to the concept of the KSSM as cited in Saadiyah Darus (2010) that present on the stages since year 2017 and based on six main principles; communication, physical development and aesthetics, humanity, self-esteem, science and technology as well as spirituality, attitudes and values. The principles of CLT is a combination of various techniques and goals to improve students' communicative competence. The characteristics of CLT as identified by Brown (2000) includes classroom goals which focuses on all of the components (grammatical, discourse, functional, sociolinguistic, and strategy) of communicative competence. Another principle of CLT is the fluency and accuracy which are seen as complementary principles underlying communicative techniques. And, the introduction of CLT in English language subject is believed can enhance speaking skills among students. In a TESL environment in Malaysia, it focuses on the four skills, and Communicative Language Teaching (CLT) is seen to be applicable in which students are learning to speak using English language from informal to formal context (Saadiyah Darus, 2010). All the tasks and activities in the classroom therefore have to equip students with the important and relevant skills of communication. In the classroom, the activities plus the interactions between teachers and students make the teaching and learning alive (Khoa Anh Viet, 2008).

### 2.2 Why Malaysian students weak in their communicative practice?

Michael Swan (2008) argued that there is no need for the mother tongue to support the foreign language, and it even can block the learning of the new language. David & Naji (2000) and David & Nambiar (2001) claims that rural students show no interest in mastering English language, so they lazy to practice it. Sarwar et al, (2014) has proven that even smart students who always achieve high scores in written examinations also were fail or nearly fail to express themselves orally in English language. Another problem is, Malaysian teachers have implemented teacher-centred educational model for decades, and some of them refuse to change the method of teaching. So, the holistic professional reform has to be applied (Don et al. 2015). English language curriculum inventors and teachers to ensure that all students achieve high level of skills and knowledge parallel to the international standards and benchmark against the Common European Framework of Reference or CEFR ((MEB, 2013) in Majdah Mahamud, 2018). Another, limited period of the lesson plus crowded classroom make students cannot practice using language effectively in the classroom (Al-Hosni 2014; Alharbi, 2015).

### 2.3 Ways of implementation of CLT to enhance students speaking skills.

First, pair work or group work practices. Paulston & Bruder (1976) revealed few classifications of activities which may bring the maximum benefits in students' effort to master the communicative competence, and these categories are social formulas and dialogs, community-oriented tasks, problem-solving activities and role plays. All of them have to be done in a group or pair work. Doan Linh Chi (2011) suggested that the activities and role-plays from course books and the Internet can be used by students too. Second, there are many fun-game learning tools also, such contributed by Kayi (2006) who had listed several prevalent speaking activities and debated about their advantages, and the activities are discussions, role-play simulations, information gap, brainstorming, storytelling, interviews, story completion, reporting, playing cards, picture narrating and picture describing. Third, students also can practice speaking by formal conversation, such structured interview, for example can teach students to sitting in a question-answer experience, sharing the fact around certain topics, and exchanging tangible information. Another way, as in Tuan and Mai (2015), several activities are highlighted where to improve students' speaking skills, such as speaking by using the target language in the classroom or outside, speak English with the classmates at home too, join speaking club activities such as drama or debate, and practice to speak in front of a mirror. Moreover, the information-gap activities, jigsaw activities, discussion and debates, communication games, and prepared talks and oral presentations are also another type of activities that are typically implemented in a CLT classroom.

## III. RESEARCH METHODOLOGY

### 3.1 Introduction

This chapter present the methodology and procedures ranging from research design, the setting, population, sample and sampling procedure, instrument, procedure for data collection method and strategies, and finally techniques for the quantitative and qualitative analysis of the mix-method of collecting data.

### 3.2 Research Type and Approach

This research was carried out based on quantitative and qualitative method by using a set of instruments including the quasi-experimental design of study for the students. This experiment consists of the pre-test and the post-test is used to analyse the impacts of Communicative Language Teaching. The research uses both qualitative and quantitative data analysis technique, as the “One group quasi experimental design” consist of pre and post-test is a quantitative method of the study. The research also integrates it with the qualitative approach as the students and teachers will be interviewed and observed throughout the research period when the method is being applied. The reflection of teachers after each lesson was analysed.

**Table 1. The schedule for one group experimental design**

<b>“One group quasi experimental design”</b>	
<b>Pre-Test</b>	<b>Post-Test</b>
- A speaking test - Before the CLT method is applied - Time (15 minutes)	- A speaking test - After the treatment based on CLT is carried out (after 6 weeks) - Time (15 minutes)

### 3.3 Study Population

In this study, the population includes all Form 2 students of SMK Jengka 2 in academic year 2018. The form 2 students of SMK Jengka 2 in academic year 2018 consist of 7 classes. Which comprises of 865 students. The quantity of students in each class of the population is as follow:

**Table 2. The quantity of students in each form 2 classes**

<b>Classes of Form 2</b>	<b>Number of students</b>
Class 1 (Kekwa)	26
Class 2 (Dahlia)	20
Class 3 (Cempaka)	22
Class 4 (Orkid)	28
Class 5 (Terkis)	28
Class 6 (Mawar)	26
Class 7 (Melur)	29

### 3.4 Sample Size

The sample of this research includes both students and teachers. The target sample of this research study includes form 2 students from 2 Orkid and 2 Terkis in Sekolah Menengah Kebangsaan Jengka 2 which consist of a total of 56 students. The form 2 students are considered as an appropriate group to be sampled for the study because they are more motivated to speak and use the language that they are learning and they do not have any major examination which focuses more on writing skills. The sample of students are also chosen on the basis that they are the first batch students under the CEFR. Hence, teachers should be able to implement CLT approach and discover its impact on students to improve their oral performance considering the lack pressure of public exams.

English teachers at Sekolah Menengah Kebangsaan Jengka 2 were the selected sample. The study dealt with the sample of 2 teachers. They were selected on the basis that they taught the classes of the form 2 students in the school. The teachers also carried out CLT activities in classroom in relation to the KSSM curriculum. All the teachers who became the participants were chosen to collect different views about communicative language teaching if they regard it as the best method to develop students’ speaking skill. The teachers provided reflections and will be interviewed at the end of the study.

### 3.5 Data Collection Method

Students’ speaking skills during the intervention in classroom were analysed through the observation by the teachers. Teachers’ reflection after each lesson in their lesson plans were also analysed. After participating in the classroom activities, students and teachers

were interviewed on their opinion on Communicative Language Teaching and the learning process using the CLT method. The students were taught and the lessons were conducted by the two respective English teachers for 6 weeks with a total of 30 periods with each period lasting 30 minutes. The teachers and students were interviewed on their opinion towards Communicative Language Teaching at the end of the course. In this study, a descriptive text in the form voice recording is used. For pre-test, students were given 10 questions for the first part (part 1), and one task based on the communicative activity in the second part (part 2). Students' answers were written and also recorded for further validation of the transcription process. The post-test consisted of exact questions and tasks as in the pre-test for students to show their improvement. The observation checklist contains 'yes' or 'no' options, followed by a feedback or comments from teachers on the activities being carried out in the classroom. The interview was carried out on both the teachers and the six students who are selected randomly. There is no specific time limit for the interview and the interview for the students was in dual language (*Malay*) to ensure they understand the questions. The interview process was voice recorded and the answers were then translated and transcribed for further analysis.

### 3.6 Data Analysis

The data is analysed to fulfil the three objectives of this study. The first objective was to examine the implementation of CLT in the SBELC in enhancing students' speaking skills. The objective was examined using the observation checklist designed for the teachers. The checklist consists of yes or no scales with a feedback column for the observer to give comments on the roles carried out by the teachers. Lesson plans are used by the teacher during the lessons. It was designed based on the current Form 2 Scheme of Work approved by the Ministry of Education. The lesson plans were used as a reference to evaluate the teachers to carry out their responsibilities in implementing CLT lessons. Teachers' reflection in the lesson plan and the observation results were analysed qualitatively. Lesson plans of the teachers and the reflections on the lessons were collected and revised on to ensure that the activity was carried out based on the standard guidelines recommended by the Ministry of Education through the Curriculum Specification. The second objective of the study is to identify the effectiveness of the implementation of CLT in the SBELC to enhance students' speaking skills. It was analysed based on language used in speaking English effectively through communication. The score from both the pre-test and post-test on speaking skills were converted into mean scores and standard deviations. Then the mean scores and standard deviations from the tests were calculated by using a paired t-test to compare the student's speaking ability before and after learning with communicative activities. The data was calculated by using the SPSS. Implementation of HOTS activity in the lesson anticipates the production of sentences spoken by students relating to the HOTS criteria. These sentences were analysed and categorised qualitatively into the respective HOTS elements. The HOTS elements include applying, analysing, evaluating and creating. HOTS criteria will be identified in each sentence that are spoken by the students. The speaking test which also includes HOTS elements will be analysed to see if students' speech consists of words and phrases that elicit elements of HOTS. The elements in the speeches will be identified and classified based on the characteristics that are outlined by the SBELC. The third objective of the study is to identify the teachers' and students' perception on the implementation of CLT in the KSSM/SBELC as an effective approach to enhance speaking skills. An interview was carried out on the teachers and students.

## IV. FINDINGS

The findings of the observation show that the teachers have provided learners with activities whether to be carried out in pair or groups, teachers provide artificial forms of sentences to assist students understand the meaning of the sentences better. Teachers were seen to not use the first language at all and strictly restricting their students from using languages other than English language. The usage of English in the classroom was carefully corrected and guided by the teacher at all time. The teacher also ensured all students participate in the activities from the minor to the major tasks. Students' competence was showed after the observation as in Table 2 below;

**Table 3. Speaking competence Observation**

Speaking Competence	The Finding after the Observations
Grammar Skill	-Minority of students found it hard to use grammatical rules correctly
Vocabulary Skill Lexical Reference	-Students do use correct words for most of the session. -Some words were not appropriately used - Some lexical reference was not used properly during activities
Pragmatic Competence	-Students were seen to use appropriate phrases to express task function because they understand the objectives of the activity.
Fluency Rate	-Not in a good level -Students take too much time to respond & pausing too much while speaking

The teacher gave basic inputs regarding the topic or errors along the lesson, while the errors in speech are usually tolerated when the vocabulary or grammatical elements are pronounced wrongly. The errors were being noted and written down for reference at the end of the lesson. Implementation of HOTS in the lesson is visible through the contents and activities that the students are required to do. The teachers try to include at least two level of HOTS elements to ensure students could expand their way of thinking in a particular topic. The findings from the teachers' lesson plan was based on the teachers' reflection and the construction of the activities that includes all the necessary elements in a CLT lesson. The reflection from the teachers on their lesson objectives and students' performances shows progress in terms of interest in speaking and also ability to finish the required tasks. Teachers' reflection showed that most of the students could not carry out task at the production stage, students still use their first language and asked for teachers' help to translate their ideas in English. The students were also very passive in speaking practices; however, it was an improvement when students' practice the application of HOTS in their presentation unlike the previous lessons when it was direct and simple answers. Lesson plans show clear positive sign when the objectives set by the teachers are all achieved.

Second objective is to identify the effectiveness of CLT implementation on learners' English speaking ability.

**Table 4. A Comparison of the Overall Mean Scores on Pre-test and Post-test.**

English Speaking Ability	N	Mean Score	S.D
Pre-Test	56	14.59	2.833
Post-Test	56	15.57	2.696

As illustrated in table 4, it was found that the English-speaking ability of learners from 2 Orkid and 2 Terkis was significantly higher after CLT activities were implemented, significant at the .05 level. The participants had significantly higher mean scores on the post-test ( $M = 15.23$ ,  $SD = 2.67$ ) than the pre-test ( $M = 14.59$ ,  $SD = 2.83$ ). It is found that students have improved significantly based on the overall mean scores which was evaluated based on five other components in speaking. Students speaking test results also proves that CLT activities have a positive impact on the students' communicative competence.

**Table 5. The mean score of the pre-test and post-test of Grammatical Competence**

Grammatical Competence	N	Mean Score	S.D
Pre-Test	56	6.66	1.69
Post-Test	56	7.11	1.66

Table 5 shows that the participants' ability in the grammatical competence on English speaking were higher on post task-based learning ( $M = 6.66$ ,  $S.D. = 1.69$ ) than pre task-based learning ( $M = 7.11$ ,  $S.D. = 1.66$ ). It is a slight increase from the pre-test mean scores and it shows a development of students' grammatical competence although the level of proficiency in this section is largely weak. The result is statistically significant as the P-value obtained is lower than the significant level at 0.05. The participants responded that they could communicate more effectively after experiencing communicative activities and group works. They were not only speaking English in longer sentences and more fluently, but also were using more appropriate vocabulary and grammar structures in each situation.

**Table 6. The mean score of the Pre-test and Post-test of Pragmatic Competence**

Pragmatic Competence	N	Mean Score	S.D
Pre-Test	56	2.11	0.45
Post-Test	56	2.23	0.50

Table 3 displays improved speaking skills in the sub element Pragmatic Competence.

For example, the mean score rose from (M=2.11, SD =0.45) to (M=2.23,SD =0.50) which explains that the students have barely improved their ability to express a range of functions effectively and appropriately. The result is statistically significant as the P-value is below 0.05. The students have improved in responding to roles and setting given to them although their response might cause social misunderstanding. However, the result does not show any large difference in terms of the improvement of the students in this section. The result has not been very encouraging as it did not meet the expected level. The functional competence of students remained the same for most of the students as more students still did not improve in fulfilling required functions effectively compared to the pre-test carried out.

**Table 7. The mean score of the Pre-test and Post-test of Discourse Competence**

Discourse Competence	N	Mean Score	S.D
Pre-Test	56	3.82	0.72
Post-Test	56	4.07	0.85

The data in table 6 refer to the score of Discourse competence which evaluates students' ability to organise a discourse coherently and cohesively. The score also measures students' contribution in interaction and managing conversation to keep the conversation going. The results of the post-test show that the mean score increased from (M= 3.82, SD= 0.72) to (M=4.07, SD= 0.85). The data proves that students can structure the discourse according to a topic or genre and they can also take turn occasionally and develop topics effectively. Although the level of proficiency among students has increased, its difference between both set of mean scores is very small. The margin of improvement has not been up to the expected levels. This proves that improvement does not match the time frame.

**Table 8. The mean score of the Pre-test and Post-test of Fluency**

Fluency	N	Mean Score	S.D
Pre-Test	56	2.00	0.43
Post-Test	56	2.20	0.52

As shown in table 7, the data refers to the fluency scores that are evaluated on the students. Students' fluency refers to the ability to speak fluently demonstrating a reasonable rate of speech. The mean score of the component increased from (M=2.00, SD=0.43) to (M=2.20, SD= 0.52) which indicates that the students have barely improved in terms of delivering ideas smoothly with less hesitation and pauses. Although, there is a very small increase in the mean scores, the students' level of fluency is still the same.

The findings for the pre-test and post-test overall mean scores has shown improvement in students' speaking proficiency. Despite increased number in terms of the mean scores, the difference of the scores from both test have not been encouraging. The paired t-test found that there is a statistically significant difference between the means of each component despite the low number of differences. This is a reason why it is important to refer to the 95% confidence interval. This gives an impression that if the experiment is done 100 times, 95 times of the true value for the difference would lie on that particular percentage. In this results, the P-value has always been lower than 0.05. It further confirms that the differences in the marks are statistically significant although the scores appear to be relatively small. Despite a statistically significant result, the small difference of means scores has to be taken seriously

Third, the findings to identify teachers' and students' perceptions on the implementation of CLT in the SBELC as an effective approach to enhance students' speaking skill. This section presents the results of analysis of the qualitative data gathered from the interview session with two teachers. They found that the students are not learning English as a matter of communication and could recognise that students feel they do not need to learn the language. The teachers were firm with their opinion that the parents' way of thinking towards the language influences the students' attitude towards the language in classrooms. Next, it also found that students refuse to speak in English unless the teachers fix rules that prohibits them from speaking other languages. Moreover, teachers' interest in CLT was found very high considering its effectiveness towards improving students speaking skills in a fun and interactive way. Teachers also agreed to welcome the freedom and the use of HOTS in the lesson that could increase students' creativity through learning English, where the

activities could elicit their creative thinking and provide a platform for the teachers to adopt and adapt many of the activities to include communicative activities. The types of activities that were encouraged by teachers are taken from the syllabus that is recommended by the Ministry of Education, added by their own adopt and adapt activities that suit students' ability as well as to elicit the Higher Order Thinking skills. The study found that one of the ways to implement CLT was thinking skills, as they need students to analyse and create conversations based on a topic. Moreover, students were found to participate in group work and pair work most of the time in a week. They were very exciting to have a chance to do and act specific roles with their friends in front of the classroom. However, the main obstacle for students was the focus on other main skills such writing, reading, and grammar which are important for the examination may reduce the focus on the communicative activities.

## V. DISCUSSION

According to the Oxford pocket dictionary (2009), speaking is "the action of covering information or express ones thought and feeling in spoken language" Another definition of speaking skill is "using language for purpose" (Baker, Watsrup, 2003). While CLT is a various set of principles that reflect a communicative view of language and its learning which is used to support a wide variety of the classroom procedures (Richards & Rodgers, 2001). Communicative Language Teaching or CLT emphasises the language usage rather than its structure. Thus, CLT concentrates attentively more to the spoken form of English which is speaking skills compared to writing and reading skills. In the academic world, CLT is one of the most influential theoretical developments in language teaching and learning especially among ESL students, and it is related to the idea of communicative competence that is believed to help in redefining the target of second language (L2) instruction in the classroom.

Students speaking skills and competence is emphasised and is one of the main components in the SBELC which is aligned with CEFR curriculum for the form 2 students. There are several ways of implementation of CLT to enhance students speaking skills, especially in the target language (Tanveer, 2007) which is English language. CLT implementation can make students willing to practice speaking in classroom for readiness in authentic situations. It is comfortable to apply in student-centred classrooms (Le, 2010) where the discovery learning approach become the base of their learning tasks or activities.

The encouragement from teachers can give a chance to the students to express and exchange their ideas in their English language classroom and the CLT activities, such as open discussion and asking questions to the teacher in the classroom. The teachers expressed that they prefer students to participate in pair work but the group work is the students' preference as it gives them freedom and more time to engage with their classmates. This is agreeable with Doan Linh Chi (2011) and Friya Islam (2016) that work in a group or group activities which is necessary for the practice of speaking skills. Activities such as role play exhibits their ability to consider opinion of others while debating activities which primarily involves discussions shows that students can make decisions using their knowledge and experience. Students are confident in the application of HOTS, where after presenting and speaking about a specific topic, students are seen to be designing or developing new ideas based on the current topic. Construction of new ideas and ways leads to many inventions and innovations with the guidance of the teachers.

Besides, in the school, the communicative English was being regarded as a confidence booster and also a tool that could promote students to speak outside classrooms. Even though most teachers recognise the importance of CLT, many of them do not have much confidence in practicing it effectively in the classroom. So, teachers have to be alerted with all the change and transformation of idea in the communicative ideas in the classroom. This is because the teachers' role is also a contributing factor to the responses that the students give coherently to their interlocutor's turns.

This suits Barbara Šteh et al., (2014) study that there are two important aspects to be served as the central concepts of the pedagogy and andragogy subject-matter in education system, which are the origins of learning process and the roles of students and teachers. This is supported by Doan Linh Chi (2011) who claims that teachers' role to help students improving their grammar, enhance their vocabulary, and manage the interactions with its perfect rules. The teacher encourages students to ask questions to keep a conversation going. Teacher guides the students who work in groups to break the information in their intended scripts or notes so that they can easily understand it when they are presenting. Yanik (2007) added by arguing that the implementation process of English language curriculum varies and this depends on the facilities of different schools and classrooms, as well as teachers' and students' characteristics. The CEFR is associated with Standards-Based English Language Curriculum (SBELC) and they are built on the basics of communicative competence with the cognitive progression in its learning standards through supply in order to increase the expectations of the ability of students to grasp concepts since their kindergarten schooling up to secondary levels. This is implemented to show that speaking skills are vital for students to be polished since their small ages, especially among non-native speakers.

## VI. CONCLUSION

This study has raised the issues that are concerned with the CLT in secondary schools in Malaysian setting. It includes the

implementation of the CLT in classroom and its impact on the students' speaking. The review of current literature has questioned the position and effectiveness of CLT in classrooms especially after the newly integration of CEFR. The challenges faced by teachers and students have been summarised in this final chapter. The CLT still proves to be a very effective approach if it is carried out according to its criteria along with the support of both teachers and students respectively. Hence, an approach which is still relevant must be supported to be able to obtain maximum impact on the students. The study also has shown clear implications and recommendations that have been made for the school administration and also the Ministry of Education. This qualitative study which also includes quantitative data provides to be a platform for further studies to be carried out on CLT in Malaysia. The areas related to this teaching approach is seen to be more important in the upcoming future due to the CEFR that is integrated into SBELC. Further research should be done on the impact of CEFR on the speaking skills of students as it also adopts the CLT as its main method. Further research should also look into the implementation HOTS in CLT as students' cognitive skills in rural schools can be compared to the schools in urban areas. This is due to the lack of literature on HOTS in rural areas in Malaysia. A comprehensive study on the newly implemented CEFR on student speaking skills can provide interesting findings to identify its effectiveness and weakness.

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# The ITC Literacy of e-Government Administrators in Communication and Informatics Office of West Nias Regency, North Sumatera - Indonesia

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**Abstract** - The electronic-government or e-government is viewed as a process with great potential for improving public service delivery to individual citizens. Thus, purpose of this study is to recognize the ability of HR and find out what aspects of technical capability are needed by the e-Government Administrators of Communication and Information Agency of West Nias Regency, North Sumatra Province. Thus, the subject of this study are e-gov administrators of Communication and Information Agency of West Nias Regency. This study employed the descriptive methods with total sampling determination. The result of study revealed that the concept of e-Gov has not been fully implemented in West Nias Regency. The main reason is due to the lack of support of the local government, especially the shorten of financial support that impact on the e-gov administrators' performance.

**Keywords:** ICT, literacy, e-government, administrator, development.

## I. INTRODUCTION

The advancement and development of information and communication technology (ICT) brings the significant changes to human life. Since the civilization time, information is one of the most important things that accelerates changes in the life of mankind. The lack of information will cause uncertainty and discomfort in humans' life. Thus, humans unrelentingly find and exchanges information each other to suppress the uncertainties. This is clearly evident in the life of our society from the scope of the simple to the most complex.

The ICT has a center role in the future governance. Accurate, timely, and comprehensive information is required to support economic development decision and policy making at all levels of government. The central and regional government agencies have taken the initiative to develop public services through communication and information networks as the implementation of Presidential Instruction No.3/2003 on National Policy and Strategy for e-Government Development, which mandates every Governor and Regent or Mayor to take steps which is needed in

accordance with their respective duties, functions and authorities for the implementation of national e-Government development.

In implementing e-Government State agencies for public services, the West Nias Regency Government has started by building a basic infrastructure of information technology with the use of a Local Area Network (LAN) computer network that connects the Regional Work Unit or *Satuan Kerja Perangkat Daerah* (SKPD) in the environment integrated office in the city center of West Nias Regency in 2016 Regional Budget, which is expected to be connected to the internet in February 2017, according to the agreement with the internet service provider from PT. Telkom Indonesia Wilayah Timur Sumatera Utara.

Thus, in focusing on one SKPD in terms of managing public communication information services and ICT management, the West Nias Regency Government has formed a new SKPD namely the Office of Communication and Information Technology based on Government Regulation Number 18 of 2016, Regulation of the Minister of Communication and Information Number 14 in 2016, and has appointed a Structural Officer in December 2016 to handle the intended Service.

Due to the new established of SKPD of West Nias Regency Communication and Information Office, this work unit needs for the experienced personnel in the field of information management and ICT services, especially in department that handle e-Government. Thus, the *Balai Besar Pengkajian dan Pengembangan Komunikasi dan Informatika* (BBPPKI) Medan conducts research and studies on the development of human resources of Communication and Information Officers of West Nias Regency in the context of implementing e-Government for public services in accordance with direction of the President of Republic of Indonesia.

In dealing with those needs, this study investigates the ITC literacy among the e-Government administrator of Communication and Informatics Office of West Nias Regency, North Sumatra Province which is initiated in 2016.

## II. LITERATURE REVIEW

The term of electronic-Government or known as *e-Gov* was officially introduced to public administration through the Presidential Instruction No. 6/2001 regarding ICT (in Indonesian, *Telematika*) to support the good governance. E-gov is one of the good governance tools to provide new insights related to accountability. It should be manifested by provides 'access' to outsiders or citizen for what is being done. In fact, in certain sectors, it also includes free access to participating in the planning, implementation, and evaluation. When there is no access, then the government is considered as not accountable (Son in Huda and Yunas, 2016:98).

The development of e-Government is part of the efforts to set up structure, system, and administration which is efficient, effective, transparently, and accountable. It is essential to be supported by capable human resources, good management systems, processes, and controlling systems. The main challenges in the development of e-Government lie in the non-technical aspect, particularly planning. However, the lack of ICT Human Resources has caused ICT to put in a low priority. (Salahuddin and Rusli, 2005:8)

Studies on e-gov in several regions of Indonesia revealed that the government officials reluctant to do the task online for they prefer the traditional way. Bastian (2003) suggested that the Indonesian government must learn from the causes of the failure of e-government in some countries due to several factors, namely: the unpreparedness of human resources, information technology infrastructure, and lack of attention from the stakeholders.

Wahid (2008:39) recognizes the disparity in e-government implementation among the regencies or cities in Indonesia. Furthermore, the reasons are including management, infrastructure, and human factors that vary across this large and heterogeneous country. From 456 of regencies and cities websites, 66.9% of them has their own website and were in operations, while other were either still embedded into website of province, not found, or inaccessible. Hermana et.al. (2012:196) found that out of total 443 local governments in Indonesia that already have official websites, only 374 website that are accessible at the time. Moreover, important issues in financial management in Indonesia is transparency and public accountability.

In 2015, an evaluation to 32 regional and city official website in Indonesia also revealed the similar result. Public Administration Reform for better, faster, and more transparency of public service by implementing e-Gov in Indonesia is still running slowly and the cities government seems to be focus on the business service and finance transparency rather than other services. (Prahono and Elidjen, 2015: 32).

### III. METHOD

This study use *Cross-sectional design* that performs for one period of study. (Singleton, et.al, 2008:237). Location of study This research is located in West Nias Regency, North Sumatra Province, Indonesia. The objective of study is to map the e-Government administrators' capability that consist of:

- a. Sociodemographic and psychographic aspects, such as age, gender, education, income, and interest in information and technology;
- b. Professional background and experience, such as background of public relations education, length of work, technical skills of information and technology possessed;
- c. Worldview dimensions that consist of attitudes, values and beliefs in the internet and e-Government
- d. Understanding of the code of ethics and professional rules with dimensions that consist of the presence or absence of professional rules and codes of ethics applied in e-Government, social responsibility;
- e. The communicators authority in the organization, that consist of resilience, problem solving, and decision making.

The respondents of this study were the administrators of e-Government in the Office of Communication and Information of West Nias Regency, North Sumatra Province. The sampling technique used is total sampling.

Data were categorized into primary and secondary data. The primary data was obtained through the Questionnaires and in-depth interviews, while the secondary data was collected from the observations concerning the e-Government in the West Nias Regency Information and Communication Agency.

## IV. RESULTS AND DISCUSSION

### 4.1 Description of e-Government in West Nias Regency

In the framework of implementing e-Government of State administrators for public services in accordance with the direction of the President of the Republic of Indonesia, the West Nias Regency Government has started to build a basic information technology infrastructure with the construction of a Local Area Network (LAN) that connects all Regional Work Units (SKPD) in integrated office environments in the city center of West Nias Regency for Regional Budget 2016, which is expected to be connected to the internet in February 2017, in line with the agreement with the internet service providers from PT. Telkom Indonesia Eastern Region of North Sumatra.

Related to the above matter, in focusing on one SKPD in terms of managing public communication information services and ICT management, the West Nias Regency Government has formed a new SKPD namely the Office of Communication and Information Technology based on Government Regulation No. 18 of 2016, Regulation of the Minister of Communication and Information No. 14 In 2016, and has appointed a Structural Officer at the end of December 2016 to handle the intended Service.

To follow up on the operation of the network that was completed at the end of 2016, the West Nias Regency Government has limited human resources (HR) that are skilled and trained as network administrators, limited budgets for training as government service application administrators developed by the Ministry of Communication and Informatics, limited funding

sources to do a variety of specific applications in some Regional Work Units (SKPD) and limited funds to send *State Civil Apparatus* (ASN) to participate in various *Diklat/Bimtek* with various training providers.

Therefore, the Government of West Nias pleaded for the Ministry of Communications and Information Technology to provide assistance, facilitate and provide training as Network Administrator and Training of Trainer to the ASN of the Office of Communications and Information Technology West Nias in particular fields handle the e-Government in Training and Bimtek held in 2017 both held directly at the Directorate of *e-Government*, as well as training held by the Education and Training Center under the Coordination of the Ministry of Communication and Information.

#### 4.2 Analysis of the Results of E-Government Mapping in West Nias Regency, North Sumatra Province

##### 1. Sociodemographic and Psychographic Aspects

The establishment of the agency that manages the Electronic Data (PDE), especially those who responsible for managing e-Government in West Nias Regency still less experienced. In the framework of the implementation of e-Government agencies for public services, the West Nias Regency Government has build a basic infrastructure of information technology with the construction of a computer Local Area Network (LAN) that connects all *Regional Work Units* (SKPD) in office environments integrated in the city center of West Nias Regency for 2016 regional budget (APBD), which is expected to be connected to the internet in February 2017. This was based upon the agreement with the internet service providers from PT. Telkom Indonesia Eastern Region of North Sumatra.

In accommodate this work, the West Nias Regency government experienced a situation of unpreparedness both infrastructure and superstructure. This is because the penetration of information technology, especially the internet in West Nias Regency is still very low. Not only the general public, but many government officials are unproficient in mastering information technology (IT).

In analysis that discusses sociodemographic and psychographic aspects, it is revealed that the logical consequence is the lack of preparedness of the West Nias Regency government apparatus in implementing Presidential Instruction No. 3 of 2003 concerning e-Government development proven in quantitative facts (statistics) obtained by BBP SDMP Medan researchers in distributing questionnaires to 3 (three) e-Government Administrators, because only three people are currently managing e-Government in Communication and Information Agency of West Nias Regency, which was the location of the study, where the three e-Government Administrators were men. The detail findings are as follows:

Table 1. The age of *e-Government* Administrators

Age	Frequency (F)	Percentage (%)
-----	---------------	----------------

19 to 24	1	33,3
25 to 30	-	-
31 to 37	-	-
38 to 43	1	33,3
> 43	1	33,3
Total	3	100

n = 3

The table above shows that the three e-Government Administrators who are working at the West Nias Regency Communication and Information Agency are in a relatively productive age.

Table 2. The last education

Education	Frequency (F)	Percentage (%)
Senior High School	-	-
Diploma	-	-
Bachelor	1	33,33
Postgraduate	2	66,67
Total	3	100

n = 3.

The table above shows that the *e-Government* administrator in Communication and Information Agency of West Nias Regency have completed their undergraduate education, in fact 2 of them have completed Postgraduate (S2).

Table 3. ICT interesting level

ICT Interest	Frequency (F)	Percentage (%)
very interested	2	66,67
interested	1	33,33
less interested	-	-
uninterested	-	-
Total	3	100

n = 3

The administrators of e-Government in Communication and Information Agency of West Nias have high interest in ICT. This is evident from the results of the study that two respondents admitted that they were very interested in ICT. This high level of interest in ICT should be reflected in their intensity in accessing the internet for the week. Moreover, most of e-Government Administrators are categorized as high user (two persons), while the rest is middle user (1 person).

In improving the skills and abilities of e-Government Administrators, all of the respondents admitted that the books were useful to be used as a reference. All of e-Government Administrators claimed to buy books and magazines to increase their knowledge.

##### 2. The professional background and communicator experience

#### a. Public Relations Education

It has been mentioned in the previous section that the qualifications of the work of Administrators of e-Government are basically very related to the basic functions of public relations, and many PDE agencies are under the Office of Communication and Information.

Of the three respondents who managing the e-Government in West Nias Regency, only one person has a public relations education qualification, and the remaining two people do not have a public relations education background.

#### b. Information and Technology IT Education

Likewise the educational qualifications in the field of IT, ideally the management of *e-Government* has an educational background in the field of IT, because their work is closely related to technical issues in the field of Information Technology (IT).

The results of study shows that all e-Government Administrators of West Nias Regency have the adequate IT education and qualification. Two of the administrators had the IT skill from formal education, and the rest admitted that he received the education through trainings and workshops.

#### c. Working period as e-Government Administrator

As mentioned in previous section, that the implementation e-Government has been started since 2003. However, this study reveals that most of e-Government Administrators in West Nias Regency stated that they are not so familiar to their tasks. They added that they had only worked as IT Administrators in their work environment for approximately 6 months.

#### d. Mastery of supporting software

Mastery of various softwares or application programs that are very closely related to the appearance of a website is very important, because it involves the task of an e-Government administrators where one of them is trying to build a website that has interesting, informative features and can introduce all potential in the district. West Nias which has a website .

From the research that has been done obtained data that the quality and competence of the Administrators of e-Government at the Office of Communication and Information of the West Nias Province Regency was not good enough. This is proven by the fact that respondents are generally less knowledgeable and capable of using some software that is important in creating and maintaining a website .

#### e. Other Technical Skills

In the level of other technical skills, the researchers try to find out how other abilities or technical skills possessed by respondents in supporting their work.

##### 1) Video editing skill

As the technical category in the video editing skills, the results shows that all respondents stated that they did not have the skills in video editing at all to support their work.

##### 2) Animation Skills

In animation skill category, the result shows that all respondents stated that they did not have the animation skills to support their work.

##### 3) Photography Skills

The photography skill is also not possessed by the respondents. The results of the questionnaire distribution shows that two of respondents stated that they did not have skills in the field of photography, only one person said that he had skills in the field of photography as supporting their work.

##### e. Updating Website Content

The regular updates of website content is a very necessary task in managing website content. This tasks is to maintain the web-content is fresh or "unexpire". The e-Government administrators should find the related material from the contents of the website from the local government, especially from the Office of Information and Communication Technology.

Material that is always up to date will be able to attract the users to always access the website so that they don't miss out on information.

The results of the study shows that the website Administrators in Information and Communication Agency of the West Nias Regency are not regularly in updating website content. It is done only when it is necessary and if there is the latest material / information to submit. Moreover, the content and the features and appearance of the website should be improved. This website does not provide interactive facilities and has no discussion space and input from website users, thus it is not interesting for public to visit.

### 3. Worldview

Concerning the worldview, an overview of how an Administrators' view and comprehend the e-Government. The view and comprehension of the concept of e-Government is very important, because it is a foundation for the conceptual frame of the Administrators in carrying out their work professionally and responsibly.

The result of study shows that two of *e-Government* administrators claimed not possess the knowledge of the e-Government concept, while the rest admitted that he has the e-Government concept.

### 4. Understanding of professional codes of ethics and rules

#### a . The established professional rules in the work environment

Professional rules in the form of Standards Operational Procedures or regulations are guidelines for Administrators in managing the e-Government. The results of the study revealed that all of the respondents admitted that the institutions they working on has no clear professional rules as guidelines to follows.

#### b . Code of Ethics

The code of ethics is important in guiding the e-gov Administrators to work together in a team. The absent of working code of ethic may lead the administrator to work in unclear area of responsibility in managing the website. However, the results of the study showed that all e-Government Administrators claimed possessed the code of ethics in their working environment.

## 5. Organizational structure

In this section, the study was focused on looking at how the pattern of work relations and hierarchy between staff working as Administrators of e-Government in Information and Communication Agency of the West Nias Regency. The important points in this section are as follows:

### a. Work incentives

This section aimed to recognize whether the Administrators were staying at work, especially when managing and update the website contents. Did they given a certain stimulus, in the form of incentives excluded the basic salary? For working behind a computer screen in a relatively long duration and is quite weary, for example due to radiation computer screens to improper sitting positions may cause the workplace accidents. The respondents admittance implied that the incentive was not a standard procedure. All of respondents stated that they had never received an incentive as long as they works to update the the website contents in long hours.

### b. Intensity in Facing Working Problems

Facing the problems is part of ITC works. The e-Government administrators also face the working problems, both concerning the technical matters, for i.e website contents and appearance to procedural things. The e-Government Administrators claimed that they were too often facing the obstacles or problems in their work. In the term of problem solving, two of respondents admitted discuss it with the team, while one respondent stated completing it by submitting the matters to the head office.

### c. Policy on the Website Content

Content is primarily determine the appearance of any websites and their impact on users. Concerning the policy of website contents, two of respondents admitted that the policy regarding the content and features on the website is under the direct control of the Information and Communication Agency Office of West Nias Regency, while one respondent admitted that the policy regarding manage website content was determined through direct instructions from the District Government Official. However, all policies regarding the material and contents of the websites are specified unregularly.

Finally in completing these results, this study also held and interview with th Head of e-Government of West Nias Regency and the Head of e-Government Organizing Department. The interviews concludes that:

1. Communication and Informatics Office of West Nias Regency was established in January 2017. Previously, the

West Nias Regency collaborated with Transportation Agency in managed its website. This governmental official website provided the practical information and content for the users. However the support of West Nias government in promoting the effectiveness of information publication via the internet is still considered unadequately. However, the West Nias Regency Government has initiated to continue the effectiveness of information publication through technology. In 2016, a the West Nias Regency Government network has been installed. The Office of Communication and Informatics of West Nias Regency has links the SKPD agencies in terms of information distribution, but for now, they still limited to several SKPDs, in West Nias Regency Government.

2. Concerning the structure and working relationship pattern is still unclear. The interviewee suppose an improvement in the future. The Communication and Informatics Office will be used as an information center and internet technology-based information center in West Nias Regency government. There are still many obstacles faced in working relationships due to the internet network, this is the main factor that slowing the public relations tasks.
3. The head of West Nias Regency also promised to improve IT structure, thus the implementation of e-Government program can be implemented properly.
4. Aside from the technical constraints the Communication and Informatics Office of West Nias Regency also experiences obstacles in the field of HR to manage the network. The efforts have been made to request additional employees with an IT education background to the West Nias District Head, but until now it has not been fulfilled because Other SKPDs also desperately need employees who have IT education backgrounds, so that there are scrambling between existing SKPDs if there is an addition to an employee with an IT education background.
5. In dealing with the problems, an adequate budget is needed. The West Nias as a newly formed SKPD has a limited budget to carry out e-Government.

The results of the interview above have a close relationship with the research through the distribution of questionnaires that have been carried out on the Administrators of e-Government in West Nias Regency, which is mutually supporting and complementing one another.

## V. CONCLUSIONS

The concept of e-Government which has been initiated since 2001 the period of Abdurrahman Wahid by issuing Presidential Instruction No. 6, 2001 regarding the construction and utilization of telecommunications in Indonesia, and was followed up by the next Megawati government by issuing Presidential Instruction no. 3 2003 June 9, 2003 on policies and strategies for developing e-Government is something that has been running for a long time but has not been fully implemented by the local nor central

government. Thus, this fact implies that there are many areas that are less ready to implement the e-government.

Several important points concerning the finding and result of study that was carried out in Communication and Informatics Office (Diskominfo) of West Nias Regency concerning the ITC literacy among the e-government administrators are revealed as follows:

The unpreparedness reflected in both infrastructure and suprastructure. It was found that only a set computer in supporting their task, while for the supra-structure level it can be seen that the e-Government Administrators are not familiar with the world of ICT. Meanwhile the Administrators of e-Government are not possess the adequate information technology.

The right attitude and comprehension of e-Government Administrators in managing websites is an important and central role in implementation of good governance concept which one of them is the principle of transparency and participation of stakeholders. This is proven, that after the launch of the e-Government of West Nias Regency, the Administrators no longer maintain and improve performance for their websites. For now, the website is suspended for various reasons and poor management.

There has been no serious attention from the head of the West Nias Regency for management, especially attention to financial support. The E-Government Administrators complain about the shorten of operational funds so that it has a negative impact on their performance.

## RECOMMENDATIONS

Some recommendations suggested as follows:

In dealing with the unpreparedness, it seems that the local government must have a common thought and perception regarding the importance of the website which is one manifestation of e-Government and the implementation of the concept of Good Governance. Especially nowadays is the era of information technology, even with the official website of the district government able to promote its area without recognizing the boundaries, so that the potential of the region can be seen by investors to tourism that is able to attract tourists.

Revitalization is an indispensable thing in improving e-Government Administrators performance, both the human resources and ITC support.

A uniformity is needed, regarding the institutional position and responsibilities of e-Government Administrators where in this study it was found that the Administrators of e-Government in each SKPD of West Nias Regency Government differed in position, under Bappeda, the Ministry of Communication and Information, or stand alone. This will affect effectiveness and performance.

To build a government that is better able to organize Good Governance, the Ministry of Communication and Information

needs to build a network of cooperation with the Minister of Home Affairs based on participatory, transparent and responsive relationships. The problems and trends of *e-Government* legality in the era of regional autonomy are to be adjusted to the actual paradigm, namely how to cultivate the young generation towards skillful knowledge as an increase in Good Governance through e-Government.

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# A Geo Spatial Analysis for Identifying the Potential of Tourism Development in Jaffna District

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**Abstract-** Tourism is a growing sector in the world Nowadays, GIS is widely recognized as a valuable decision support system that enables the Determination of suitable locations for tourism based on a group of criteria. Thus, this study was undertaken with the main objective is to identify the tourist potential in the Jaffna peninsula. The suitability model composite of Criteria's are commercial areas, infrastructures, roads, Existing tourist places, accommodations and recreational areas. First, a weighted multi-criteria analysis is performed to spatially integrate the first six conditions in a weighted manner by using GIS suitability model. The designed weights have been selected. As per the conclusion of the study, on the basics of the objectives and criterias, the Nallur and pannai beach area found to be with most suitable for tourism development. Other places are found to be with low suitable for tourism development. Though, based on last criteria, Pannai is identified to develop the tourist potential.

**Index Terms-** GIS, suitability analysis, tourism land use, Jaffna district

## I. INTRODUCTION

Tourism is one of the most exciting and progressive industries in Sri Lanka. Part of the visitor economy, tourism is also business and it impacts on almost every other industry. Tourist arrivals to Sri Lanka rose by 16 percent in November compared with the same month in 2015 with India and China remaining the leading markets, statistics from the Sri Lanka Tourism Development Authority. The term 'tourism industries' is the internationally accepted UNWTO/OECD definition of twelve standard industrial classification of the sector of the economy that provide products/services consumed by visitors. Tourist is the common denominator that covers all the forms of tourism defined above for the same range of purposes.

The entire North is blessed with natural beauty, a source for tourist attraction. Foremost of the attractions is the fascinating town of Jaffna, with its absorbing mixture of colonial charm and vibrant Tamil culture, while the Jaffna Peninsula and surrounding islands offer a string of remote temples, Hindu and Buddhist alike, beaches and more off-beat attractions. Sri Lanka tourism plans to develop tourist locations in the peninsula on a massive tourist project designed to the north.

The geographic information system applied to tourism management is the preferred platform of tourism information. The technical advances in computer sciences and techniques, geography got new powerful tools and methods to capture, handle, manipulate, and analyze huge amounts of data. These "organized collection of computer hardware, software, geographic data, and personnel design to efficiently capture, information" is called geographic information systems (GIS) (ESRI Environmental Systems Research Institute, 1990). With its capabilities for business mapping, geospatial analysis and its contribution to decision support GIS seems to be a very useful tool for the geography of tourism. To what extent the capabilities of geospatial analysis can contribute to tourism potential research will be investigated in Jaffna peninsula.

## II. OBJECTIVES

### 2.1 General Objective

The main objective of the study is to identify the tourist potential for development in Jaffna peninsula using Geospatial analysis Technology.

### 2.2 Specific Objectives

To identify the existing ecological and anthropogenic resources in the study area.

To identify the current situation of tourism in the study area.

To identify the awareness of the people engaged in tourism industry

To reveal the strategic plans to increase the regional development of the study area in future.

To propose suitable suggestions for development of tourism in Jaffna District.

### III. STUDY AREA

The Area represents physical, social, environment aspects. Jaffna District is one of the 25 administrative districts of Sri Lanka. Jaffna District is located in the far north of Sri Lanka in the Northern Province and occupies most of the Jaffna Peninsula. It has an area of 1,025 square kilometers (396 sq mi). It is divided into four areas geographically, Thenmarachchi, Vadamarachchi, and Valigamam and Jaffna islands. Jaffna District is divided into 15 Divisional Secretary's Division and 435 Grama Niladhari Divisions. Jaffna has enormous potential for development, tourism and hotel industry in the Northern Province of Sri Lanka. There are several tourist attractions. The following map is show the research area.

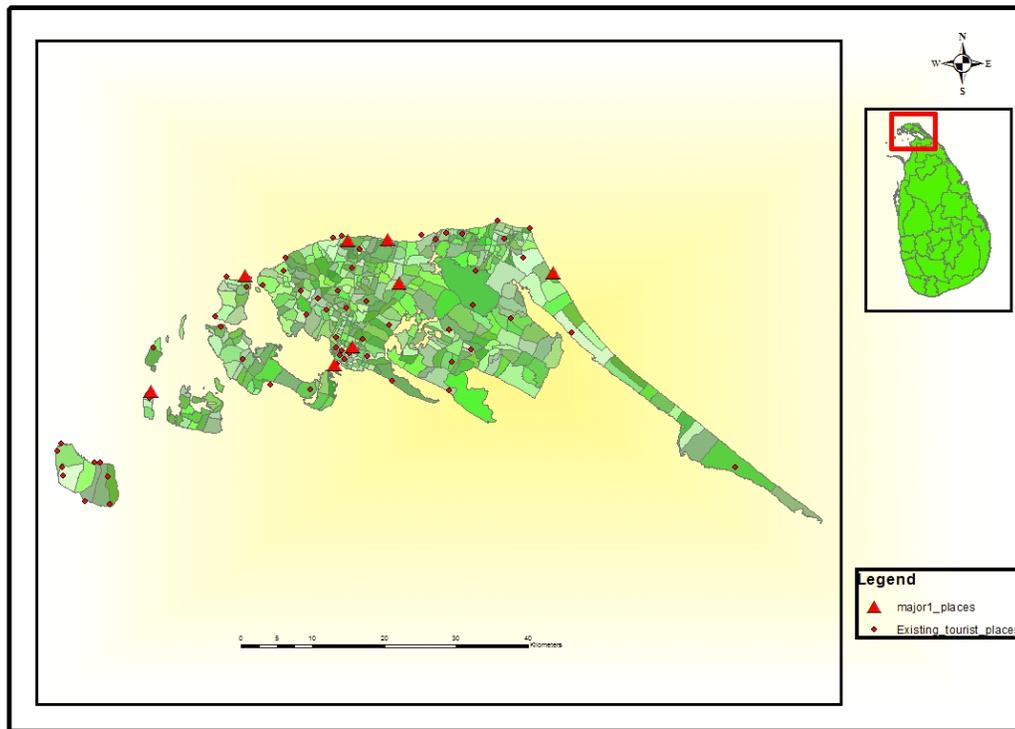


Figure 3.1 Study area  
 Source: by author

### IV. METHODOLOGY

Information was gathered through primary and secondary data. Information was gathered through visit to existing tourist areas, Field observation (Service provider, People engaged with tourism, Expert Opinion Survey). Secondary data was collected from Tourism Report, DSD Report.

Table 4.1. Data obtained from various authorities

Data type	Data format	Data Source	Scale
Land use map	Soft copy	Survey Department	1:50,000
District map, roads map, commercial areas map, accommodation, recreational map,	Soft copy	Jaffna Kacheri	1:50,000
Existing tourist places map	Soft copy	Survey Department	1:50,000

Tourism Report, DSD Report	Hard copy	Jaffna kacheri, Jaffna DSD Division	
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Source: by author

Through this research analysis is the identification of existing tourism for improving the tourist industry in Jaffna district. Descriptive research type and suitability and multicriteria analysis were used for the results by using Arc GIS. Non probability samplings were used and samples were selected for the data processing. The data processing has been performed in several stages in order to acquired up-to-data spatial datasets and non spatial datasets regarding the study area. In the first step and recent Land use maps has been obtained, and then identify the existing tourist places through the Arc GIS 10 .3 software. Secondly, a field campaign has been organized to collect field data about land use types for the recognized existing tourist places field work (GPS survey and discuss with tourist experts). Integrating such attribute data into the study area shape files enables the categorizing of available land uses in Jaffna peninsula. A total of eight major existing tourist places have been identified for the urban boundaries of Jaffna peninsula that find the existing place to develop.

Multi-criteria site suitability analysis is performed to identify appropriate spatial locations based on a group of criteria or constraints. In this study seven criteria and factors have been designed to construct a tourist infrastructure' suitability model. These conditions aim to: Identify safe locations and easy to access the facilities, fulfill spatial homogenous distribution over the city, reduce construction' costs by allocating sites close to an existing road, being in a flat or small slope area, and currently being empty parcels, Select appropriate locations with areas fit tourist infrastructures.

Accordingly, these the multicriteria composite of Criteria's are commercial areas, infrastructures, roads, Existing tourist places, accommodations and recreational areas.

- Within 3000m away from accommodations.
- Within 3000m away from recreational areas.
- Within 3000m away from commercial areas.
- Within 3000meters away from an existing tourist places.
- Away from an existing road by no more than 2000 meters.
- Within 3000m away from infrastructures.
- The area of the proposed site is larger than 1000 square meters and preferred be a beach site.

Lastly, a weighted multi-criteria analysis is performed to spatially integrate the first six conditions in a weighted manner by using GIS. The designed weights have been selected to be: a weight of 1to 4 for all conditions. The last criteria have been performed separately after the site suitability model is obtained through field visit, in order to define appropriate sites. The weight has been obtained from tourist experts through field survey.

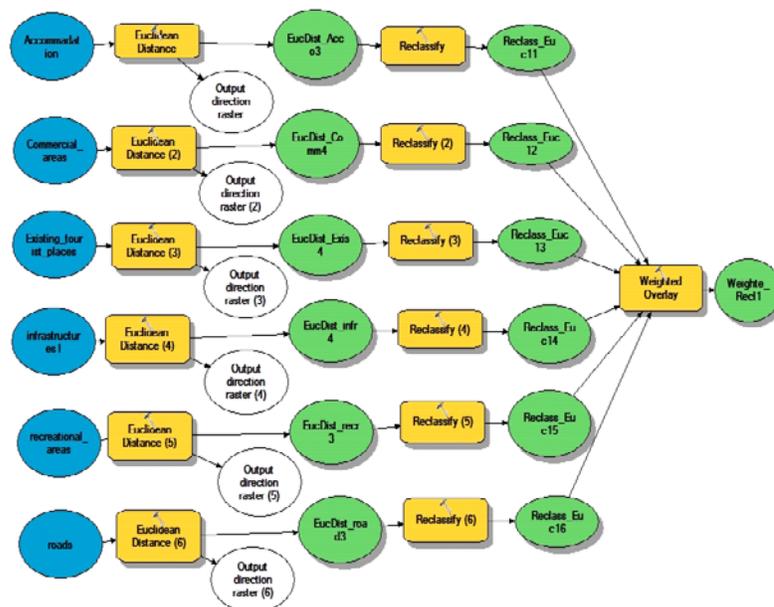


Figure 4.1. Analysis method of suitability model  
 Source: by author

Results and analysis Firstly, the Arc GIS spatial analysis tools have been applied for each criterion individually. Thus, six distinct suitability models have been obtained, one for each specified constraint. The spatial results of each attained model have been divided into four categories: more suitability, suitability, moderate and low. The suitability analysis model is given below. These are indicated by colors order to red, orange, light green and green.

## V. FINDINGS

Tourists started pouring in to the country after the end of civil war. Now, Major infrastructure development projects are undergoing in the country. The Government identified tourism as a fast emerging potential growth sector in the economy in terms of foreign exchange earnings, employment creation, infrastructure development and regional development. Tourism can bring higher living standard in a country if well managed to serve the interest of the nation.

### 5.1. Current situation of the tourism in study area.

Jaffna has already become a popular destination for tourists. Jaffna has 32 tourist destinations. The Old Dutch Fort of Jaffna, Nallur Kovil, Nagadeepa temple, Keerimalai springs and the Jaffna public library are some of the key tourist attractions in the Jaffna district. Over 500 people visit Jaffna daily from various parts of the country with the dawn of peace. With the opening of the A-9 road for the public, the number of tourists visiting Jaffna has increased rapidly. The climate, lagoon and variety of flora and fauna of Jaffna is very good for the tourism industry. Though, during this periods Jaffna has seven tourist places that are famous destinations.

Jaffna has already become a popular destination for tourists. Jaffna has 32 tourist destinations. The Old Dutch Fort of Jaffna, Nallur Kovil, Nagadeepa temple, Keerimalai springs and the Jaffna public library are some of the key tourist attractions in the Jaffna district. Thirty years ago most of the Jaffna people left the country due to the uncertainty in the country and now they are returning to the island. Today instead of the brain drain; brain gain rate has increased. With the beginning of a new era with peace and stability it is vital that the business community recognize the possibilities and re-build the country's economy. Jaffna has enormous potential for development in the North. Jaffna is a resource land, which was untouched for the past three decades and it is vital to adopt the concept of being green since it is timely to have a sustained tourism in the country. There is immense potential for tourism and hotel industry in the Northern Province. Over 500 people visit Jaffna daily from various parts of the country with the dawn of peace. With the opening of the A-9 road for the public, the number of tourists visiting Jaffna has increased rapidly. The entire North is blessed with natural beauty, a source for tourist attraction.

Sri Lanka Tourism plans to develop tourist locations in the peninsula on a massive tourist project designed to the North. The climate of Jaffna is very good for the tourism industry. Climate of Jaffna is dry and tropical as it lies within ten degrees of the equator. Humidity in the air and land-sea breezes makes the temperature conditions more equable on the sea board. The weather conditions in Jaffna are marked by extremes temperatures as it falls in the Dry Zone. The highest temperatures are recorded during the months of April - May and August - September, when the sun is directly overhead. December - January are the coolest period. Many tourists are coming in these periods. Jaffna is home to beautiful Hindu temples. There are Buddhist temples in Jaffna but most were destroyed by the civil war. The Old Dutch Fort still stands well preserved within is an old Church. Another illustration of Dutch architecture is the King's House. No visit to Jaffna is complete without tasting the delicious Jaffna mango, reputed for its sweetness. About 3 kms away is the majestic Nallur Kandaswamy Temple, home to the largest religious Festival in Jaffna.

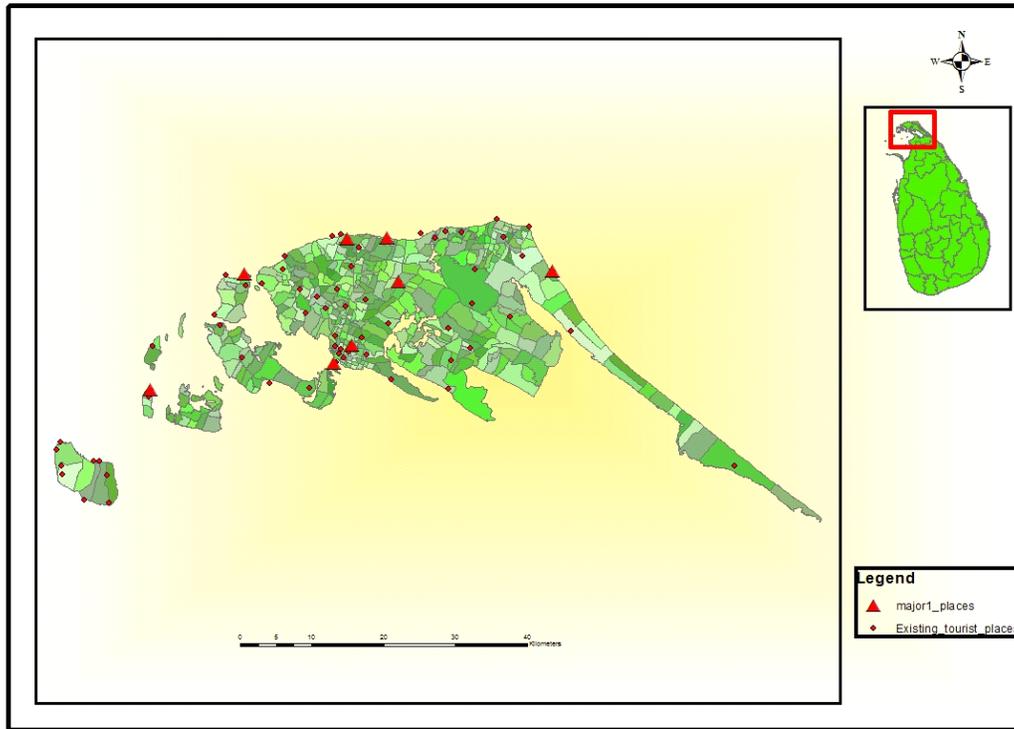


Figure 5.1. Tourist Destination in Jaffna Peninsula

Source: by author

The above figure (5.1) has shown that distribution of existing tourist places in Jaffna district. Seven major places were selected through the field survey and expert discussion for the study. There are Nallur, Nillawarai well, Manatkadu beach, Casurina beach, Thalsawena resort, Nainathivu, and Mathagal beach. Within the Jaffna district which area has more suitable criteria together. that will be suitable area for tourism development. Figure.5.1 has shown in the Major Tourist Places in the Jaffna district given below.

According to the above places figure (5.2), Jaffna district is a semi-urban area which includes Jaffna city, the capital of northern Sri Lanka. This area is becoming important as a potential center for population growth and economic development for the north region of Sri Lanka.



Figure 5.2. The Major Tourist Places in Jaffna Peninsula.

### 5.2 Existing ecological and anthropogenic resources in the

This study identifies the following factors as indicators of suitability within the land systems of Jaffna District landscape/naturalness, wildlife, topography, accessibility and community characteristics. The evaluation for tourism sites was conducted based on the seven chosen criteria namely: accommodation, recreational places, infrastructures, commercial areas, proximity to existing tourist sites, distance from roads, beach and more space. The factors and criteria set up were chosen according to experience, experts' opinions and information from various sources. Knowledge acquisition has been accomplished through discussions with experts of related fields of study, surveying of authenticated literatures and analysis of historical data. Proximity to cultural sites factor was classified by Euclidean analysis according to the nearby cultural sites. Distance from roads factor depends on the transport condition by access types and distance from the road types.

The related factors and criteria as seen in figure 5.3 were created and kept as GIS layers. Land used/cover factor was classified and reclassified from 2007 land use map according to bio-physical, cultural characteristics of tourism potential resources. In this study, accommodation, existing tourist places, roads, infrastructures area (shops, tailoring, police stations etc.) accommodations, commercial areas (banks) and recreational areas (parks, library, cinema), are ranked more suitable, suitable, moderate, and low.

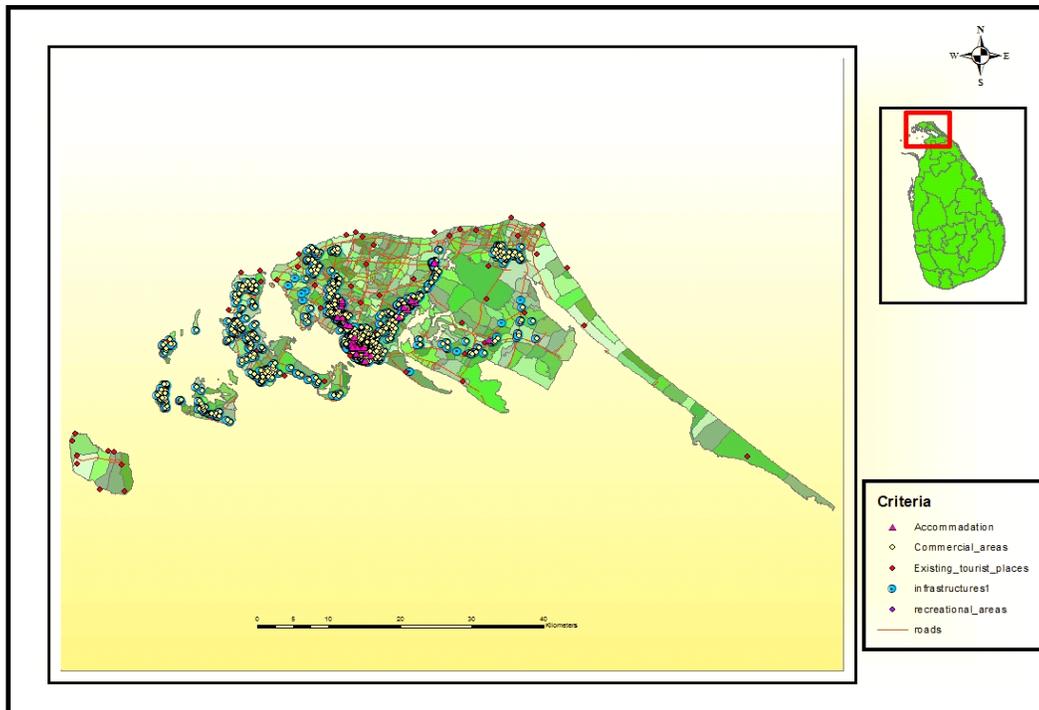


Figure 5.3. Factors and criteria in land suitability analysis for Tourism Development  
Source: by author

### 5.2.1 Existing Tourist Place

This site has potential to grow into major tourist center provide with good infrastructure, thus it has a high rank (Figure 5.4). Existing heritage and cultural centers are important tourist attraction. They could be ancient cultural relic site or architectural remains. They hold value for tourist as they are an interesting object. Tourists are fascinated to see and learn information about new and unique cultural heritage. Such sites are favorable for tourism development so, very important factor is to these sites.

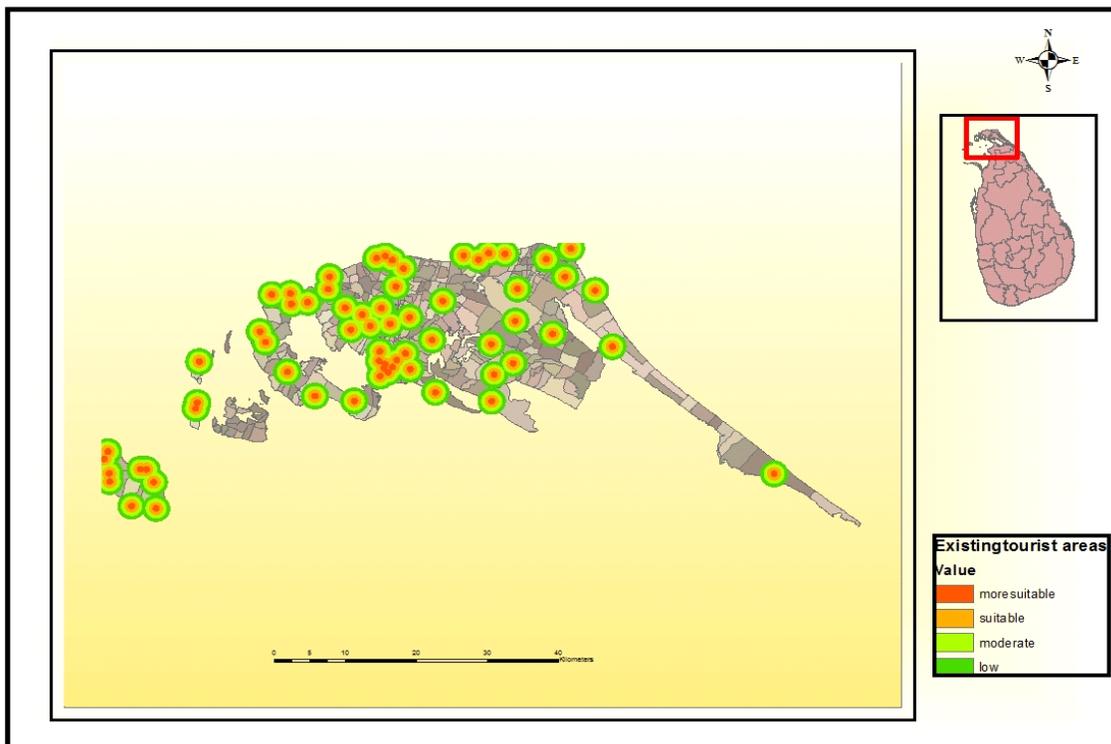


Figure 5.4. Spatial patterns of existing tourist areas in Jaffna peninsula

Source: by author

Figure 5.4 shows the spatial distribution of Existing Tourist Spots. Thus, Pannai Beach, Nallur areas are found to be with high spatial distribution and Manatkadu, Casuarina Beach, Mathagal Beach areas with low special distribution. When considering the importance of Existing Tourist Spots in Tourism Development, as such lot of places are close by, it will be easier to attract tourists.

### 5.2.2 Commercial Areas

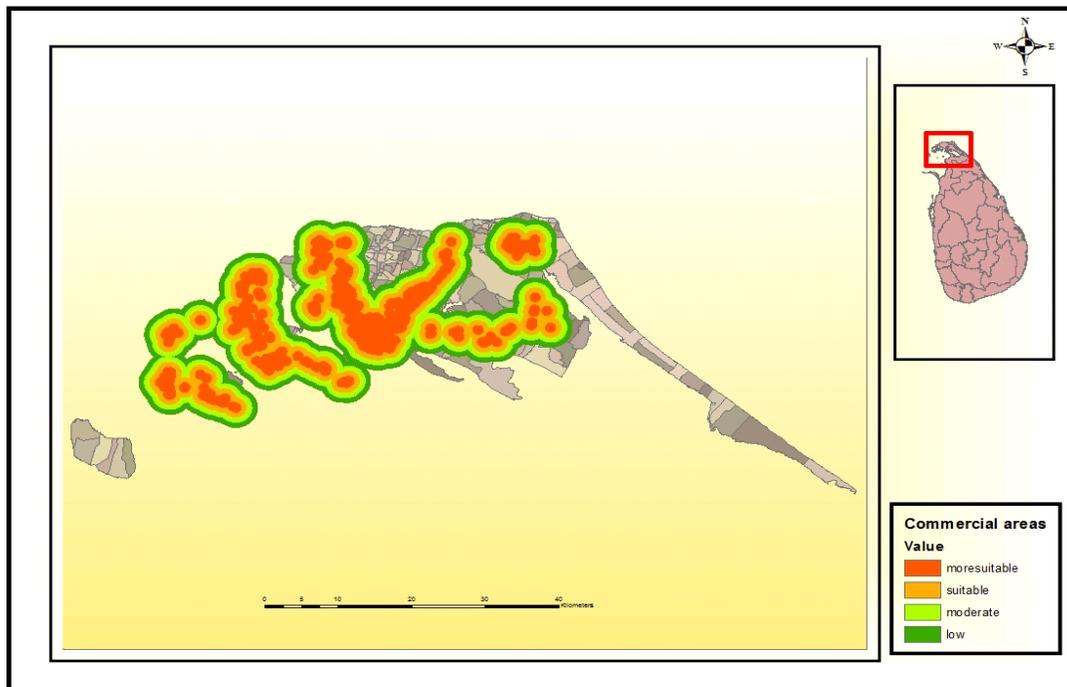


Figure 5.5. Commercial areas in Jaffna peninsula

Source: by author

Urban center have already developed infrastructures and services which are required for setting up tourism sector. It can be further enhanced by creating few recreational areas to attract tourist. The distribution of Commercial Areas shown in Figure 5.5 holds a great

Importance in determining the tourist spots and developing them. Thus, viewing through figure 5.5, Pannai, Nallur, Nilavarai and Nainatheevu are respectively with lot of commercial places and Manatkadu, Naguleswaram and Thalsevana with less distribution of commercial spots.

### 5.2.3 Recreational area

This includes already existing facilities which acts as a catalyst for tourism development and expansion. It includes basic facilities like accommodation (cinema theatres, resorts and parks), tour and travel services, recreational spot and other tourist attraction which will pull more tourists into the area. Area wise distribution of the recreational areas is shown in Figure 5.6. In this, the distribution of places such as Parks, Cinemas Stadiums is shown. Viewing in this way, the importance of the distribution of these is found to be an important factor encouraging the developing Tourist areas. Hence, it could be seen that there are more recreational areas near places such as Pannai and Nallur.

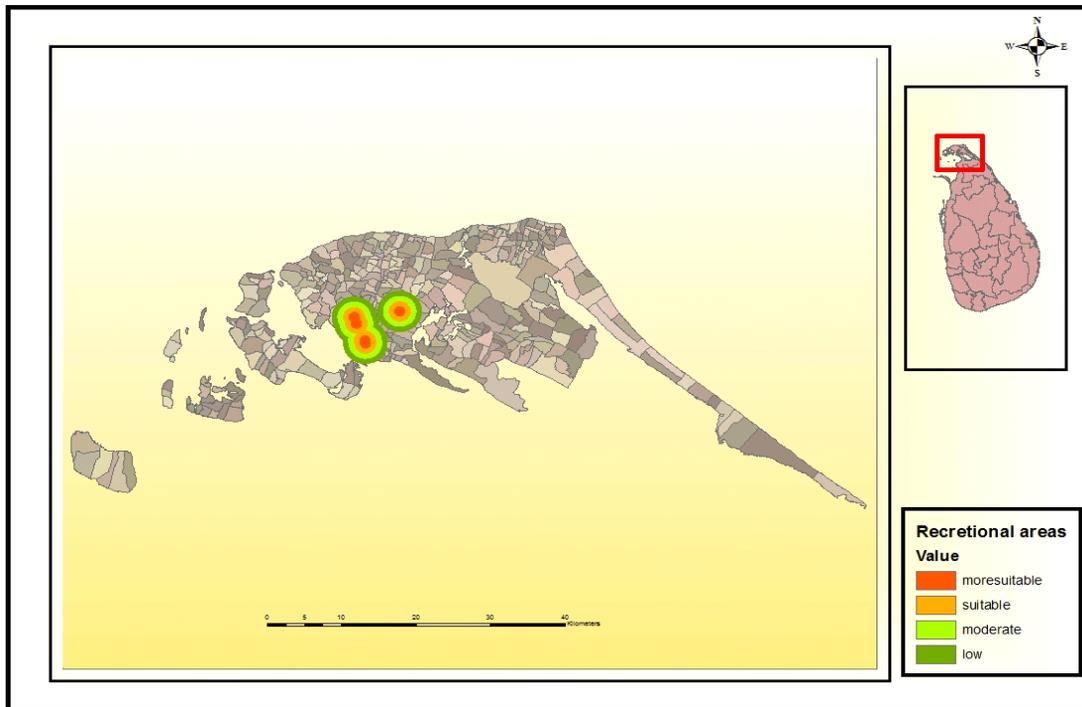


Figure 5.6 Spatial patterns of recreational areas in Jaffna district  
Source: by author

#### 5.2.4 Road

Road network connects from major tourist transit to the interior parts of the region. It provides facility for easy and faster movement. Road is the basic prerequisite is to tourism. This is only possible by travelling from one place to another through road, rail, and air. Three means of transports are use for measuring tourism suitability here. Figure 5.7 Shows the Spatial distribution of Roads. When viewing through this Figure Pannai and Nallur areas are found to be, with roads longer than 2,000 meters. other places are with less than 200 Kms. roads (within 2,000 Ms.)

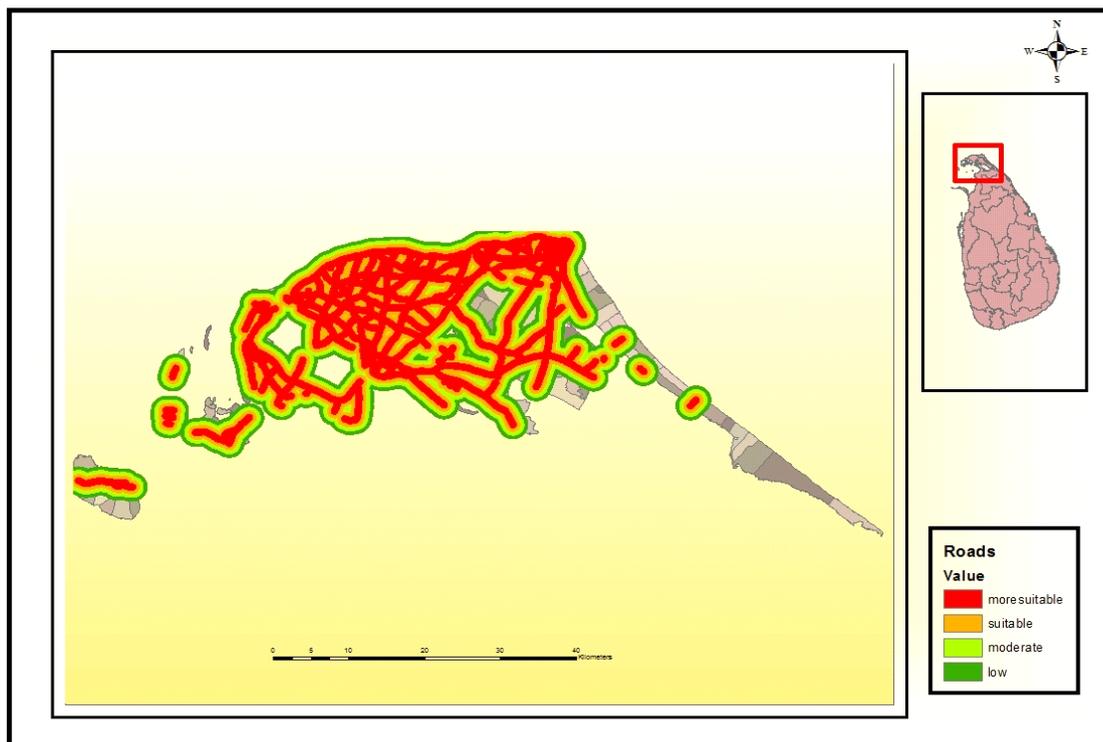


Figure 5.7. Spatial patterns of roads in Jaffna district  
Source: by author

### 5.2.5 Infrastructure Facilities

Tourism infrastructure can be regarded as the physical elements that are designed and erected to cater for visitors. Tourism infrastructure includes ancillary and complementary facilities, equipment, systems, processes, and resources necessary for the functioning of every tourist destination. This primarily includes roads, railways, airports, and the like, which make a tourist destination accessible for tourists. In addition, infrastructure includes health care systems, services, and public services. Building on infrastructure, superstructure includes building facilities, which exist only because of tourism activities. Their main purpose is accommodation and meeting the needs and desires of tourists, in the form of hotels, campsites, restaurants, sports facilities, and the like (Popescu, 2011). The spatial pattern of the Infra structure facilities is shown in Figure 5.8. When observing through this, Manatkadu, Naguleswaram and Thalsevana are found to be without Infra structure facilities within 3,000 meters

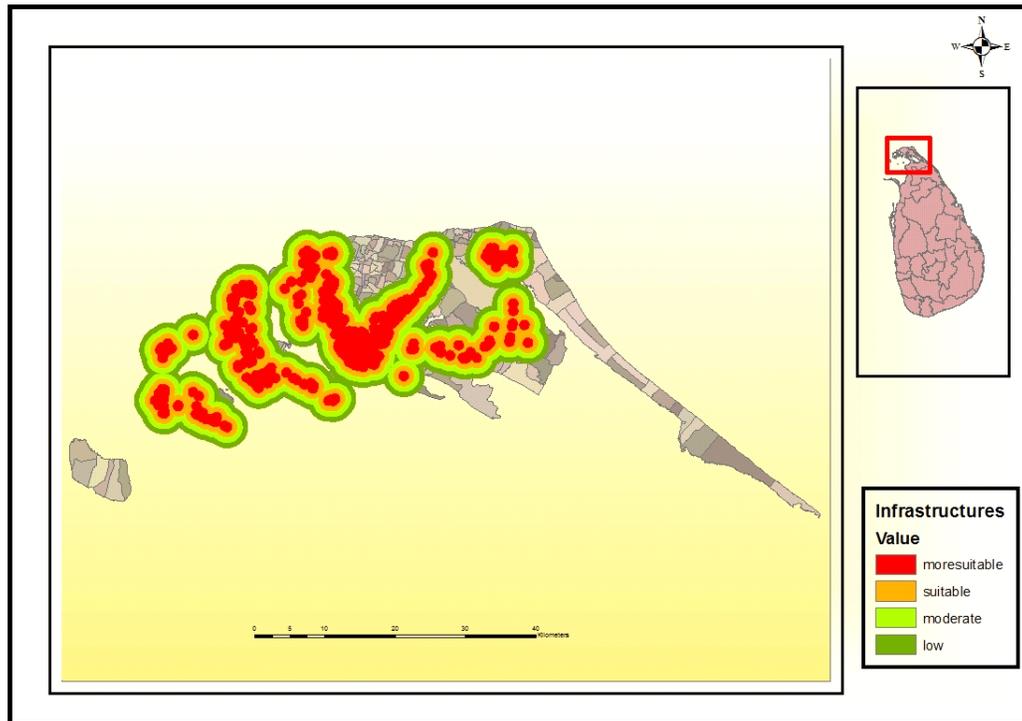


Figure 5.8. Spatial patterns of Infrastructures in Jaffna District  
Source: by author

### 5.2.6 Accommodations

People like to spend good times with family and friend while at the same time exploring various tourist places across the globe. As result the tourism industry across the globe has seen an unprecedented growth which in turn has also resulted in tremendous growth in the hotel and accommodation facilities. Comfortable hotels and accommodation facilities play a very important role in popularizing any tourist destination. If a person, who is quite far away from home, gets to enjoy the sea facilities and comforts as he enjoys at his home, then he is bound to become attached to the place. So accommodation facilities were taken as one of the criteria for this tourism development in Jaffna peninsula.

The figure 5.9 has shown in the spatial patterns of accommodation in the Jaffna peninsula. So accommodation facilities were taken as one of the criteria for this tourism development in Jaffna peninsula. Figure 5.9 shows the spatial pattern of Accommodations. Here, the Accommodations are found to be the very encouraging factor in developing a Tourist spot. When examining Figure 5.9, it could be observed that Pannai and Nilavarai are found to be areas with accommodation facilities and others are found to be areas without accommodations within 3,000 Meters.

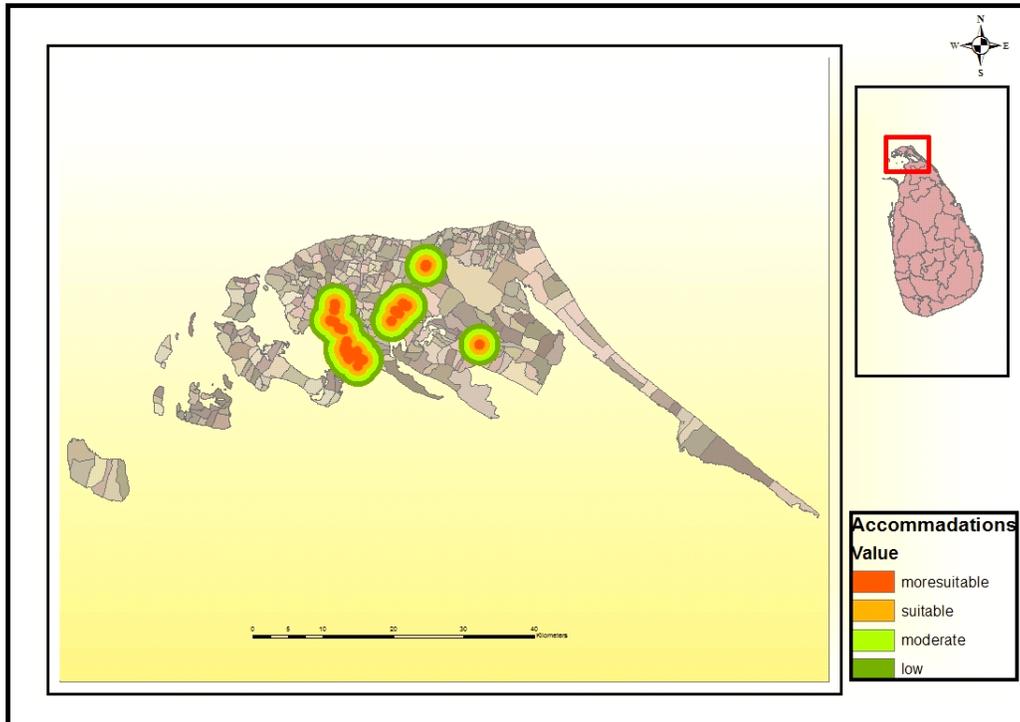


Figure 5.9. Spatial patterns of accommodations in Jaffna district  
Source: by author

#### 5.2.7 Outcome of Suitability Map for Tourism Development

The final suitability map (Figure – 5.10) has been displayed in a gradation of red to green. The red patches represent the most suitable locations for tourism development while the green patches denote the least. The most suitable areas are the ones which have got an aggregate score close to four. Open spaces can be developed into tourist area with the condition that it is proximity to existing tourist hub.



Figure 5.10. Suitability area for tourism development in Jaffna district

Source: by author

The above figure- 5.10 has shown suitability area for tourism development in the Jaffna district among the eight study places (existing tourist places). Regarding this research seven criteria were taken to find the suitability area. There are accommodations, infrastructures, roads, commercial areas, recreational area existing tourist places and beach site, space preferred.

Different rates for the classes under each parameter and weights for the parameters were assigned simultaneously to take final decisions on suitable rates and weights, which produced better results. The pair wise comparisons of all the parameters were taken as the inputs while the relative weights and rates of the parameters and sub classes for the outputs.

Table 5.1. Weighted overlay method for Suitability by using GIS

Criteria	% influence	Field	Scale value
Roads	25%	value	
		1	4
		2	3
		3	2
		4	1
Accommodations	20%	value	
		1	4
		2	3
		3	2
		4	1
Existing tourist places	20%	value	
		1	4
		2	3
		3	2
		4	1
Infrastructure areas	15%	value	
		1	4
		2	3
		3	2
		4	1
Recreational areas	15%	value	
		1	4
		2	3
		3	2
		4	1
Commercial areas	5%	value	
		1	4
		2	3
		3	2
		4	1

Source: by author

The Above Table 5.1 shows about weighted overlay. Here, road influenced by 25% out of 100% among six criteria's. It is the high value. Because road is the very important access to define the potential than others. Through this table second influenced criteria are Existing tourist places and accommodations. These are influenced by 20% out of 100%. Then infrastructures and recreational areas are influenced by 15% Out of 100%. Finally, commercial areas are influenced by 5%. It is the least value than others. These values obtained from tourist experts with discussion through field survey. Confides, identified the potential for tourism in Jaffna district by GIS suitability model. There are pannai beach and Nallur (figure 5.10).though the last criteria which is not influence in GIS that is influenced pannai

beach for potential tourism as it has beach with more than 1000skm space. So pannai is very suitable for tourism potential in Jaffna peninsula to development and get more income with sustainable.

This study identifies the following factors as indicators of suitability for tourism potential in Jaffna Peninsula. The evaluation for Tourism sites was conducted based on the seven chosen criteria namely: Road, accommodation, Existing tourist places, infrastructures, commercial, recreational, space and beach. (Table 5.2) The factors and criteria set up were chosen according to experience, experts' opinions and information from various sources. Knowledge acquisition has been accomplished through discussions with experts of related fields of study, surveying of authenticated literatures and analysis of historical data.

Table 5.2 Factors and Criteria for potential tourism

			More suitable	Suitable	Moderate	Low
Road	<2000	m	0-500	500-1000	1000-1500	1500-2000
Existing tourist Places	<2000	m	0-500	500-1000	1000-1500	1500-2000
Accommodation	<3000	m	0-750	750-1500	1500-2250	2250-3000
Infrastructures	Factors with priority order.	Criteria	Unit	Factor Suitability Rating	1500-2250	2250-3000
Recreational	<3000	m	0-750	750-1500	1500-2250	2250-3000
Commercial	<3000	m	0-750	750-1500	1500-2250	2250-3000
Space	>1000	Sq.km	More than			
beach	Preferred within 2km					

Source: by author

The tourist place need to be accessible to people if it is not fairly accessible, there will be low patronage (Ouiambo, 2001). Closeness to recreation sites infrastructures and Existing tourist places enhances the tourism potential.3000m is recommended so that other activities at the recreation sites may attract tourists (Meija,et al.2000).commercial area recommended that the tourist area is within 3km .because tourist needs to commercial activities often. Streams are very important tourist attraction .so it is recommended that the tourist site preferred to be at a walking distance.

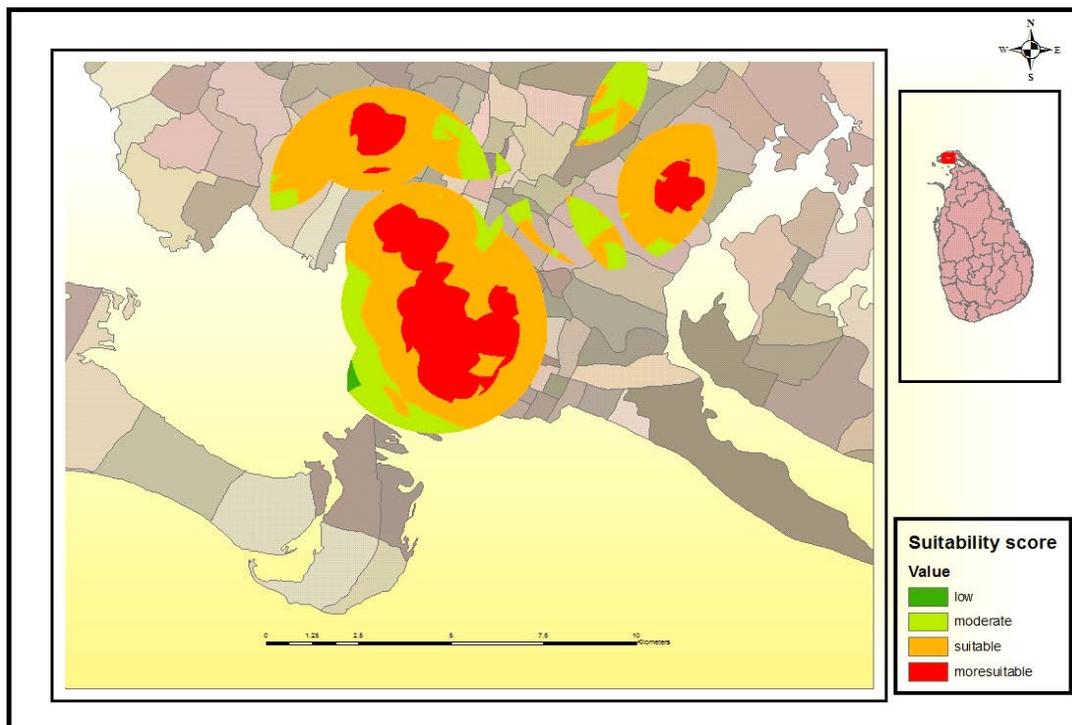


Figure 5.11. Suitability areas for tourism development

Source: by author

The above figure 5.11 has shown in the more suitability areas are pannai beach and Nallur temple. Though, pannai beach area needs to develop than Nallur temple in the Jaffna district. Because, Pannai beach has more space with stream. so, it is very possible to develop the tourist attraction and it is much closer to Jaffna fort and public library and Regarding this research it has more suitable criteria than other existing places and there are many tourists come in the current situation. In addition, Jaffna has no recreational area with streams like pannai. So that pannai beach must to develop with more facilities.

The setting up of hotels and restaurants will increase income and business opportunities for the self-employed, small and medium enterprises and farmers. It is important to enrich the tourism industry will directly and indirectly help many other economic activities to achieve a higher growth rate. The key potential areas are identified for tourism industry.

## VI. CONCLUSION

Suitability area for Tourism Development has shown in Figure 5.11. As per this the Pannai area and Nallur temple are found to be with more suitable. though based on the last criteria pannai beach is more suitable than nallur and other area for tourist development in the Jaffna District. The absence of existing tourist spots is a setback. This area could be seen in Figure 5.11.

The pannai beach is located in the Jaffna town area and next to the fort. The fort was built by the Dutch. Jaffna pannai-kayts road is next to kannadai and is located in Northern Province, Sri Lanka. Jaffna pannai- kayts road has a length of 15.81kms. The pannai beach is identified the tourist place with fort as it is closed to the fort area.

On the basis of the criteria adopted for this study, areas such as, Casuarina Beach, Naguleswaram, Manalkadu, Nilawarai well, Thal Sevana, and Nainatheevu are found to be with unsuitable areas to develop tourism because they are already famous in tourism and no need to develop than Pannai area. Pannai beach is already in existence and found to be having the said criteria; it could be identified as an area with likelihood for further development. Thus, as it is found to contain accommodations, road facilities, existing places, recreational areas and commercial areas, it is found to be an appropriate place to attract tourists, with likelihood for further development. Other areas do not satisfy the criteria adhered, and as the cost to develop them will be very high, they are found to be areas with less likelihood for development.

The result of the overlay and select by theme analysis shows the possible area of locating tourist sites in the Jaffna district based on the selection criteria. Tourism is a highly complex activity, and thus requires tools that aid in effective decision making to come to terms with the competing economic, social, and environmental demands of sustainable development. Applications of GIS in tourism and recreation planning illustrate that GIS is a strong and effective tool that can aid in tourism planning and decision-making (*Pareta, 2010*)<sup>14</sup>. The power of GIS lies not only in the ability to visualize spatial relationships, but also beyond the space to a holistic view of the world with its many interconnected components and complex relationships. The most suitable tourism site is identified according to the analysis are within the Jaffna district. There are urban centres with possibility to grow into tourism centres. The remaining places are low suitability scale due to lack of chosen criteria.

Accessibility is a prerequisite for tourism development. Good road network connectivity with proximity to railways station or airport showed strong tourist potential site, this coupled with nearness to scenic beauty depict a high suitability. Major tourist attraction such as heritage site, coastal beaches and water bodies or lake showed strong red color depicting high suitability. This can be correlated to the fact that heritage sites and other high ranking features are translated into suitable tourism site.

Hence, the tourism zones that can be identified for tourism site are (in order of hierarchy based on the proportion of suitable areas in that zone) Panay beach is identified as the most suitable site for tourism development. It has maximum red patches which are translated from the existing characteristic such as proximity to Jaffna town, good transport network and existing two popular heritage site located within the town. There are Jaffna public library and Jaffna fort. It is located along kayts road that is used to go Nainathivu nagapoosani Amman temple and naga viharai. so that many people used in the road. These are Supports tourism expansion for future. It can draw advantage from the fact that it is close to the coast and accelerate tourism activities from the town to other surrounding areas.

Coastal stretches are very attractive site for tourism development. Beach recreation and water based activities can be developed in these sites. To ensure environmental sustainability low development strategies are to be adopted. In addition pannai beach have more suitability criteria, but it need to more facilities to develop as it is beach site. Such as parking facility, boating, growing attractive trees, developing the jogging areas, establishing the cultural sites for example Palmyra products and increasing the fishing activities to attract the tourism development.

## VII. RECOMMENDATIONS

As demonstrated by figure 5.11, Pannai Beach is found to be appropriate for Tourism related development. It is also found to be satisfying the criteria adhered for this study. As there is a beach in existence, it is found to be with likelihood for development. This had been identified as an important Tourist centre as, the Public library, stadium, Subramanium Park, Jetwing hotel, Cargils Square and the Dutch fort located in close proximity to it. The location of it on the route to Nainatheevu, the largest pilgrimage location in Jaffna is a special future.

When we consider probable development activities that could be undertaken at Pannai through extension of Boating, jogging area, trapping fish with nets, dog training, habitat improvement, Parking facilities and arrangement of shopping complex which sell articles

made from Palmyra leaves, which will represent tradition of Jaffna, the Tourism sector could be developed and it will an opportunity to reap high earnings.

The setting up of hotels and restaurants will increase income and business opportunities for the self-employed, small and medium enterprises and farmers. It is important to enrich the tourism industry will directly and indirectly help many other economic activities to achieve a higher growth rate. The key potential areas are identified for tourism industry.

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# Analysis of Tree Based Supervised Learning Algorithms on Medical Data

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**Abstract-** Classification is one of the major tasks in data mining and has also been studied extensively in statistics, machine learning, expert systems, and different application areas on different domains over decades. Decision tree is one of the popular and practical classification approaches in data mining. It is also widely used in several research areas. Tree growing methods used to construct the decision tree may vary the performance of this classifier. Tree based classification algorithms are separated based on their attribute selection measure method. Therefore, this paper presents the comparative analysis of different tree based algorithms such as CART, ID3, J48, Random Tree and PART. Macro average accuracy, precision, recall, and F-measure are used for performance comparisons of these algorithms by using WEKA tool.

Keywords: CART, ID3, PART, Random Tree, C4.5

## I. INTRODUCTION

The tendency in recent decades to computerize the process of disease treatment ensures a more rapid accumulation of medical information. Information technologies are actively used in the sector of healthcare. National electronic health records systems and medical imaging archives are implemented all over the world. Health care institutions implement and deploy hospital information systems (HIS), radiological picture reviewing and archiving systems (PACS), laboratory information systems (LIS), and others. Compared to other science and engineering disciplines, data mining (DM) is in its infancy. Over the past decade, the application of DM in biomedicine has also been actively investigated. Data mining is mainly used for the specific set of six activities namely Classification, Estimation, Prediction, Affinity grouping or Association rules, Clustering, Description and Visualization. The first three tasks- classification, estimation and prediction are all examples of the directed data mining or supervised learning [11]. Classification is one of the fundamental tasks in data mining and has also been studied extensively in statistics, machine learning and expert systems over decades. It has been successfully applied to a wide range of application areas, such as scientific experiments, medical diagnosis, weather prediction, credit approval, customer segmentation, target marketing and fraud detection. The input for classification is a set of training records (training instances), where each record has several attributes. Attributes with discrete domains are referred to as categorical, while those with continuous domains are referred to as numerical. There is one distinguished attribute called the class label. In general, given a database of records, each with a class label, a classifier generates a concise meaningful description for each class in terms of the attributes. The model is then used to predict class labels of unknown objects.

Decision Tree (DT) is a popular supervised classification scheme that generates a tree and a set of rules from a given training data set, representing models of different classes. It is widely used in different research fields. DT is a flow chart like tree structure in which each internal node represents a test of attributes, each branch represents the result of a test, and a leaf node represents a class label of class distribution. The topmost node on the tree is the root node. By traversing each leaf of the tree starting from the node, it can easily derive rules corresponding to the tree. It can be noted that many different leaves of a tree can refer to the same category label, but each leaf refers to a different rule. Decision tree classifiers are widely used in the diagnosis of breast tumors such as ultrasound images, ovarian cancer and heart sound diagnosis. These classifiers play a vital role in the field of medical diagnostics to diagnose patient problems. In this system, the decision tree algorithm is implemented on a health related data set [3][4]. Several research have been developed the decision tree classifiers using various tree growing or node selection methods for tree construction process. The well-known decision tree classifiers are Iterative Dichotomiser3 (ID3), C4.5, and Classification and Regression Tree (CART). In this study, six medical datasets obtained from the UCI machine learning database are applied to analyze the performance of tree growing methods in decision tree classifier.

## II. RELATED WORK

Data Mining is the computational process of discovering patterns in large datasets involving methods at the intersection of artificial intelligence, machine learning, statistics and expert systems. Decision Tree is the one of the most popular data mining algorithms. It was developed as a supervised machine learning algorithm known as ID3 (Iterative Dichotomiser ) decision tree by

J.Ross Quilan during 1980s. The expansion of this algorithm as concept learning systems was described by Hunt et al. A successor of ID3 (C4.5) was presented by J. R. Quinlan. It can support both nominal and numerical attributes to build a decision tree. In 1984, a group of machine learning researchers presented Classification and Regression Tree (CART) in 1984 [6]. They described the generation of binary decision trees. ID3 and CART were invented independently of one another at around the same time. However these algorithms follow a similar approach for learning decision trees from training tuples. ID3, C4.5 and CART are constructed in a top-down recursive divide-and-conquer manner. Most algorithms for decision tree induction also follow such a top-down approach, which starts with a training set of tuples and their associated class labels. The training set is recursively partitioned into smaller subsets as the tree is being built [8]. Roy et al. proposed the correlation ratio based decision tree model (CRDT) based on healthcare datasets. They compared the results of CRDT model with ID3 model and described that CRDT model outperformed the ID3 model [14].

### III. METHODOLOGY

A decision tree method is powerful for classification and prediction. It is used for facilitate the decision making process in sequential decision problems. It is a graphical model which is used to describe decisions and their outcomes those are possible. A decision tree classifies various items of data by applying a series of questions those are all about the features associated with data items [8]. Every node of the decision tree contains a question and every internal node for every possible answer of its question point to one child node. Every time it receives an answer, a follow-up question is asked until it gets the conclusion about the record's class label. Decision tree is a hierarchical structure which contains nodes and directed edges. Every decision tree algorithm has its advantages and disadvantages. Therefore, it is difficult to find out that which algorithm is best among the algorithms. To construct a decision tree, these algorithms use a greedy strategy, in which they make series of locally optimum decisions. These decisions are about the selection of the attribute that can be used for partitioning the data. The various decision tree approaches are classification tree, regression tree and survival tree. ID3, C4.5 and CART are constructed in a top-down recursive divide-and-conquer manner. Most algorithms for decision tree induction also follow such a top-down approach, which starts with a training set of tuples and their associated class labels. The training set is recursively partitioned into smaller subsets as the tree is being built [5]. The system flow of the proposed methodology is described in Figure 1.

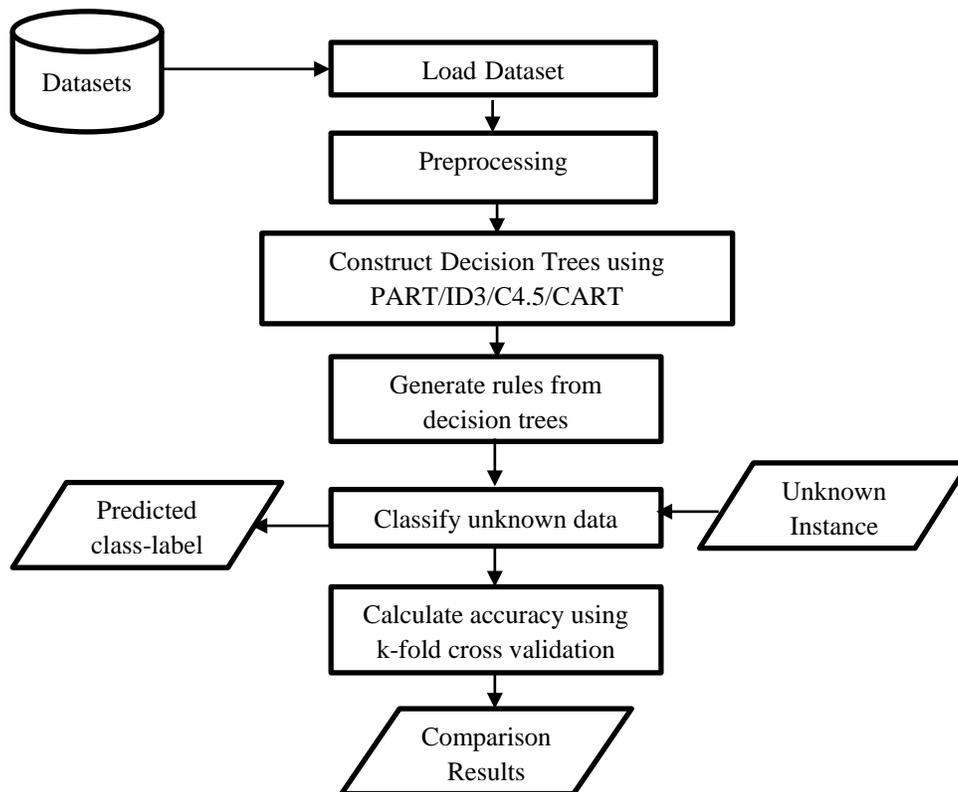


Figure 1 Architecture of the System

Firstly, load data from the database and then discretize the data by using equal width binning method. Secondly, the preprocessed data are classified by tree based classifiers such as Classification and Regression Tree (CART), Random Tree (RT), PART, Iterative Dichotomiser (ID3) and C4.5. And then generate rules from decision trees. According to the generated decision rules, classify new input and display the classified result. Then, the accuracy of the classifier is measured with k-fold cross validation. For k-fold cross validation, accept k-value from the user and splits the dataset into  $k^{\text{th}}$  sets. Each set into  $k^{\text{th}}$  sets is used as testing data while the rest are

for training until the  $k^{\text{th}}$  loop classification process is finished. It records all the correct and incorrect classification results in each loop and computes the classification accuracy. And then, display the accuracy result. The best classifier is known by comparing the accuracy results of these classifiers.

### A. ID3 Algorithm

ID3 uses Information Gain as its attribute selection measure. Information Gain is a measuring the expected reduction in Entropy. To minimize the decision tree depth, it is needed to select the optimal attribute for splitting the tree node. The attribute with the highest Information Gain is chosen as the splitting attribute ID3 Algorithm for node.

$$Gain(S, A) = Entropy(S) - \sum_{v \in Values(A)} \frac{|S_v|}{|S|} Entropy(S_v)$$

Where Values (A) is the set of all possible values for attribute A, and  $S_v$  is the subset of S for which attribute A has value v (i.e.,  $S_v = \{s \in S | A(s) = v\}$ ). Information Gain can be used to rank attributes and to build decision trees where at each node is located the attribute with greatest gain among the attributes not yet considered in the path from the root. ID3 is harder to use on continuous data. If the values of any given attribute are continuous, then there are many more places to split the data on this attribute, and searching for the best value to split by can be time consuming [16].

### B. C4.5 Algorithm

This algorithm is an extension to ID3 developed by Quinlan Ross [6, 10, 17]. It is also based on Hunt's algorithm. C4.5 handles both categorical and continuous attributes to build a decision tree. In order to handle continuous attributes, C4.5 splits the attribute values into two partitions based on the selected threshold such that all the values above the threshold as one child and the remaining as another child. It also handles missing attribute values. C4.5 uses Gain Ratio as an attribute selection measure to build a decision tree. It removes the biasness of Information Gain when there are many outcome values of an attribute [3]. It applies a kind of normalization to Information Gain using a "split information" value.

The information-gain criterion unfortunately has a serious deficiency in that there is a strong bias in favour of tests with a lot of outcomes. A remedy comes in the form of a proper normalization. In analogy with the definition of the entropy of a set, an additional parameter is introduced for each test x that splits a given set T into subsets.

Where SplitInfo is:

$$SplitInfo(A, S) = - \sum_{j=1}^v \frac{|S_j|}{|S|} * \log_2 \frac{|S_j|}{|S|}$$

This represents the potential information generated by dividing set S into n subsets  $S_j$ . Now, Gain ratio, is defined as follows:

$$GainRatio(A, S) = \frac{Gain(A, S)}{SplitInfo(A, S)}$$

This new gain measure expresses the proportion of information generated by the split that appears useful in classification. The gain-ratio criterion selects a test that maximizes this ratio. This criterion is robust and typically gives a consistently better choice of a test than the previous

### C. CART Algorithm

CART is a classification and regression tree algorithm [8]. Like C4.5, it can be seen as classification tree but it can be applied on regression problems with numerical response variables. It uses a generalization of the binomial variance called the Gini index. It first grows an overly large tree and then prunes it to a smaller size to minimize an estimate of the misclassification error. The selection of which input variable to use and the specific split or cut-point is chosen using a greedy algorithm to minimize a cost function. Tree construction ends using a predefined stopping criterion, such as a minimum number of training instances assigned to each leaf node of the tree. For classification the Gini index function is used which provides an indication of how "pure" the leaf nodes are (how mixed the training data assigned to each node is).

$$Gini = \sum(pk * (1 - pk))$$

Where G is the Gini index over all classes,  $p_k$  are the proportion of training instances with class k in the rectangle of interest. For a binary classification problem, this can be re-written as:

$$Gini = 2 * p1 * p2$$

The Gini index calculation for each node is weighted by the total number of instances in the parent node. The Gini score for a chosen split point in a binary classification problem is therefore calculated as follows:

$$Gini = ((1 - (g1_1^2 + g1_2^2)) * (ng1/n)) + ((1 - (g2_1^2 + g2_2^2)) * (ng2/n))$$

Where G is the Gini index for the split point,  $g1_1$  is the proportion of instances in group 1 for class 1,  $g1_2$  for class 2,  $g2_1$  for group 2 and class 1,  $g2_2$  group 2 class 2,  $ng1$  and  $ng2$  are the total number of instances in group 1 and 2 and n are the total number of instances that are tried to group from the parent node.

*D. PART Algorithm*

PART is a rule based learner. It combines the divide and conquers strategy with separate and conquers strategy of rule based learning. This algorithm produces sets of rules called decision lists “which are planned set of rules”. A new test data is compared to each rule in the list and the data item is assigned the class value of the first matching rule. PART builds a partial C4.5 decision tree in each iteration step and makes the “best” leaf to create a rule [3].

*E. Random Tree*

Random Tree is a supervised machine learning classifier. It is an ensemble learning algorithm like Bagging and Random Forest [7]. It also generates lots of individual learners. It applies the idea of bagging algorithm to construct a random set of data as a decision tree. In general, every node in the tree is split using the best split based on all features variables. Random Tree classifier can deal with both classification and regression applications. It behaves like a forest with a set of trees. In classification, each tree in the forest classifies the input examples. And it provides the output class label for examples based on the majority votes of label from the results of each trees like Random Forest. For regression analysis, Random Tree classifier produces its prediction for response variable based on the average of the results of each trees in the forest.

In Random Trees, each decision trees with every single leaf holds a linear model which is optimized for the local subspace by this leaf. Tree diversity is created by two ways of randomization to improve the performance of each decision trees. First the training data is sampled with replacement for each tree like in Bagging. Secondly, when growing a tree, the best split is computed on a random subset of all attributes which is done at every node. Random trees uses this produce for split selection and thus induce reasonably balanced trees where one global setting for the ridge value works across all leaves, thus simplifying the optimization procedure. [1][2][12][13][15].

IV. EXPERIMENT SETTING

This work used Weka data mining tool to conduct the experiment. We compared the classification performance of the tree based models such as ID3, C 4.5, CART, PART and Random Tree. In this paper, we applied six different medical datasets for analysis of various decision tree algorithms. The detailed description of datasets is shown in Table 1. These datasets are obtained from UCI machine learning repository. We applied 10-fold cross validation as the test mode to record classification accuracy. This approach is suitable to avoid biased results and provide robustness to the classification. Also, the parameters of a classification algorithm are chosen to their default values.

Table1. Information of Six Medical Datasets

Dataset	Number of Instances	Number of Attributes	Number of Classes
Indian Liver Patients Dataset	583	11	2
Mammography Masses Dataset	961	6	2
Pima Indian Diabetes Dataset	768	9	2
Breast Cancer Dataset	699	11	2
Hepatitis Dataset	155	20	2
Diabetic Retinopathy	1151	20	2

The experimental results of the different methods based on Macro Average Precision (F), Recall (R) and F-measure (F). Table-2 summarizes the classification accuracy in percentage of all the classifiers across the datasets.

Table2. Classification Performance of Tree Based Algorithms

Dataset	Random Tree			CART			C4.5			PART			ID3		
	P	R	F	P	R	F	P	R	F	P	R	F	P	R	F
Indian Liver Patients	0.89	0.68	0.75	0.68	0.61	0.69	0.93	0.93	0.93	<b>0.96</b>	<b>0.96</b>	<b>0.96</b>	0.93	0.93	0.93
Mammography Masses	0.79	0.79	0.79	<b>0.85</b>	<b>0.85</b>	<b>0.85</b>	<b>0.83</b>	<b>0.83</b>	<b>0.83</b>	<b>0.83</b>	<b>0.83</b>	<b>0.83</b>	0.82	0.82	0.82
Pima Indian Diabetes	0.70	0.70	0.70	0.74	0.74	0.74	0.87	0.87	0.87	<b>0.89</b>	<b>0.89</b>	<b>0.89</b>	0.69	0.69	0.69
Breast Cancer	0.94	0.94	0.94	0.94	0.94	0.94	0.95	0.953	0.95	0.94	0.941	0.94	<b>0.96</b>	<b>0.96</b>	<b>0.96</b>
Hepatitis Dataset	0.79	0.79	0.79	<b>0.81</b>	<b>0.81</b>	0.75	0.78	0.80	<b>0.79</b>	0.77	0.79	0.78	0.8	0.79	0.79
Diabetic Retinopathy	0.61	0.61	0.61	0.65	0.65	0.65	<b>0.67</b>	<b>0.68</b>	<b>0.68</b>	<b>0.68</b>	0.65	0.64	0.61	0.61	0.61

C 4.5 and PART performs better than ID3 and Random Tree on Pima Indian Diabetes dataset. So, when PART outperforms the other three methods in Indian Liver Patients dataset. On the other hand, ID3 perform better than the other methods in Mammography Masses dataset. J48 outperforms the other methods in Breast Cancer and Diabetic Retinopathy datasets. The performance of Random tree is pretty enough in different datasets but it always lower than the other three methods.

## V. CONCLUSION

This system focused on the comparison of five different tree based classification algorithms on six datasets pertaining to medical domain. The continuous attributes of all datasets are discretized by using equal width binning method. This system also studies the tree growing methods of decision tree classification algorithms such as Gini Index, Information Gain and Gain Ratio based Decision Trees. It compared the classification performance of classifier models on health care data. According to the experimental results, PART can perform slightly better than the C 4.5 methods for three datasets and C 4.5 is better than PART on two datasets. It is found that the classification performance of the classifiers across the dataset is not very uniform. The performance of Random Tree is worst. Based on the results, Gain Ratio is the most useful tree growing method used in decision tree construction and helps the user in order to classify new medical data more exactly.

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# Isolation of Seed borne Pathogens associated with Some Cereal grains in Khartoum State (Sudan)

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**Abstract-** Seed borne fungi present on or inside the seed or as contaminant with the seed debris adversely affect seed viability, germination, emergence, plant growth vigour and eventually production and productivity. In the present study, seed borne fungi of 4 imported cereal seeds (Maize and Wheat) were examined and recovered from the seeds. The seeds were highly contaminated with Four fungal species (*Aspergillus*, *Penicillium*, *Alternaria* and *Rhizopus*) were detected in (Maize and Wheat) In maize *Aspergillus* recorded the highest fungi percent in Filter paper (28.67%) and Agar method (28.33%) Followed by *Penicillium*, *Alternaria* and *Rhizopus* (26.67, 17.33 and 5.33) respectively. The genus *Aspergillus* and *Penicillium* were the most prevalent genera followed by *Alternaria* and *Rhizopus*.

Therefore, there is urgent need for development of proper Standard laboratory seed testing methods, fungal eradication measures, and adopting strong legislations and quarantine regulations. The use of certified and high grade seeds is a priority.

**Index Terms-** wheat, maize, seed pathogens, mycoflora

## I. INTRODUCTION

Cereals can be defined as a grain or edible seed of the grass family Gramineae (Bender & Bender, 1999). Cereals are grown for their highly nutritious edible seeds, which are often referred to as grains. Some cereals have been staple foods both directly for human consumption and indirectly via livestock feed since the beginning of civilization (BNF, 1994). Cereals are the most important sources of food (FAO, 2002), and cereal based foods are a major source of energy, protein, vitamins and minerals for the world population. Generally, cereals are cheap to produce, are easily stored and transported, and do not deteriorate readily if kept dry.

Wheat is a major cereal crop in many parts of the world. It belongs to the *Triticum* family, of which there are many thousands of species (Kent & Evers, 1994). It is grown as both a winter and spring cereal and, owing to the number of species and varieties and their adaptability, it is grown in many countries around the world. The great wheat-producing countries of the world include the USA, China and Russia; extensive wheat growing occurs in India, Pakistan, the European Union (EU), Canada, Argentina and Australia. It is estimated that 556.4 million tons of wheat will have been produced in 2003, accounting for 30% of the world's cereal production (FAO, 2003). Wheat plants are largely susceptible to various pests and diseases (Prescott *et al.* 2006).

The maize kernel (the reproductive seed of the plant) has four main parts – the germ, the endosperm, the pericarp and the tip cap. Production in the USA exceeds that in any other country (Fast & Caldwell 2000). Therefore, the present study aim to detect and identify seed borne fungi associated with seed of cereals grain (via Wheat and Maize).

## II. MATERIALS AND METHODS

### 1. Study location

This study was conducted in the laboratory of plant pathology department of plant protection, college of agricultural studies, Sudan University of science and technology during February –April, 2016. The aim of this study was to detect and identify seed borne fungi associated with seed of cereals grain (Wheat and Maize) collected from three different locations in local market of Khartoum (Al haguysif, Khartoum bahri and Omdurman) stored since season 2015.

### Collections of samples

The cereals seed stocks on shells were obtained from grains market seed stocks in each location (Al haguysif, Khartoum bahri and Omdurman). The maize and wheat, samples were obtained from on random and homogeneous sample of five kilo grams was secured from each of the three locations in the market. The seed samples were drawn according to international standards for seed testing association (ISTA, 1966). Collected samples were labeled and kept separately in sealed paper bag and transferred to the laboratory where they were stored at 5°C refrigerator for further investigations.

All materials except seeds, which used in the experiments, were sterilized using 70% ethyl alcohol. Cotton blue and lacto phenol were used for staining of the fungal cytoplasm and for providing a light blue background, against which the walls of hyphae can readily be seen according to Aneja (2004).

### Detection and isolation of seed borne fungi Dry seed inspection

A sample of 400 seeds of each seed sample were randomly selected and examined under microscope and by magnified lens and naked eye according to the international seed testing association (ISTA) (Rules, 1966). The samples were examined for impurities, plant debris, weed seed, discoloration and malformation.

**Methods for the detection of seed borne fungal pathogens**

The seed samples were tested by the standard filter paper and agar methods for fungi identified and their percentage of occurrence was calculated by applying following formula:

$Pf = \frac{\text{No. of seeds on which fungus appear}}{\text{Total number of seeds}} \times 100$ .

All the detection methods of seed borne fungi as described by ISTA. The normal and discolored seeds were tested separately for seed borne fungi.

**Blotter method**

For the detection of seed borne fungi, standard blotter method as described by the international seed testing association (ISTA, 1996), was used for the detection of the seed-borne fungi associated with each seed samples. All the samples were plated on moisture filter papers (dia-9.0cm) in 9.0cm sterilized plastic petri-dishes. five seeds were plated from each sample, 3 arranged at the periphery of plate and 2 at the center, each sample was replicated four times and then kept in dark place for seed germination after seven days of incubation, seeds were the examined for fungal growth under stereomicroscope. Fungi identification by habit character was supplemented by microscopic examination of spores and fungi bodies using a compound microscope. Other identification used method according to were Agarwal *et al.*, (1989); Buregers *et al.*, (1994), Mathursk, SD Mathur, PNeergard (1975), and Mathur and Kongsdal (2003). In cadence levels were recorded as the percentage of infected seeds in a sample.

**Agar method**

All seed samples was pre-treated with sodium hypochloride (NaOCl) 1% for 5 minutes then washed three times with sterilized distilled water (SDW) and dried between tow filter papers. The seed samples, (five of each crop) seeded in PDA medium (Potato Dextrose Agar), in sterilized glass petri-dishes.

The plates were incubated for seven days in incubator at 25°C. Then the seeds were examined under light microscopes using sli

Slide preparation and identification

The samples of fungus were taken randomly from each crop samples. These samples were identified on the basis of colony characteristics and microscopic examinations standard books and research paper were consulted during the examination of those fungi (Aneja, 2004., Barntt and Hunter, 1999., and Rifai, 1969). The binocular compound microscope was also used to determine the type of fungus in each plate.

**Data analysis**

All the collected data were determined by Analyses of Variance (ANOVA) using a completely randomized design. The significance (p<0.05) of differences between treatments were determined, using the Duncan's Multiple Range (DMR) test of Statistical Analysis.

**III. RESULT AND DISCUSSION**

This study was conducted under laboratory conditions, during February –April, 2016 to investigate the occurrence seed borne mycoflora associated with seeds samples of four food crops

collected from three local markets in Khartoum State in Sudan. The methods used in detection that Dry inspection, Blotter method and agar plate method,

**4.1 Dry Seed Inspection**

Dry inspection of the Cereal grains collected from different areas of Khartoum state discolored seeds. Besides that, impurities were mixed with all seed samples. These were identified as dust particles, stones, pieces of straw and plant debris. However, with the exception of the few discolored seeds no disease like symptoms was observed in the dry inspected seeds. (Table 1)

**Table 1. Dry inspection for Maize and Wheat crops**

Crop	Health y	Un health y (%)	Malformatio n seeds (%)	Plant debri s (%)	Tota l (%)
Maize	73	22	5	0	100
Whea t	70	15	9	6	100

**Blotter method and agar plate method in maize**

Two samples of cereal grain collected from seed market, fungi isolated include Aspergillus, Penicillium, Alternaria, Rhizopus. Table (2), plate (1 and 2). Four fungal species (Aspergillus, Penicillium, Alternaria and Rhizopus) were detected in Maize. The fungi Aspergillus recorded the highest fungi percent in Filter paper (28.67%) and Agar method (28.33%) Followed by Penicillium, Alternaria and Rhizopus (26.67, 17.33 and 5.33) respectively

**Table 2. Fungal genera obtained from Maize grains collected from study area**

Method Fungi	Filter Papper			Agar Method		
	MIA	MIA	MIA	MIA	MIA	MIA
	ZE	ZE	ZE	ZE	ZE	ZE
	B	H	O	B	H	O
<i>Aspergillus</i>	42.00 <sub>a</sub>	28.67 <sub>a</sub>	22.00 <sub>a</sub>	28.33 <sub>a</sub>	28.33 <sub>a</sub>	11.00 <sub>a</sub>
<i>Penicillium</i>	11.67 <sub>b</sub>	23.00 <sub>ab</sub>	26.67 <sub>a</sub>	15.33 <sub>a</sub>	13.00 <sub>ab</sub>	1.33 <sup>a</sup>
<i>Alternaria</i>	17.33 <sub>b</sub>	14.33 <sub>ab</sub>	15.33 <sub>ab</sub>	15.33 <sub>a</sub>	5.67 <sup>b</sup>	1.33 <sup>a</sup>
<i>Rhizopus</i>	0.00 <sup>b</sup>	0.00 <sup>b</sup>	0.00 <sup>b</sup>	5.33 <sup>a</sup>	3.33 <sup>b</sup>	0.67 <sup>a</sup>
CV%	9.20	9.88	6.05	19.08	9.95	23.07
SE±	8.58	12.11	7.32	24.96	9.65	6.82

Key:

O= Omdurman

H= Al haryousif

B= Khartoum bahri

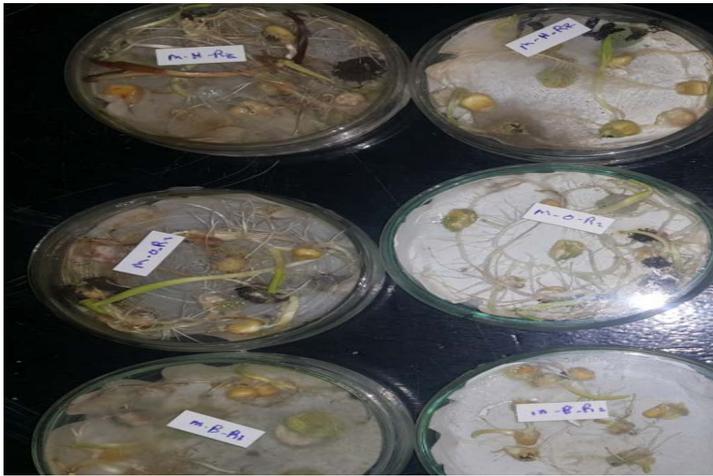


Plate 1. Seeds tested by the filterpaper for maize seeds



Plate 2. Seeds tested by the Blotter method for maize seeds

<i>Alternaria</i>	3.67 <sup>a</sup>	0.33 <sup>b</sup>	11.00 <sup>a</sup>	0.33 <sup>b</sup>	4.33 <sup>ab</sup>	7.67 <sup>ab</sup>
<i>Rhizopus</i>	0.00 <sup>a</sup>	0.00 <sup>b</sup>	0.00 <sup>a</sup>	0.00 <sup>b</sup>	0.33 <sup>b</sup>	3.33 <sup>b</sup>
CV%	10.14	30.31	12.09	12.08	11.10	7.64
SE±	5.69	2.57	10.14	10.38	7.94	6.81

**Key:**  
O=Omdurman  
H=Al haryousif  
B=Khartoum bahri

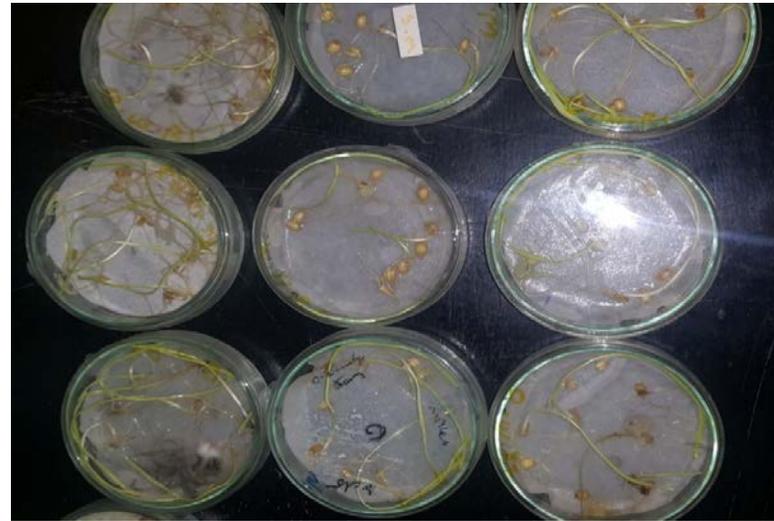


Plate 3. seeds tested by the Blotter test for wheat seeds

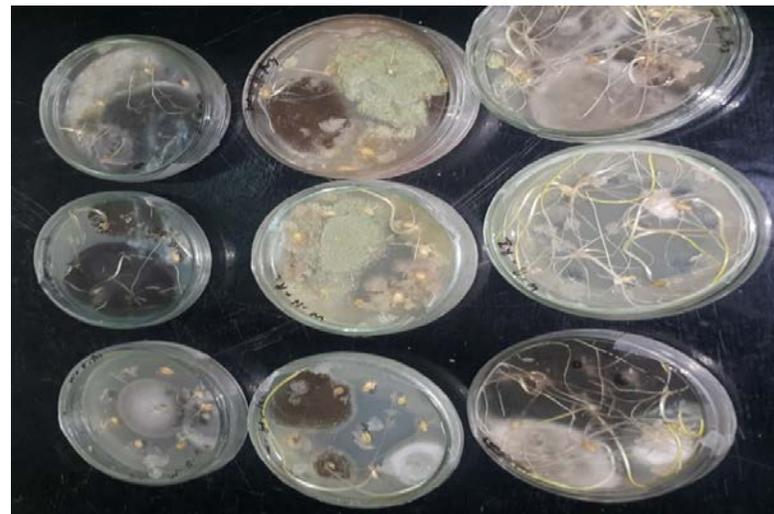


Plate 4. seeds tested by Agar plate method for wheat seeds

### Detection of Fungi from wheat Seeds

Fungi species detected from wheat seeds are shown in Table (3). The most common fungi species detected from the wheat seeds is *Aspergillus niger* whether tested by the Blotter or Agar methods. Other fungi detected include *Penicillium*, *Rhizopus* and *Alternaria* (Plate 3 and 4)

Table 3. fungal genera obtained from Wheat grains collected from study area

Method	Filter Paper			Agar Method		
	Whe at B	Whe at H	Whea th O	Whe at B	Wheat H	Whea th O
<i>Aspergillus</i>	11.67 <sup>a</sup>	8.00 <sup>a</sup>	18.00 <sup>a</sup>	27.33 <sup>a</sup>	21.33 <sup>a</sup>	19.67 <sup>a</sup>
<i>Penicillium</i>	10.67 <sup>a</sup>	1.33 <sup>b</sup>	15.33 <sup>a</sup>	12.33 <sup>ab</sup>	9.00 <sup>ab</sup>	18.67 <sup>a</sup>

### IV. DISCUSSION

This study was conducted in the laboratory of plant pathology department of plant protection, college of agricultural studies, Sudan University of science and technology during February –April, 2016. The aim of this study was to detect and identify seed borne fungi associated with seed of cereals

grain(Wheat and Miaze) collected from three different locations in local market of Khartoum(Al haguayouf, Khartoum bahri and Omdurman) stored since season 2015.The dry inspection tests revealed the presence of a few (less than1%) discolored seeds. In similar tests Neegaard (1977) reported that dry seeds may show symptoms in varying degrees due to necrosis or discoloration from stain produced by various seed-borne micro-organisms. The results of the present study revealed a high incidence of seed-borne *Aspergillus niger* and *A. flavus*. Working with the seeds of sorghum in the Sudan, Abuagla (2001)also reported high incidence of *A. niger* and *A. flavus*. Moreover, a high incidence of *A. niger* and *A. flavus* from seeds stored in high temperature. In comparison of the different methods used in the present study the Agar plate tests gave excellent mycelial growth and conidial sporulation of the fungi detected. As explained by Mrs. Awatif (Personal Communication) such results are expected as the agar media provide the necessary nutrients for the growth of the fungi. The results of the present work also revealed that beside *A. niger* other less prevalent fungi include *Penicillium* sp, *Alternaria* and *Rhizopus*. As previously stated by Malone and Muskett (1964) and Reddy (1987) such results are expected from seeds stored under high temperature and high humidity conditions. Hence, the need for proper storing, seed health testing and seed sterilization should be a routine practice before sowing of above seeds.

#### V. CONCLUSION

1. In view of the abundant seed contamination reported in the present study and in other previous studies it is high time that the seed health testing should be applied before sowing both local and imported seeds.
2. The result obtained in this study showed the need for further research and investigation to provide a satisfactory explanation to these results.

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# Microhabitat Preference of Frogs at Similajau National Park, Sarawak, Malaysia.

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**Abstract** - Tropical heath forest occurs widely in many places of Borneo. Similajau National Park is one of the locations with heath forest. Because of insufficient data on the anurans of heath forest in Similajau National Park, a survey was carried out in the beginning of August 2014 until January 2015. The objectives of the study were to compare the anuran species diversity between two different study plots and to determine anuran species microhabitat preferences. The sampling method involved a 300m transects line and 240 quadrats method (5m x 5m) at both study sites. A total of 23 species of frogs (299 individuals) belonging to six frog families were detected. The study site was dominated by anurans of the family Dicroglossidae (48.8%) followed by Rhacophoridae (24.7%), Ranidae (17.7%), Ceratobatrachidae (4.7%), Microhylidae (1.3%) and Bufonidae (2.7%). Four endemic Borneo frogs, namely *Ingerophyrus divergens*, *Limnonectes ingeri*, *Kalophrynus intermedius*, and *Philautus tectus* were among anurans captured in this study. The Shannon Wiener Diversity Index,  $H'$  at forest site was higher than the non-forest site ( $2.48 \pm 0.06$  vs.  $1.77 \pm 0.05$ ). There was no dominant species at forest sites, which was reflected by the low Simpson Index,  $D$ , 0.091 ( $\pm 0.01$ ). Conversely, the same index at the non-forest site was higher with 0.201 ( $\pm 0.04$ ). This is apparent with the presence of *Fejervarya cancrivora* that made up about 20% of the total frogs sampled in the area. Habitat preferences associated with the recovered species from this are discussed in this paper.

**Index Terms** - Diversity, frog occurrence, kerangas forest, non-forest, Similajau National Park

## INTRODUCTION

Tropical heath forest occurs widely in many places of Borneo where they are called kerangas, but occur in small areas in Peninsular Malaysia [62]. Similajau National Park is one of the locations with heath forest. Heath forests are a type of seasonal lowland tropical rain forests that occur extensively in dry land sites; on flat sites, inter-digitations occur correlated with predominantly podzolized, highly acidic and sandy soils [6,15,63]. Many previous studies in Borneo, especially in Sarawak and Brunei, focuses on their ecology, plant community compositions, soil, litter, and environmental characteristics [36,38,44], but less on anurans diversity.

Tropical heath forests are distinctive in their forest structure compared to lowland mixed dipterocarp forests that are more dominant throughout Borneo. There are several factors that contribute to the distinct characteristic of this forest type. First factor is caused by periodic droughts such as decreasing soil depth and increasing variability of water supply under favourable conditions that would

create vegetation types similar to the dipterocarp forests [6]. Second includes the striking structural and physiognomic features, such as lower roughness of canopy surface, smaller mean leaf size, steeply inclined leaves and twigs, and shorter and unbuttressed trees [13,62,64].

Nowadays, anurans population and species are representatives of the general loss of biodiversity worldwide [2,23]. About 5,532 species of anurans drive the average threat level for amphibians as a whole with 31.6% representing 1,749 species either threatened or extinct about 28 families of anurans are found around the world [27]. In Malaysia, there are 16 families in Peninsular Malaysia, where 12 families of frogs that have been recorded which are Bufonidae, Centrolenidae, Dendrobatidae, Discoglossidae, Hylidae, Hyperolidae, Leptodactylidae, Microhylidae, Pseudidae, Ranidae, Rhacophoridae, and Rhinophrynidae [40]. In Borneo, eight families of frogs have been recorded which are Bombinatoridae (Firebellied Toads), Bufonidae (True Toads), Ceratobranchidae (no vernacular name), Dicroglossidae (True Frogs I), Megophryidae (Litter frogs), Microhylidae (Narrow-Mouthed Frogs), Ranidae (True Frogs II) and Rhacophoridae (Afro-Asian Tree Frogs) [19,26].

Studies on the effect of different types of land used in local landscape levels of Borneo are insufficient. There is a need to study species diversity of anurans. In addition, there are insufficient data on the anurans of Similajau National Park, especially in tropical heath forest habitat. Previous research about frogs in Similajau National Park is confined to the characteristics of *Hylarana* sp. [48]. The reason of selection of this area is based on the lack of scientific data and research that has not been systematically examined. The proposed study will provide information about species diversity and their abundance which is important for future conservation plans and also for the determination of habitat preferences which can be used for conservation of species in captivity programs.

The hypothesis is the pattern of frog assemblage including their diversity and presences of dominant species are significantly different in two different habitat types. There is significant difference in species association with microhabitat structures. The objectives of the study are to compare the anuran species diversity between two different study plots, in relation to the effect of reduced habitat cover of Similajau National Park and to determine anuran species microhabitat preferences in association with the study plots.

## MATERIALS AND METHODS

### *Study site*

This study was conducted in Similajau National Park, which is located about 30 km from Bintulu town in north Sarawak, Malaysia (Figure 1). Comprising of 8,996 ha, the Similajau National Park reserve generally consists of three distinct habitat types: mixed dipterocarp forest, mangrove forest, and tropical heath forest [21]. During the study period, the climate in the area was typically humid tropic, characterised by yearly high temperature (ranged between 26°C and maximum of 32°C) and seasonal heavy rain (ranged between 2000mm and 4000mm per year) overall in a year [9].

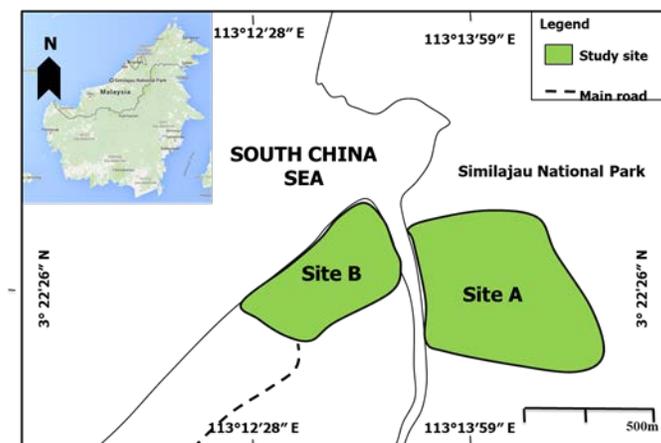


Figure 1. The location of study sites in Similajau National Park which are known as site A indicates the forest site and Site B the non-forest site.

Two sampling plots of different land uses within the Similajau National Park were selected to serve the objectives of this study; (a) forest area (an approximate area of 18-ha tropical heath forest), and (b) developed area (an approximate 14-ha area developed for the park office and lodgings, consisting primarily of casuarina trees as the dominant vegetation). The exact size of study area covers 18.9% of total size tropical heath forest at Similajau National Park. According to the park officer the education trail was almost covered by tropical heath forest. The total length of the trail is 600 meters (0.37 mi) and 95-ha in hectare. The altitude of study sites ranges from 50 m to 220 m for forest plot and 0 m to 50m of developed area. The developed area has a very flat landform because it is near the beach. A limitation faced in our study area was having access to fieldworkers. This is because experienced fieldworkers are limited and expensive if we conducted the study for a long time and recruit more existing ones.

Sampling plots were selected to fit the objectives of testing the effect of habitat cover where (a) each plot represented are a well-defined habitat type, and (b) both plots consisted of at least one constructed or natural water source (river, stream, drain, pool) to ensure the availability of water that frogs require to complete their life cycles within the plot boundaries. The shortest distance between the two plots was about 400 m to ensure the sample independence [22,54,29].

#### *Frog sampling*

This study was conducted with the approval from the Sarawak Forestry (Permit no: NCCD.907.4.4 (Jld.10)-251). Initially, the fieldwork was planned to be conducted during the typical dry (April-August) and wet (September-March) climates of Borneo, based on tropical monsoon seasons. However, due to constraints in project funding, the fieldwork period was limited from 13 August 2014 until 22 January 2015 (24 weeks), during which the area was experiencing a wet climate (rainy season).

Active transect-line search and quadrat plot sampling were used during frog sampling in the forest and developed area plots. The following procedures were standardized throughout the study period at both plots; 1) A 300m transect line with an interval distance of 15m sampling points along the line were established during the fieldwork. The total of 20 sampling point at transect line was set approximately parallel to the water source structure. 2) A total of 240 quadrats (5m x 5m each) were established in both study plots where the distance between quadrats was not less than 5m to avoid census duplicate, but every visit to the quadrats established 20 quadrats in the morning, prior to the night fieldwork. At each transect and quadrat, visual encounter search within a range of 10m perpendicular to each sampling point was employed according to past works [11,52].

All fieldworks were conducted at night because frogs are mostly nocturnal and their encounter rate was reportedly higher than during the day [35]. Only visible frogs were registered in the field note during fieldwork. Both survey methods were conducted between approximately 19:30 pm to 22:30 pm, where visual search was assisted by headlamps and carried out by four fieldworkers. Two fieldworkers, including a local fieldworker who is familiar with the frog identification, were assigned to look for frogs; one was assigned to capture the frogs and another was assigned to record the captured information (nominal species, locality, microhabitat structures). Species counts were tallied thereafter as abundance data.

A 10-minutes search was made at each sampling points and quadrat samplings. The encountered individual of a species was kept in a jar for use as a voucher specimen. Other captured frogs were released after field identification. Species identification was conducted in the field whenever possible and in the laboratory by using established taxonomic guidelines [26, Stuebing, personal comm.]. Photographs of every encountered frog were taken in the field and laboratory. Voucher specimens were preserved in 10% formalin for two weeks to fix the tissues and then changed to 70% ethanol for long storage. All voucher specimens were deposited at Universiti Putra Malaysia Bintulu Campus in Sarawak.

#### *Microhabitat variables*

During the sampling survey, observations on microhabitat structures were recorded based on microhabitat structures within each quadrat and transect [49,60]. The structures were defined as (1) vegetation – consisting of green leaf, vegetation stems ,and vegetation and grass roots, (2) mineral deposits (bank mud, bank sand/gravel and bank rock), (3) forest litter (leaf litter, rotten twig, dead stump (diameter > 10 mm)) and dead vegetation (diameter < 10 mm), and (4) water sources –(stream bank, in drain and temporary pool). The number of each category present was tallied.

#### *Data Analysis*

All data collected using two methods was pooled and separated into forest and non-forest plot for analysis, using the Margalef index, R to determine species richness or, the number of species or species abundance in each study plot [51]. The species diversity for each study plot was calculated by Shannon-Wiener index,  $H'$  and the Simpson index, D to quantify species dominance. The Shannon's Evenness index was also used to measure the distribution of species abundance over a number of species present in each study plot. The Jaccard's index was used to identify the level of similarity in diversity between forest and non-forest plots. The index used to indicate the degree at which both areas consisted of the same species and degree of species uniqueness in each area. All biological indices were performed through the Paleontological Statistics (PAST) and Species Prediction and Diversity Estimation (SPADE) software [7,20]. Non-metric multidimensional scale (NMDS) ordination was also performed to assess the similarity and tendency in microhabitat structures selections for each frog species also using PAST. The substrate groups serve as the independent variable, whereas the dependent variable was the species abundance.

## RESULTS

### *Species Composition*

A total of 299 individuals belonging to 23 species were observed to inhabit the forest and non-forest plots of Similajau National Park (Table 1). The species recovered from the survey constituted 13.5% of 170 frog species known from Borneo [12,18,26,34,65]. Frog species were from six families in which species from the family Dicroglossidae dominated the area (six species, 48.8% of total occurrences), followed by Rhacophoridae (seven species, 24.7%), Ranidae (four species, 17.7%), Ceratobatrachidae (one species, 4.7%), Bufonidae (two species, 2.7%), and Microhylidae (one species, 1.3%). Overall, a higher family diversity was observed in the forest than the non-forest plots (Figure 2)

Table 1. The frog count tally and percentage of their occurrence in Similajau National Park

Taxa	Sampling plot		Total	Conservation status
	Forest	Non-forest		
<b>Bufonidae</b>				
<i>Ingerophyrus divergens</i> * (Id)	6 (5.56)	0	6 (2.01)	Least Concern
<i>Pelophryne saravacensis</i> (Ps)	2 (1.85) <sup>†</sup>	0	2 (0.67)	Least Concern
<b>Ceratobatrachidae</b>				
<i>Ingerana</i> sp. (Isp)	14 (12.96)	0	14 (4.68)	Unknown
<b>Dicroglossidae</b>				
<i>Fejervarya cancrivora</i> (Fc)	0	59 (30.89)	59 (19.73)	Least Concern
<i>Fejervarya limnocharis</i> (Fl)	0	49 (25.65)	49 (16.39)	Least Concern
<i>Limnonectes paramacrodon</i> (Lp)	8 (7.41)	2 (1.05) <sup>†</sup>	10 (3.34)	Near Threatened
<i>Limnonectes ingeri</i> * (Li)	4 (3.70) <sup>†</sup>	0	4 (1.33)	Near Threatened
<i>Limnonectes kuhlii</i> (Lk)	10 (9.26)	0	10 (3.40)	Least Concern
<i>Limnonectes deinodon</i> (Ll)	14 (12.96)	0	14 (4.68)	Least Concern
<b>Microhylidae</b>				
<i>Microhyla borneensis</i> (Mb)	1 (0.93) <sup>†</sup>	0	1 (0.33)	Least Concern
<i>Kalophrynus intermedius</i> * (Ki)	2 (1.85) <sup>†</sup>	0	2 (0.67)	Vulnerable
<i>Kalophrynus</i> sp.(Ksp)	1 (0.93) <sup>†</sup>	0	1 (0.33)	Unknown
<b>Ranidae</b>				
<i>Hylarana erythraea</i> (He)	0	24 (12.57)	24 (8.03)	Least Concern
<i>Chalcorana labialis</i> (Hr)	18 (16.67)	0	18 (6.02)	Least Concern
<i>Pulchrana signata</i> (Hs)	7 (6.48)	0	7 (2.34)	Least Concern
<i>Pulchrana baramica</i> (Hb)	4 (3.70) <sup>†</sup>	0	4 (1.33)	Least Concern
<b>Rhacophoridae</b>				
<i>Nyctixalus pictus</i> (Np)	1 (0.93) <sup>†</sup>	0	1 (0.33)	Near Threatened
<i>Philautus tectus</i> * (Pt)	5 (4.62)	0	5 (1.67)	Vulnerable
<i>Polypedates colletti</i> (Pc)	11 (10.18)	3 (1.57) <sup>†</sup>	14 (4.68)	Least Concern
<i>Polypedates leucomystax</i> (Pl)	0	29 (15.18)	29 (9.69)	Least Concern
<i>Polypedates macrotis</i> (Pm)	0	4 (2.09) <sup>†</sup>	4 (1.33)	Least Concern
<i>Rhacophorus pardalis</i> (Rp)	0	17 (8.90)	17 (5.69)	Least Concern
<i>Rhacophorus gauni</i> (Rr)	0	4 (2.09) <sup>†</sup>	4 (1.33)	Near Threatened
Total species	16	9	23	
Total numbers of individual	108	191	299	

\*Endemic species, <sup>†</sup>Rare species;  $\leq 1/10$  the highest number of individuals caught for a species in a site  
 Annotated conservation statuses were inferred from the IUCN website.

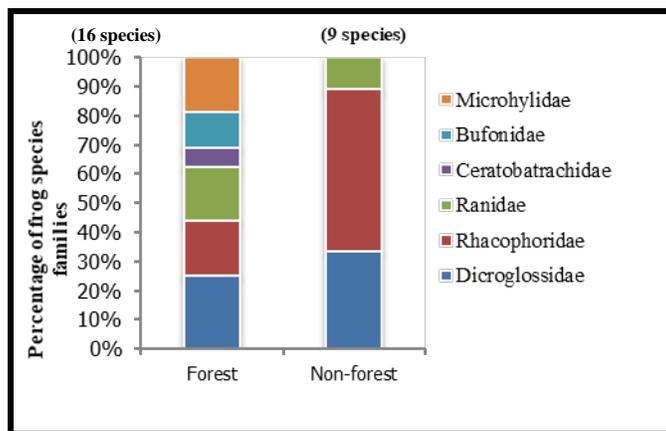


Figure 2. The percentage of frog species families in study sites A and B in Similajau National Park, Sarawak

The number of individuals was higher in the non-forest plot than the forest plot despite the latter plot harbouring more species (191 vs. 108 individuals). Only *Limnonectes paramacrodon* and *Polypedates colletti* were commonly found in both plots. Four species with endemic distribution to Borneo were found in the forest plot, namely *Ingerophyrus divergens*, *Limnonectes ingeri*, *Kalophrynus intermedius*, and *Philautus tectus* (IUCN, 2015). Four species namely *Limnonectes paramacrodon*, *Limnonectes singeri*, *Nyctixalus pictus* and *Rhacophorus gauni* recovered in the study were classified under IUCN’s ‘Near Threatened’ category and one species was under ‘Vulnerable’ category (Table 1).

The rank abundance curve was hollow in shape. This means that species community has a small number of abundant species and large number of rare species. For example, the higher abundance species is dominated by *Fejervarya cancrivora* (59 individuals, 19.73% of total occurrence) followed by *Fejervarya limnocharis* (49 individuals, 16.39% of total occurrence). At rank number seven, the three species that have same occurrence of individuals (4.68%) were *Limnonectes deinodon*, *Polypedates colletti* and *Ingerana* sp. with 14 individuals. the rank abundance of fifty was shared by *Pulchrana baramica*, *Limnonectes ingeri*, *Polypedates macrotis* and *Rhacophorus gauni* with four species (1.33 % of total occurred) respectably. Rare species with only one individual each per species recorded during the study conducted includes *Microhyla borneensis*, *Nyctixalus pictus* and *Kalophrynus* spp.

### Biological Indices

There were marked differences in biological indices between the forest and non-forest plots examined in the study (Table 2). Forest plot consisted of almost double the species richness in non-forest plot ( $R_{\text{forest plot}} = 3.22$  vs.  $R_{\text{non-forest plot}} = 1.52$ ). On the contrary, the number of individuals caught in the forest plot was lower than the non-forest plot (108 vs. 191). Despite the reverse values for R and number of individuals caught between the forest and non-forest plots, the estimation of evenness index, E Shannon was different for both sites (0.75, forest plot vs. 0.65, non-forest plot). The Shannon-Wiener Diversity Index, H’ at the forest plot was significantly higher ( $2.48 \pm 0.06$ ) than the non-forest plot ( $1.77 \pm 0.05$ ) at p value of 0.05. Conversely, the Simpson Index for dominance (D) for the non-forest plot was twice higher than the forest plot ( $0.201 \pm 0.04$  vs.  $0.091 \pm 0.01$ ). The study further showed that the Jaccard Similarity, J pooled for both the forest and non-forest plots were 8.7%, indicating a low level of overlap or similarity of frog species between the two study plots.

Table 2. The diversity indices of frogs in forest plots and non-forest plots at Similajau National Park

Diversity indices	Forest Plot	Non-Forest Plot
Margalef Richness, R	3.22	1.52
Shannon-Weiner Diversity Index, H'	2.48 (±0.06)	1.77 (±0.05)
Evenness Index, E <sub>Shannon</sub>	0.75	0.65
Shannon Variance	0.0047	0.0029
Dominance, D	0.099 (±0.01)	0.205 (±0.04)
Jaccard Similarity index, J		0.087

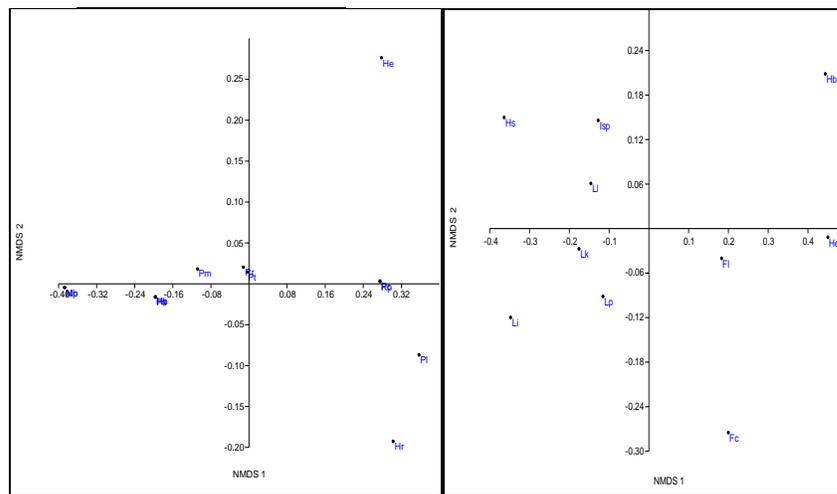
*Microhabitat variables*

The NMDS axes cumulatively accounted for number of species abundance (Axis 1) followed by substrates of microhabitat structures (Axis 2). A total of 13 species associated in vegetation microhabitat structures. The ordination (figure 2a) showed that *Hylarana erythraea* (He) seemed to occur in higher abundance around grasses, benefitting from its background colour. This is followed by *Rhacophorus pardalis* (Rp), *Polypedates leucomystax* (Pl) and *Chalcorana labialis* (Hr) which occurred at green leaves during the study conducted. *Rhacophorus rufipes* (R) and *Philaitus tectus* were in centre of axes which means these species only associated with vegetation especially on stem of vegetation. The rest of species showed negative associations with both axes.

In mineral deposit, *Pulchrana baramica* (Hb) showed strong positive association with both axes as this species was only found to select bank sand or gravel in mineral deposit. *Fejervarya cancrivora* (Fc), *Fejervarya limnocharis* (Fl) and *Hylarana erythraea* (He) were associated with negative axes 2, indicating a strong positive association with mudbank and band sand or gravel. Other species such as *Pulchrana signata* (Hs), *Ingerana* spp. (Is), and *Limnonectes deinodon* (Li) were associated with negative axes 1 scores, indicating a strong positive association with bank rock. The rest of species showed negative association with mud bank and bank sand or gravel.

a. Vegetation

b. Mineral deposit



c. Forest litter

d. Water sources

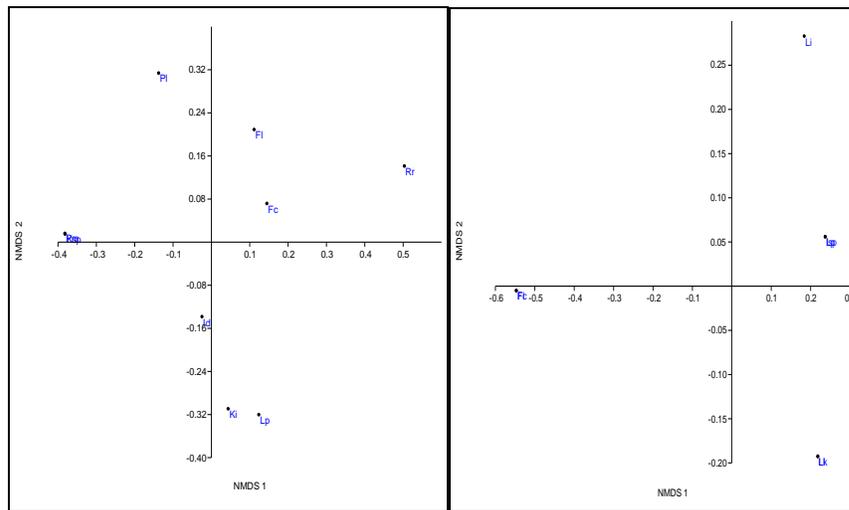


Figure 4. The location of frog species recorded between Aug, 2014 and Jan, 2015 in forest and non-forest plot at Similajau National Park.

In forest litter selection, *Rhachoporus rufipes* (Rr) showed positive ordination because this species only selected rotten twig, compared to *Fejervarya limnocharis* (FI), and *Fejervarya cancrivora* (Fc) which selected leaf litter and rotten twig for their substrate. *Limnonectes paramacrodon* (Lp), and *Kalophrynus sintermedius* (Ki) selected one substrate which is seen in the position of positive ordination on axes 1. *Polypedates leucomystax* (PI) was higher in a positive association with the axes 2 which had the tendency to choose forest litter and dead stumps (diameter <10 mm) respectively. The tendency of *Limnonectes paramacrodon* and *Kalophrynus intermedium* to choose their own substrate was reflected by body colour, where these species have light brown to blend well with the forest litter.

For water sources selection, the ordination of *Limnonectes ingeri* (Li) was positive of both axes because only one individual was found at the bank stream compared to rest of the species which were also associated with bank stream but have more abundance such as *Ingerana* spp. (Isp), *Limnonectes kuhlii* (Lk), *Limnonectes paramacrodon* (Lp) and *Limnonectes laticeps* (LI). The tendency of these species to choose their substrate reflects their characteristic as ground-dwelling frogs. In contrast, *Fejervarya cancrivora* (Fc) exhibited a relationship with slightly positive values along the axis 2. Perhaps the attribute to select the drain and temporary pool for their substrate may be explained since there are no stream available at the developed area plot.

## DISCUSSIONS

### *Frog Diversity, Richness and Composition*

Variation in habitat structures revealed that frogs have diversity patterns. Predictably, diverse habitats provide more variety in microhabitats and in resources, such as food, space, and cover. However higher population levels are not necessarily correlated with greater species richness [5]. Mature forests predictably possess high plant diversity that provides more complex canopy covers, resulting in more shelter and breeding microhabitats [17]. Although plant diversity was not systematically covered in the method, a rough estimate showed that the forest plot in the study area consisted of 43 tree species (177 individuals) while the non-forest plots

contained only 11 tree species (53 individuals). More extensive canopy cover reduces evaporation rates, and thus provides relatively high moisture and humidity for frogs [1,16].

Additionally, controlled evaporation in microclimates allows the proliferation of invertebrates that in turn supplies abundant food resources for frogs [1,5,16,17]. On the contrary, the non-forest study plot homogeneously consisted of Casuarina trees where the accumulation of the leaf litter, one of the frogs' important microhabitat features, was conspicuously lower than forest plot. The forest plot consisted of a natural stream that flowed continuously through the plot, containing microhabitat structures that intermittently retain water. Meanwhile, the non-forest plot consisted of an intermittent stream that only sporadically contained water, and lined with water channelling structures, such as cement drains, silt traps forming temporary pools, and permanent puddle from draining effect. The species survival heavily depends on their ability to reproduce, which means that the suitable microhabitats for frogs, especially species of ground-dwelling are very restricted and can inhibit their ability to complete their life cycle [18,66].

Frog abundance in the non-forest plot was relatively higher than the forest plot and possibly due to two factors of abundance pattern which are 1) better detection ability with the absence of diverse vegetation types; 2) the presence of ground-living and non-endemic species that are generalist in behaviour [26,16,59,65]. Lack of habitat covers resulted in an increased probability of individual detection by field observers and also predators [10,37]. The non-forest plot recorded a dominance index twice higher than the forest plot, with the presence of *Fejervarya cancrivora* and *Fejervarya limnocharis*. The presence of dominant species is an ecological phenomenon that needs further investigation.

The evenness index is an important ecological parameter in studies that measure the distribution of species abundance in relation to species presence in a community [14,51,59,61]. The present study revealed that the evenness index was similar in both forest and non-forest plots, as compared to other indices that exhibited marked contrasts, like species richness. Indeed, both research plots in Similajau National Park did not share the same species composition. Species richness composition was affected more by area than isolation [31]. Two possible ecological processes that are not mutually exclusive can be proposed for the park that allowed only certain species to proliferate in either study plots: a) different microhabitat requirements; b) extirpation by means of ecological simplification and the loss of numerous microhabitats. For instance, *Fejervarya cancrivora* and *Fejervarya limnocharis* that were only found in the non-forest plot had a closer access to the coastal sea area than species in the forest plot. An area that is implicated by the seawater salinity may not be suitable for other species but *Fejervarya cancrivora* has the ability to survive under relatively high salinity condition [45], even though it still uses temporary freshwater ponds to breed [33]. *Fejervarya limnocharis* was co-dominant in the non-forest plot. However, these species prefer shallower pools (approximately 2 – 3 inches deep) as breeding sites and are typically abundant in open field areas [8,26,65]. The non-forest plot provides an advantage for frogs that are adapted to open spaces, explaining why species such as *Fejervarya cancrivora* and *Fejervarya limnocharis* were dominant in the non-forest plot.

Of all species, only two, *Limnonectes paramacrodon* and *Polypedates colletti* were present in both study plots throughout the study period. Individuals of *Limnonectes paramacrodon* were captured in both study plots because the elevation of habitat types was quite similar. The swamp forest in Similajau National Park was in the middle of both areas of forest (heath forest) and non-forest plot. Individuals of *Limnonectes paramacrodon* were collected along gravel and clay stream bank at the forest plot, near to temporary freshwater pond and also on leaf-litter at non-forest plot. Such habitat characteristics were similar to what has been found elsewhere of swampy areas [42,56]. *Polypedates colletti* descends from trees for breeding around the water [26,65]. Various types of shrubs and connected tree branches of *Anisophyllea beccariana*, *Gynostroches axillaris*, *Baccaurea minor*, *Knema* sp., *Maallotu* ssp at forest plot and on *Macaranga gigantea*, *Dillenia suffruticosa* at non-forest plot were recorded. The non-forest plot consisted of small patches of

trees that were similar to the heath forest. Such habitat characteristic allows a *Polypedates colletti* that is nocturnal to jump between trees in both plots. Observations from the study recorded that they could be found in trees around 1.5m as high and more than 6m off the ground.

This study reported that 23 frog species that inhabit the heath forest and non-forest at Similajau National Park consisted of common frogs found in other areas in Malaysia (Table 5.1). Given the small sampling plots for the present study, the species diversity ( $H' = 2.63$ ) was still relatively higher than an island population, a river-related area, and a plantation site in Malaysia [24,39,56]. However, this checklist was slightly lower as compared to a number of species in a study conducted at Gunung Inas Forest Reserve, Kedah and Crocker Range Park, Sabah which documented about 28 and 30 frog species, respectively [25,53]. The differences caused by sampling period, the elevation and also type of habitat were the factors that influenced species diversity [24,56,66]. The probably species founded will be increase if the time of sampling period was employed longer. In addition, if a longer sampling period was conducted at higher elevation of habitat types, the number of species found probably would also increase because the number of species present depends on its proximity to the forest cover [46].

The study plots in Similajau National Park harbour frog species with various IUCN Red List statuses. Two species of concern, *Philautus tectus* and *Kalophrynus intermedius*, are listed as vulnerable (Vu). Found in the forest plot, further forest degradation is likely detrimental to their future survival. Four species were listed by IUCN as Near Threatened (Nt): *Limnonectes paramacrodon*, *Nyctixalus pictus*, *Limnonectes ingeri*, and *Rhacophorus gauni*. The remaining species found are of "Least Concern" (Lc), but their natural habitat preservation must be maintained when delineating future conservation and development plans.

#### *Microhabitat preferences to frog species occurrences*

Different frog species utilise different microhabitat structures. Three species, namely *Fejervarya cancrivora*, *Fejervarya limnocharis*, and *Limnonectes paramacrodon* were associated with all microhabitat structures, except the vegetated substrates. During the study period, *Fejervarya cancrivora* and *Fejervarya limnocharis* were present in both sampling plots and quadrats, indicating their adaptability to more than one microhabitat structures, from leafy to nearly-bare forest floors and sandy areas (by the beach). Both species dwell in low canopy cover and are commonly associated with disturbed and human environments [3,4,61]. *Limnonectes paramacrodon* was recorded near the coast, stream, and in a peat swamp.

Four species were found in the grass area and bank sand during the study period. They were *Hylarana erythrae*, *Limnonectes ingeri*, *Limnonectes kuhlii*, and *Polypedates leucomystax*. Previous study of *Hylarana erythrae* reported that these species could not be found in forest area as they live in disturbed habitat, natural grasslands, and open area [50] *Polypedates leucomystax* typically occurs in the lowlands of non-forest habitat [57], is a commensal species that indicated the area has been disturbed by humans [43,55]. *Polypedates leucomystax* also occurred in abundant during the study, and dead vegetations and leaf of shrubs like *Melastoma malabathricum* at non-forest plot indicated that the species is associated with vegetation and forest litter substrate. In contrast, *Limnonectes ingeri* and *Limnonectes kuhlii* shared an association with mineral deposit and water source substrate where their abundance were mostly recorded on mud bank and near flowing stream of water. These results supported that both species are related to ancient river systems and

living by river banks as well as riparian species [30] though this species was not found in ground floor and no previous studies mentioned about the species because it was considered as a non-stream breeding arboreal frog [39].

*Chalcorana abialis* and *Rhacophorus pardalis* were associated with one microhabitat structure and only vegetation substrate. Results showed that *Chalcorana labialis* was the most abundant species in forest plots and not recorded at non-forest plot because this species can increase their abundance in low alteration impacts sites [32]. *Chalcorana labialis* usually perches on seedlings and herbaceous plants [26]. This supports our result, as the species abundance occurrence was on palma leaf like *Pandanus* sp., *Calamus* sp. and *Licuala grandis*, and stems of seedling plants. In contrast, the occurrence of *Rhacophorus pardalis* on stem and leaf of *Zingibers* sp., *Dillenia suffruticosa* and *Acacia mangium* indicated that they are only associated with vegetation substrate. However, previous studies stated that *Rhacophorus pardalis* lives in the canopy and only comes down during breeding season [55]. Though in our study, it was recorded that 1m of height from the ground floor was the microhabitat they were associated with and was supposed to be supported by the study period which was considered the breeding season. It was clear that this species highly active in calling activities and the individuals recorded were also close to each other, which was lower than 0.5 m distance (personal observation).

The preference of *Pulchrana baramica*, *Pulchrana assignata*, *Ingerana* spp., and *Limnonectes deinodon* in terms of microhabitats is structure with mineral deposits. Only two individuals of *Pulchrana baramica* were recorded at a sand bank in the forest plot. Meanwhile, the other three species shared occurrence at bank rock as their substrates. *Pulchrana signata* is categorised as rocky riparian frogs [47] and it was proven during our study that this species' abundance was recorded on the rock and above flowing water. In contrast, *Ingerana* spp. and *Limnonectes deinodon* were commonly found abundant at stone slit and on the bank rock near the stream in forest plot. Both species were also like *Limnonectes ingeri* and *Limnonectes kuhlii* and well known as riparian species. Besides that, *Ingerophyrus divergens* and *Kalophrynus intermedius* shared forest litter as their similar microhabitat structure. Both species of leaf litter frogs have special camouflage characteristics that were difficult to locate their own [55]. Both species have strong voice but it was difficult to see where the individual was located. Their body was small and the body colour, in which these species have light brown, blend well with the forest.

## CONCLUSION

This study is the very first comprehensive research and systematic field survey on frog diversity in Similajau National Park. Although this study was conducted for only a short duration period, the number of species and individuals found in both study plot areas showed clear differences. It provided useful data to initiate an understanding on the impact of variations in habitat covers on local frog species distribution and habitat preferences, besides providing an updated species list and habitat requirement data. Indeed, frogs rely on habitat cover to sustain their populations, thus in the study, such an effect indicatively reduced species richness when habitat cover is decreased. Interspecific competition seems to inherently occur in reduced habitat cover more as a result of reduced richness, where a few dominant species appeared in the area. A study on habitat preference should be concluded that different species have their own associated microhabitats. It can also be concluded that the occurrences of individual's species and richness depends on rainfall, relative humidity and temperature.

## APPENDIX

Table 3. A frog diversity in different forest types at Malaysia.

Locality	No. of species	Sampling duration (months)	Sampling area (hectare)	Elevation of sampling area (from sea level, m)	Habitat types (major vegetation)	Shannon-Weiner Diversity Index, H'	References
Similajau National Park, Sarawak	23	6	32	< 600	Heath forest and non-forest	2.63	Present study
Sungai Ranting Taiping, Perak	12	10	NA	< 200	Lowland forest	1.95	Shahriza et al. 2015
Pasoh Oil Palm Plantation, Negeri Sembilan	9	3	127	< 100	Plantation	1.82	Norhayati et al. 2014
Bukit Panchor State Park, Penang	24	10	445	< 416	Lowland forest	NA	Quah et al. 2013
Jerejak Island, Penang	10	3	NA	< 230	Coastal forest	NA	Ibrahim et al. 2013
Crocker Range Park, Sabah	30	5	25*	600 < 1000	Lowland forest and Lower montane	2.53	Zaini et al. 2012
Gunung Inas Forest Reserve, Kedah	28	6	NA	< 1000	Lowland forest	1.7	Ibrahim et al. 2012

Notes: NA- not available, \*approximately estimation area

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# Implications of advertising in the contemporary models of consumer behaviour

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**Abstract-** \* Analysing of consumer behaviour and models of this field is increasingly gaining high significance. This is due to the fact that the consumer behaviour changes continuously, and its study brings new perspectives, which are extremely important for the world of marketing. The purpose of this study is to analyse the impact of advertising on the consumer behaviour through analysing its impact on the main contemporary models of consumer behaviour. In order to meet the objective of this study, main constructs of each individual model have been elaborated in details and the potential impact of advertising on each of these constructs. In conclusion, advertising influences the consumer behaviour, and this has been argued through illustration of impact that advertising has on the contemporary models of consumer behaviour.

**Index Terms-** Advertising, consumer behaviour, impact of advertising, models.

## I. INTRODUCTION

Consumers are involved in decision-making process many times during a day. Starting from selection of transport to go to work to the choice of what will be for dinner, all of them are decisions preceded by a decision making process. From the fact of what transport we choose to go to work to the choice of food that we consume for lunch, all of these are decisions preceded by a decision making process. But, why is the knowledge and the study of this process so important? Marketers, market researchers and companies in general should know why a consumer chooses to drink a Coca-Cola and not a Pepsi for lunch? Why does he/she choose a pair of Nike sneakers instead Adidas sneakers? Etc.

Understanding of consumer preferences and the way they take decisions helps marketers to influence the consumer's decision making process, and it creates them the opportunity to convince consumers to consider their brand and to always put it to the group of products they consider for purchasing.

From the process of analysing and familiarising with the process of consumer decision making, marketers learn that there are numerous factors influencing the decision making of consumers. Therefore, there are different models of consumer behaviour that help in understanding the consumer behaviour.

During this study, main categorizations of consumer behaviour models will be illustrated, afterwards the focus will be on analysing of contemporary models of consumer behaviour and implication of advertising on these models.

Models have been created with the aim of simplifying the reality and presentation of variables that comprise an event, a phenomenon or occurrence in the simplest way and the best real way.

In literature, there are different definitions on what it is understood by a model. A model is "a simplified representation of reality" (Loudon and Della-Bitta 1993, p. 599). "Models include various elements of behaviour and present also the relationships that exist among these elements that comprise the behaviour, normally in a chronological manner from the beginning to the end of behaviour process" (Bowen and Clarke 2009, p. 58). Similar definition was provided also by Schiffman and Kanuk (1997, p. 652), who define the model as "A simplified representation of reality designed to indicate the relationships among different elements of a system or process that is under observation/study." Based on these definitions, it may be said that a model is similar to a map that represents a reality in a simplified way, which is presented as a roadmap, and which enables to make successful predictions and to present possible essential impacts.

The use of consumer behaviour models is quite broad and beneficial. According to Loudon and Della-Bitta (1993), models of consumer behaviour serve to build a theory and facilitation of learning. Only two years later, Chisnall (1995, p.192) added that models of consumer

behaviour provide simple descriptions of "market parameters or characteristics that influence in purchasing", and these models enable to make predictions on possible outputs of different shares of marketing. Moreover, through implementation of these models, collection and integration of information on the position of the company in a certain period of time are enabled (Toybout and Hauser, 1981). Toybout and Hauser, 1981, through analysing a conceptual model of consumer behaviour and its application in auditing practice, came to a conclusion that, by measuring variables presented in the model and by determining their relationships, managers are able to identify a wide range of strategies through which they may influence the change of consumer behaviour, for example, strategies which may impact the change of consumer perceptions and preferences.

However, regardless of vast accessibility and practical profits that we may have from the use of models of consumer behaviour, there are critics towards them. The majority of consumer behaviour models have been developed in the United States of America. Given that many scholars called on testing the applicability of these models also in other cultures and countries (Albaum and Peterson 1984; Hui and Triandis 1985; Lee and Green 1991, cited by Durvasula, et.al 1993, p. 626), very few studies truly did so. Therefore, it is today more than necessary to carry out examinations of these models internationally, since it was assumed very often by researchers that these models are relevant also in other countries in addition to the U.S., however, this has never been proven by scientific researches. Attention should be paid to this, since various models of behaviour may lead to internationally invalid conclusions (Durvasula, et.al 1993).

Different researchers of consumer behaviour have provided different categorization of consumer behaviour models. In compliance with this study context, the categorization of Loudon and Della-Bitta, (1993) will be discussed, who categorize models based on their scope of action. According to them, models of consumer behaviour may take two forms: (a) specific, (b) comprehensive. In order to provide a brief definition of them, specific models try to describe a very specific aspect of behaviour, for example repeated purchases, loyalty, innovative behaviours, etc. On the other hand, comprehensive models, as implied by their names, they incorporate a great number of variables, trying to explain a considerable number of behaviours, though in less details than the specific models. Afterwards, comprehensive models are categorized by Loudon and Della-Bitta (1993) into two groups: (a) traditional models, and (b) contemporary models. Traditional models, as implied by their name, present the first efforts made by economists in order to facilitate the meaning of economic systems. For example, such systems describe consumer behaviour in the market suggesting that a consumer in the market, in a full rational situation, will always try to buy products that give higher profit in relation to the cost, or as expressed in microeconomic language, the marginal benefit of the product towards the price.

Models in which we are interested in our relation to advertising are categorized in the category of contemporary models of consumer behaviour, which will be clarified in details in the following, along with their relationship to advertising.

## II. LITERATURE REVIEW

### *A. Contemporary models of consumer behaviour*

Compared to other traditional models of consumer behaviour, contemporary models differ for the fact that they put emphasis on the consumer decision making process with special focus on mental activities that take place in the mind of the consumer before, during and after the purchase. In fact, this is also one of the reasons for which these models will be clarified individually, since this is the point in which the consumer behaviour and the advertisement meet in the best manner. Contemporary models of consumer behaviour rely heavily on knowledge developed in the behavioural sciences. Such models are the model of Nicosia, the theory of consumer behaviour or as it is also known as Howard and Sheth model, and finally the model of consumer decision process or as it is also known Engel, Blackwell and Miniard model of consumer behaviour.

The objective of discussing these models is the effort to illustrate the development of opinion of different authors in relation to consumer behaviour and to indicate the significance these models of consumer behaviour have for the study and the research of consumer behaviour in general and a study of consumer behaviour in relation to advertising in particular.

In regards to practical application of contemporary models of consumer behaviour, in particular their application in the field of advertising, it could be said that these models contain in themselves ideas that are often used by marketing managers on real marketing decisions. These models have been so far used mainly to study issues such as effects to the sale from the change of the amount of money spent on advertising; or in the other case, contemporary models of consumer behaviour are the best ways to predict the effect of advertising on the consumer attitude (for example when effects are reduced, then there is indication that something should be done or changed in the field of advertising).

## III. THE NICOSIA MODEL

This model was developed in mid of '60s by Francesco Nicosia (1966). This model explains the consumer behaviour through four main fields in decision-making behaviour. The output of the first field becomes the input of the second field, and it continues also for other fields.

Such model of consumer behaviour is a comprehensive model, given that it deals with all aspects of building the consumer attitudes, the purchase and use of the product, including also the consumer behaviour after the purchase of the product, another extremely important aspect when it comes to research of effects of advertising on the consumer behaviour. According to Runyon & Stewart (1987, p. 699), "the Nicosia Model provides a sophisticated effort to show the relationship between consumer attributes, consumer decision making process, communication, marketing of an organization and feedback or reaction of the consumer to the organization".

*A. Constructs of the model that are potentially influenced by advertising*

In the following, the discussion will be on the possible impacts that advertising has on each of four main fields included in the Nicosia's model.

The first field of model is known as "from the source of the message to the consumer's attitude". In this field, there were identified the following possible impacts of advertising.

Given that in the first field, we are dealing with the consumer's attitudes, which are influenced by the message initiated by the company, then the discussion begins with the consumer attitudes. In the first field, the consumer attitudes serve as a variable depending on the message of the company. Very often in different studies, attitudes have served as a dependent variable that reviews the responses of consumers towards marketing incentives (e.g. Erickson and Johansson 1985, Gardner 1985, MacKenzie, Lutz and Belch 1986), an approach particularly spread in theory research of reviewing the effects of advertising.

There are several ways through which advertising may influence the consumer's attitudes:

First, advertising has the ability to influence the consumer's attitude through its repetition. Effects of repeated exposure to a certain message have been studied in the context of changing attitudes either from psychologists or from researchers of the field of marketing. However, attention should be paid to the fact that repetition of advertising may have positive impact on the consumer's attitudes up to a certain frequency of repetition. Studies have shown that consumers generate positive opinions on the product/service that is advertised, at low level of exposure frequency to such advertisement/message. Nevertheless, it comes to a moment when the consumer becomes inattentive to the message that the advertisement conveys, because this consumer has been exposed to that advertisement many times, leading to negative attitudes of the consumer to the brand that is being advertised or the company sponsoring the advertisement (Berger and Mitchell, 1989).

Advertising influences the consumer attitude due to the fact that it supplies him/her with information. The consumer receives information on a certain product/service in other ways apart from advertising. For example, experiences of other individuals who consumed the same product are an important source of information for the consumer, and it may thus have high value for the consumer, by influencing his/her attitudes. However, advertisement has advantage in this case due to its repetition. Repeated exposure to an advertisement allows the individuals to process more information and thus get convinced in favour of the company that advertises the product/service.

The message that the advertisement conveys to the consumer should contain clear information regarding the benefit and importance of the product/service that is being advertised, so that this message leads the consumer towards the aimed behaviour for the company, specifically towards changing the attitudes (Milne and Gordon, 1993).

The second field of the Nicosia model is known as "search for, and evaluation of means-end relations". In this field, there were identified the following possible impacts of advertising.

From the perspective of the consumer, advertising is often the only step they notice prior to consuming the product/service. This means that the entire information they have, regarding the product/service they want to purchase, has been generated by advertising. However, advertising does not serve only as generator of information for the consumer. Through comparison of information contained in different advertisements for similar/same products, the consumer manages to carry out the process of information assessment over a certain product/service.

Scholars of consumer's attitude have stated that if a consumer observes two advertisements for two products of different companies, wherein one advertisement is better than the other, then the product of the better advertisement will undoubtedly have more characteristics and this will have higher values in the mind of the consumer (Rai, 2013). Therefore, advertising can be used as means for creating images of the brand and symbolic appeals, a very important ability especially for companies that sell products/services that are hardly noticed by consumers in regards to functional attributes (Belch and Belch, 2003).

For many individuals, advertising provides the only information or knowledge on a certain brand or product, which they will ever have (Hackley, 2005). Millions of consumers worldwide have never had a Mercedes car; they never smoke or they very rarely drink sparkling drinks. However, if they are requested, they are able to provide detailed descriptions regarding the values and characteristics of a Mercedes-Benz, of Marlboro cigarettes, or to speak about the characteristics of Coca-Cola. All this is due to the information that supplied them through advertising.

The third model of Nicosia is known as “the act of purchase”. Below there will be discussed in brief the possible impacts of advertisement in this field.

Studies on decision making have found that self-confidence in judgment is increased with the increase of the quantity of information (Oskamp, 1965). Moreover, the quantity of information is increased by more exposure of the consumer to advertising. The more information the more alternatives and opportunity for assessment, comparison and decision making. Communication through advertisement and promotion may make consumers select a certain brand on possible alternatives in the market (Hackley, 2005). In other words, advertising may lead the consumer towards the decisions making that is desired by the company, specifically towards the act of purchase.

The act of purchase is different in different products. For many products and services decisions to purchase are a result of a long and detailed process, which may include a thorough research of information, comparison and assessment of alternative brands. However, there are also products for which the purchase takes place coincidentally. It often happens that we buy a product only because we have observed a notification on discount and that resulted to the act of purchase, which is known in marketing as impulsive purchase.

In order to have impact on the act of purchase, marketers should be perfectly aware of the consumer’s behaviours. They should know how a consumer collects information?; How does he/she evaluate alternatives?; How does he/she make decisions?; How is he/she influenced by instant marketing incentives in order to perform the act of purchase?; etc.

Some of the ways through which advertising may influence a decision to purchase the product are:

Different dissatisfactions may be an important part of the consumer’s life, which can be used by marketers with the aim of influencing the consumer behaviour, precisely to lead the consumer towards the act of purchase. For example, a consumer may think that his ski boots are uncomfortable and ugly. The advertisement in the media, which presents the latest model of ski boots may help the consumer to know better the problem he has and to encourage him towards a new purchase. The advertisement, in addition to encouraging the act of purchase for the product that the consumer truly needs, it is a good technique to also encourage the purchase of products that the consumer already has and with which he/she is satisfied (Belch & Belch, 2003).

The fourth field of Nicosia’s model is known as “feedback”. Such stage is achieved after concluding the decision making process by the consumer. Nicosia explains that there are two forms of feedback: (a) the feedback that the company receives (through various channels, such as analysis of sales, auditing in shops, different questionnaires, etc.) and (b) the feedback for the consumer that consumed the product/service, and such feedback may lead to a potential change of the attitude of the consumer to the brand and his/her predispositions over that brand (Fotis, 2005).

How does advertising impact the feedback of the company and the feedback of the consumer?

a. Advertising influences the consumer behaviour and that means advertising influences also the feedback received by the company. Advertising influences the consumer’s attitude, his awareness, his perceptions, thus in general in his behaviour. Advertising also impacts the sale of the company. According to Hu, Yuxing Du, and Damangir (2014), advertising may urge the sale of the product/service, by making consumers interested to seek for information regarding a product and afterwards transforming the information seeker into a buyer.

b. In regards to the impact of advertising to the feedback, which is received by the consumer after consuming a certain product/service, it can be stated as follows:

At the moment when a consumer consumes a certain product/service, at the part of experiences in his brain a feedback appears, which has impact on creating new predispositions and new attitudes on the already consumed product. For this reason, studying the consumer behaviour after consuming the product/service is of huge importance, since it impacts the compilation of successful marketing strategies. In our case, through selection of the proper advertising strategy, the company may impact on changing or strengthening the established consumer’s attitude.

#### IV. THE THEORY OF BUYER BEHAVIOUR

Both models of consumer behaviour from Nicosia and Howard & Sheth are considered to have brought a giant step forward in the field of marketing. Both models, though they are different in a variety of details, in essence they are configurations of behaviour, situation and economic variables that impact on the decision making process of the consumer. These two models of consumer behaviour are generic, therefore they may handle different classes of buyer behaviour.

The model that tries to elaborate buying behaviour of both consumers and industrial buyers is the model of Howard and Sheth (1969), which is also known under the name "The Theory of Buyer Behaviour". Even though this theory is focused on selection of the brand, it also includes in itself a set of broader activities related to this part, that is the reason why its authors decided to call it "the theory of buyer behaviour", rather than a theory of brand choice. The theory of buyer behaviour includes four main fields, which are acknowledged

by Howard and Sheth as constructs or variables: 1. Input variables; 2. Hypothetical constructions; 3. Exogenous variables; 4. Output variables (Fotis, 2015).

1. Input variables: consist of three types of stimuli: significative stimuli, symbolic stimuli and social environmental stimuli. Significative stimuli are those stimuli that are communicated by the object of the brand itself; symbolic stimuli are those stimuli that are communicated through the mass media; and social and environment stimuli consist of the information regarding the brand that is provided by the social environment or as also known from the buyer's word-of-mouth. Either significative stimuli or symbolic ones are related to main dimensions of a brand, such as: price, quality, distinctiveness, and availability. (Fotis, 2015).

2. Hypothetical constructs: Present the inner state of the buyer and are divided into two classes: (a) Perceptual constructs – are those that provide and process the respective information and (b) learning constructs are those that facilitate the formation of the concept.

3. Exogenous variables: In regards to impacts from the external environment, Howard and Sheth (1969) distinguish the impacts that occurred in the past and which have embedded in the recollection of the consumer as perceptions and learning constructs, from the impacts that take place within the timeframe of making the decision, and these impacts are exactly known as exogenous variables. With these variables, there can be mentioned the significance of purchase, financial situation of the consumer, consumer's personality traits, social class to which the consumer belongs, his culture, etc.

4. Outputs: Include reactions of buyers that come as a result of interaction among the stimuli and his/her inner state. There can be mentioned here the comprehension of a brand by the consumer, the attitude of the consumer towards a brand; the intention to buy; purchase behaviour; etc.

#### *A. Constructs of the model that are potentially influenced by advertising*

Based on the characteristics of advertising and on the review of Howard and Sheth model, the following discussion tries to identify the constructs of this model that are influenced by advertising.

Referring to input variables, the following impacts of advertising may be identified:

Advertising belongs to symbolic stimuli, thus to the stimuli communicated by the mass media. Given that these stimuli are related to the main dimensions of a brand, such as: price, quality, distinctiveness and availability, advertising impacts on the following dimensions as below.

First, there are two approaches in regards to the impact of advertising to the price paid by the consumer for the product. The first approach considers advertising as market power that changes the consumer taste, it creates loyal buyers for the products that are advertised. As a result of this, the greatest advertisers of products set higher prices for consumers and gain higher profits by reducing the competition in the market. However, according to the second approach, advertising provides valuable information for the consumer, it supplies consumers with information regarding the market, alternatives and existing opportunities, for this reason, advertising actually increases price elasticity and lowers prices. (Farris and Albion, 1980).

Second, analysing the relationship between the advertising and the quality of the product is not easy, since empirical evidence is little and the theoretical work is disputable. A study conducted in the shoes market, by Archibald, Haulman and Moody (1983), found a positive relationship between advertising and the quality of the product. Studies of Federal Trade Committee (1953), Lambin (1976) and Marquardt and McGann (1975) also found a positive relationship, whereas other studies lead to irrelevant or contradictory outcomes (Cole et al., 1955; Farris and Buzzell 1979; Rotfeld and Rotzoll 1976) (Tellis and Fornell, 1988). Regardless of the positive or negative relationship between advertising and quality, what it can be concluded clearly is that there is a relationship between advertising and the quality of the product/service that is being advertised. The debate continues if the products belonging to the group of higher quality are advertised more; or it is invested more in advertising for non-quality products, which the company tries to sell through advertising.

Third, in regards to the relationship of advertising with the distinctiveness of the product, it could be said that brand choice of consumer in essence depends on the ability to distinguish products in the decision making process. One of the best methods used by companies to distinguish their products from the products of competitiveness is advertising. The existing literature suggests that there are visuals that make the consumer distinguish products from one another. However, the opposite may happen when the customer is exposed to a large number of visuals, it can lead to confusion, obscuring perceptions, diminishing the distinctiveness of product attractiveness and increasing uncertainty (Jia, Shiv, Rao, 2014).

Finally, in regards to the impact of advertising on the availability of products, it may be said as in the following. Broad product availability companies usually use TV advertisements to reach the mass market, to which they want to convey their advertising message at a low cost. On the other hand, many consumers buy a newspaper in order to read advertisements they contain, in order to get informed about prices and availability of products and to see which brand offers a discount (Belch & Belch, 2003). Advertising affects the availability of products, given that products that are advertised are apt to be sought more by consumers, and this drives retailers to make sure that these products are available on market shelves.

The advertising impact is also noticed with hypothetical constructs, with particular emphasis on learning constructs. Learning is the process by which experience brings about a change in knowledge, attitude or behaviour of the consumer. Learning begins with the development of a favourable or unfavourable behaviour of the consumer in regards to a company or the products it offers. Advertising also plays a very significant role in learning process. Consumer behaviour may change throughout the learning process, and advertising can be considered as one of the most important sources of learning for the consumer. Some researchers suggest that advertising may be used as positive tool to influence the consumer learning process due to the fact it does never overload the consumer with redundant information, this is due to the fact that the consumer will stop processing of advertisements before being overloaded (Jacoby, 1984). However, it should not be forgotten that the process of learning depends also on factors, such as: motivation of the subject to learn, amount of information that should be learned, and familiarization of the subject with the information in question. In the context of advertising, when speaking about the process of learning, it can then be said that factors such as colour, length of advertisement, music, humour, fables, etc., are factors that influence the consumer (Kassarjian, 1977).

## V. THE CONSUMER DECISION PROCESS MODEL

The Consumer Decision Process (CDP) was first developed in 1968 by Engel, Kollat and Blackwell. Afterwards, this model was subject to numerous changes, and it is today known as one of the best known representations of consumer behaviour (Loudon and Della-Bitta, 1993). What is worth highlighting in regards to this model is that the Consumer Decision Process (CDP) acknowledges a continuity of decision making between what is known as the Extended Problem Solving (EPS) and the Limited Problem Solving (LPS). These two types of behaviours differ mainly by the level of involvement.

Characteristics of EPS include: (a) high consumer involvement; (b) high perceived risk of the purchase; (c) prolonged research, and (d) full evaluation process. In the opposite, characteristics of LPS include: (a) low involvement level; (b) perceived low risk; (c) low motivation for research; and (d) incomplete evaluation of alternatives (Loudon and Della-Bitta 1993).

A behaviour that includes an extended problem solving (EPS), the process is activated when environmental impacts, individual distinctions and memory retained information, contribute to consumer awareness of the gap that exists between his actual and ideal situation, and this is exactly where the consumer recognizes a need. Afterwards, the consumer refers to his/her memory for searching for information regarding alternatives and solution criteria. This is known as internal search. If the internal search does not produce the required information, the consumer is involved in external search of information when such search is dominated by different stimuli. One of the stimuli encountered by the consumer in external search of information in EPS is advertising. What is more important in exposing of the consumer to stimuli is if the consumer trusts the interpreted stimuli and if he/she manages to get convinced regarding the information transmitted by such stimuli. As a result of such process, the consumer already has the required information in his/her mind about alternative products and brands in the market. The consumer influenced by the environment factors or by individual differences determines the evaluation criteria for the alternatives he has in mind, afterwards he takes a decision for selecting a certain alternative. After that, it precedes the purchase of the selected alternative and consequently the consumption.

On the other hand, in cases of LPS, the journey for decision making and purchase of the product is obvious and brief. There is very little, almost no process of information search and evaluation of alternatives.

### *A. Constructs of the model that are potentially influenced by advertising*

During the information search phase, in particular during the external information search phase, advertising plays an important role. A company is always searching in the market for consumers to whom it aims to sell its products/services. Advertising serves for the company as a communication tool.

At the moment when the consumer perceives a problem or need that can be satisfied by the purchase of a product or service, he/she starts with the information search process. It often happens that internal search does not provide sufficient information to the consumer and he/she is therefore forced to commit to the so-called external information search, and it is exactly here the stage in which the impact of advertising is noticed the most.

One of the main sources from which the consumer can obtain information from the external information search is the market-controlled sources, such as advertising, sellers and Internet (Belch & Belch, 2003). Given that advertising is seen as one of the primary sources of external information search by the consumer, marketers are increasingly paying more attention to the message and content that is transmitted to the consumer through advertising. Companies are aware that consumers use the selective perception to filter unwanted or irrelevant advertising messages, therefore they use various creative tactics in order to make their advertising messages be more noticeable. A disputable tactic for which advertising has often been accused of is the impact of advertising to the consumer's subconscious. That was called by Belch & Belch (2003) as subliminal perception, which refers to the ability of an individual to perceive a stimuli (in this case the advertisement), which is below the level of his/her consciousness. Therefore, advertising through the use of various tactics manages to supply the consumer with information also in cases he/she may not be aware of the fact that he/she is being informed through advertising.

The impact of advertising during preliminary evaluation of alternatives: Following the collection of information during the phase of information search, the consumer goes to the stage of assessment of alternatives. At this stage, the consumer compares different brands or products and services, which he /she has identified as convenient for resolving the issue of consumption and to satisfy the needs or motives that began with the decision making process. Different brands identified as purchasing options and which will be considered during the process of evaluation of alternatives are known as consumer's evoked set (Belch & Belch, 2003).

The purpose of the majority of advertisements is to increase the opportunity for a brand to be included in the consumer's evoked set and to be considered during preliminary evaluation of alternatives. Marketers use advertising as a tool by which they aim to make the consumer aware of the brand, and to keep it as long as possible in their memory, in order for this brand to be included into the targeted evoked set of audience. According to Belch & Belch (2003), advertising is a valuable promotion and very important tool for creating and maintaining the awareness of the brand and ensuring that a brand is included in the evoked set. Therefore, through advertising the consumer can be influenced and it leads to inclusion of the product or service to the group of alternatives that he/she considers for evaluation prior to taking a decision to purchase one of them.

The impact of advertising during the purchase: In the process of purchase, the consumer comes to a point where he/she concludes the search for information and assessment of alternatives from the evoked set and therefore makes a decision to purchase. It should be taken into account that the purchase decision is not the same as the actual purchase. After the selection of the product that the consumer selects to purchase, he/she should apply such decision in practice in order to carry out the actual purchase. In this case, other decisions are required to take, such as: when to buy the product, where to buy the product and how much money should he/she spent on it (Belch & Belch, 2003).

Before leaving the house and going out to purchase, the consumer often compiles a list of products that he/she is going to purchase, this is due to the fact that he has already established trust on a certain brand, which results in a repeated purchase of the certain product. The impact of advertising comes to the fore exactly here. For marketers, it is vital to establish and maintain the loyalty of the consumer. In order to achieve this, they use advertising through which they try to keep 'alive' the names of their brands for the consumers; and to prevent the consumers from changing the brands. In other words, efforts are made through advertising in order to influence the purchase decision that will be taken by the consumer.

The impact of advertising during the consumption stage and post-consumption evaluation stage: The process of decision making by the consumer does not end upon the purchase of the product. Following the purchase, it comes the stage of product/service consumption and after the consumption, the consumer compares the level of real performance to the anticipation that he/she has had for the product. This leads to a satisfied or unsatisfied consumer. The consumption stage is of great importance due to the fact that the impressions gained during consumption of product/service will influence the likelihood for a consumer to purchase a certain product/service again. Marketers should pay particular attention to this phase. An unsatisfied consumer does not simply mean not purchasing the product by him/her, but, on the other hand an unsatisfied consumer may disseminate information to the broader audience by preventing the others from purchasing such product/service. It is important at this stage that advertising does not create unjustifiable expectations, which cannot be met in reality by the products/services. Therefore, all that an advertisement can do for the consumption stage, in consumer decision making process, is to be as real as possible and not to create discrepancy between the information it contains and the real quality of the product. Recently, more and more companies are paying attention to communication following the purchase. Some companies send brochures in order to reassure the buyers and to reinforce the wisdom they have shown by selection of their brand for purchase and consumption.

## VI. CONCLUSION

Advertising impacts the consumer's behaviour and this can be argued through the influence it has on different dimensions of behaviour, namely in various constructs of comprehensive models of consumer behaviour, such as: Nicosia model; the theory of buyer behaviour (or Howard and Sheth model); and the Engel, Blackwell and Miniard model of consumer behaviour.

Advertising influences building up of consumer's behaviour, the decision for purchasing and using the product, and the consumer's behaviour after the purchase and use of the product/service. This has been argued through the impact and potential changes in the five main areas of Nicosia's model, which derive as a result of the impact of advertising on them.

The impact of advertising is also noticed when the consumer interferes with the observable reality, specifically when in contact with external stimuli, part of which the advertising is considered to be. Under "the theory of buyer behaviour (or Howard and Sheth model)", this has been argued through illustration of impact that advertising has on the constructs of this model, which are the input and output variables.

Advertising influences the inner state of the buyer. Furthermore, the relationship between advertising and the consumer's behaviour has been known for centuries as a mind body problem. Advertising impacts on provision of information that is processed in the mind of the consumer, in processing of this information and afterwards also in forming the concept in his/her opinion. This has been substantiated through analysing the impact of advertising on hypothetical constructs of Howard and Sheth model.

Significant impact of advertising is noticed in consume decision making process, in particular when the consumer is involved in Extended Problem Solving (EPS). Many times in the reality of a consumer, it is an advertising, whatever that is, the main "cause" that drives the consumer in identifying a need or a problem, of whose existence he/she might have not been aware. Moreover, very often a

beautiful audio and visual illustration, with colours, music and other attractive components, such as advertising is the best and easiest way to be selected as the method of information by a consumer. This selection can frequently be carried out unconsciously by the consumer. Many of alternative opportunities that are in the mind of the consumer, are there because of a good and qualitative advertisement. As soon as the consumer encounters a purchase, it may be the advertisement that is embedded in his memory to be the fact that drives him/her to purchase a certain product. The advertisement should pay attention to the content of the message that is transmitted and to the characteristics of the product/service advertised. Any discrepancy among the expectations established in the mind of the consumer after being exposed to an advertisement and the real perceptions, after consuming a certain product/service, lead to an unsatisfied consumer. In addition, an unsatisfied consumer does not simply mean an individual who will not purchase the product/service of the company any longer – but it means a consumer who will disseminate information to others on the bad experience, by preventing also others from purchasing the product/service.

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# The Use of Interactive Multimedia to Improve Critical Thinking Skills of Primary School Students

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**Abstract-** Based on observations made by researchers in the fifth grade of elementary school, there is a lack of students' activity in the learning process and the lack of teacher's innovation in selecting and applying learning media. These create a less optimal learning process and student learning outcomes that has not achieved the Minimum Achievement Criteria. One of the skills that must be mastered by students is critical thinking. Alternative problem solving is using interactive multimedia in learning. This study uses classroom action research. The research instrument used observation sheets, non-tests and questionnaires. The data analysis technique uses qualitative and quantitative analysis techniques. Increased teacher activity, student activities, student learning outcomes, results of critical thinking skills and student responses to the learning process are the results of this learning process. Increases occur in stages starting from cycle I to cycle III in very good criteria. Based on the results of this study, it can be concluded that the learning process by using interactive multimedia to improve critical thinking skills is able to improve teacher and student activities, learning outcomes and student responses in elementary school.

**Index Terms-** critical thinking, interactive multimedia, learning outcomes

## I. INTRODUCTION

Education itself will continue to follow the life journey of students, because education is actually an endless process that follows humans from babies to death, along with the increasing quality of human life itself. [1]. In the era of globalization, mastery of technology is a prestige of a country's progress. Countries are said to be advanced if they have high technology mastery, while countries that cannot adapt to technological progress are often called failed countries. Indonesia as a developing country is trying to meet the needs of technological advances seen by the application of information technology in the world of education to provide quality education for every citizen. [2] Primary school age between 7-13 years is a period of children who tend to be active and always curious about new things. The selection of learning media for social studies learning for elementary school students must be in accordance with their characteristics, it is necessary to develop learning media that are interesting, effective and fun for students. Media as an intermediary that is used to increase effectiveness and efficiency in achieving learning goals, [3]

Based on the results of observations and interviews at Dukuh Menanggal I / 424 Elementary School Surabaya, it was shown that the use of information technology in delivering thematic learning with IPS material was still rarely done. This activity suggests learning that is still teacher-centered, when learning students who sit behind cannot see what the teacher is doing, then tend to get bored and make the class not conducive. Problems that arise include: 1) lack of teacher innovation during the teaching and learning process and limited time to share some material in class 2) the teacher uses the lecture method; 3) teacher centered learning; 4) lack of interaction between students and teacher. Problems arising from students in the social studies learning process in class V B of Dukuh Menanggal I Elementary School include: 1) students are only objects in learning activities; 2) students only receive material given by the teacher; 3) students do not focus on receiving material and do not pay attention to the explanation from the teacher; and 4) students chat with other students.

The results of the initial test were held only a small number of class V students who achieved the passing grade in the material role of the economy in improving people's lives, students who completed were students who had the ability to read and memorize material.

After doing a reflection in the class, there is a lack of learning outcomes in Social Sciences which analyzes several cases in the economic role of the community. About 65 percent of all students do not get grades above minimal completeness criteria. From some of the problems described above, researchers focus on this case, especially in low student learning outcomes, low student activity and lack of learning media applied by teachers which are not appropriate in social science.

According to Sadiman, et al. Some of the benefits of using media in learning are; 1) clarify the presentation of the message so that it is not too visual, 2) overcome the limitations of space, time, and sense power, 3) increase learning motivation and reduce student passivity, 3) students are able to learn on their own based on student interest, 4) can equate student experience and perception the contents of the lesson [5]. Whereas according to the times, multimedia will benefit the learning process more interesting, more interactive, the amount of teaching time can be reduced, the quality of student learning can be improved and the teaching and learning process can be done at any time, and student learning attitudes can be improved [6]. Critical thinking ability is the activity of analyzing ideas in a more specific direction, distinguishing sharply, identifying, studying and developing in a more perfect direction is a skill that must be possessed by students in the 21<sup>st</sup>-century [7]. Critical thinking skills themselves are one of the 21<sup>st</sup>-century learning skills that are now supported by the existence of technology to access, search, analyze, store, organize, create and communicate information. Students can master critical thinking skills by utilizing e-mail, short messages, and online media to work together with fellow students more easily.

Interactive multimedia has a purpose where students are asked to work together independently in finding the concept of a problem more practically. The use of interactive multimedia will make some students become active in discussions, question and answer, presentations and also pay more attention to learning. In addition, the reason for using interactive multimedia for critical thinking skills is that students can work with their friends by utilizing modern technology-based media during the teaching and learning process. Based on the description above, the researcher conducted a classroom action research entitled "The Use of Interactive Multimedia to Improve Critical Thinking Skills of Primary School Students". Researchers try to turn old traditions into the latest methods, conducive, active and communicative methods. The purpose of this study was to find out the teacher's activities in applying the Use of Interactive Multimedia to Improve Critical Thinking Skills of Primary Students in the fifth grade of Dukuh Menanggal I Elementary School and to determine students 'learning outcomes and students' critical thinking skills in social studies and describe responses to the use of interactive multimedia to improve critical thinking skills.

## II. IDENTIFICATION, RESEARCH AND DATA COLLECTION

This study uses Classroom Action Research (CAR) using a 3 cycle model. According to Kemmis and Mc. Taggart [8], the implementation of Classroom Action Research (CAR) consists of 3 stages, namely: a) planning, b) actions and observations (actions and observations), c) reflection. The subjects of this study were 31 fifth grade students in Dukuh Menanggal I Elementary School. consisted of 17 male students and 14 female students. Research will be conducted for social studies subjects.

The research data is taken from teacher activities, student activities, student learning outcomes, results of students' critical thinking skills and student responses during the learning process. Data collection techniques consist of, 1) Observation of teacher and student activities during learning; 2) Questionnaires that are given as qualitative data for students' responses to using interactive multimedia; 3) Written tests to assess students' critical thinking skills. The instruments used in the study are, 1) teacher activity observation sheet; 2) student activity observation sheet; 3) student response interview questionnaire sheets; 4) Test critical thinking skills. Data analysis techniques in this study are: (1) Analysis of data from observations of teacher and student activities during the learning process, the data collected is then analyzed. (2) Test Analysis using the percentage of learning outcomes of students who succeed to have critical thinking skills and assessment of completeness of student learning outcomes. (3) analysis of student responses during learning.

## III. RESEARCH RESULT

The research will be analyzed to determine the increase in teacher activity, student activities, skills of students' thinking, learning outcomes and student responses in learning cycles I, II and III by using interactive multimedia. From the description, it can be explained by the tables and diagrams below:

### Teacher Activity

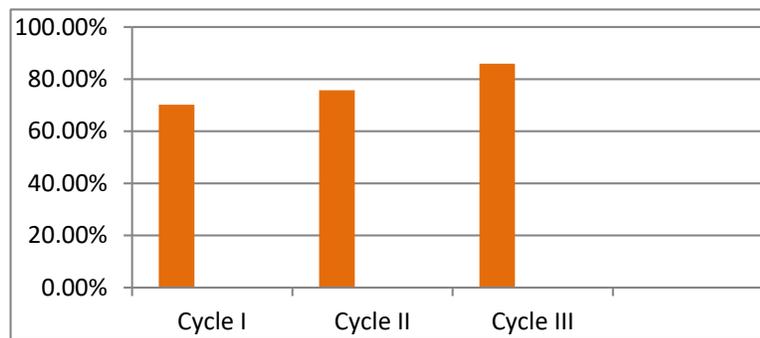
this is a comparison table of teacher activities in cycles I, II and III

Table 1. Comparison of activities in cycles I, II and III

Aspect	Cycle I	Cycle II	Cycle III	Results
Average increase in teacher activity	70,18%	75,74%	85,91%	Increase

Below is a comparison diagram of teacher activities seen in cycles I, II and III

Diagram 1. Data Comparison of teacher activities using interactive multimedia during learning



From the tables and diagrams above, it can be seen that the teacher's abilities and activities increase from cycle I, cycle II and cycle III. This research shows that the use of interactive multimedia on social studies learning in grade 5 elementary school can be implemented properly by the teacher. The average percentage of teacher activity in using interactive multimedia in social increased from the first cycle of 70.18% to 75.74% during the second cycle and 85.91% in the third cycle. Increased teacher activity can be seen from reflections carried out after the implementation and observation in the first cycle and second cycle.

In the first cycle, the increase in teacher activities did not meet the expected research indicators. After reflection, the researcher continued on cycle II. After the implementation of the second cycle of learning was carried out, it was seen that the activity of the teacher had fulfilled the expected research indicator criteria. However, the researcher continued to cycle III to check the validity of the results, and it was seen in the third cycle that teacher activity fulfilled the expected and increasing research indicators.

**Student activities**

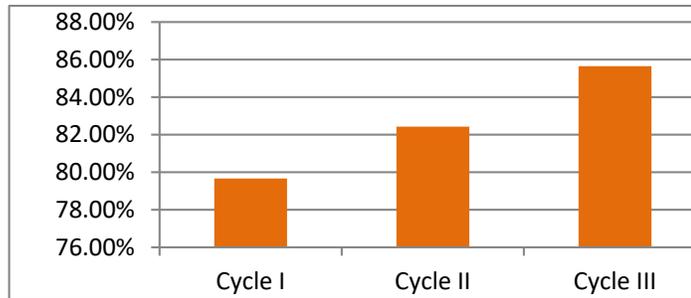
This is a comparison table of student activities in cycles I, II and III

Table 2. Comparison of student activities in cycles I, II and III

Aspects of improvement	Cycle I	Cycle II	Cycle III	Criteria Results
Average increase in student activity	79,67%	82,43%	85,65%	Increase

Below is a comparison diagram of student activities seen in cycles I, II and III

Diagram 2. Data Comparison of student activities using interactive multimedia during learning



From the tables and diagrams above, it can be seen that students' abilities and activities have increased from cycle I, cycle II and cycle III. This research shows that the use of interactive multimedia in social studies learning in grade 5 elementary school can be implemented in students. The average percentage of student activities in using interactive multimedia increased from 79.67% in the first cycle to 82.43% during the second cycle and 85.65 % in the third cycle.

In the first cycle, the increase in student activities has met the expected research indicators, but students are still adapting to the learning media so that the results are not too maximal, after reflection, the researcher continues on the second cycle. After the implementation of the second cycle of learning is done, it appears that student activities have met the criteria of the expected research indicators and experienced improvement. Continuing to cycle III to check the validity of the results, and seen in the third cycle the activities of students who have adapted to the learning media used, namely interactive multimedia meet the expected research indicators and experience a fairly high increase.

**Student learning outcomes**

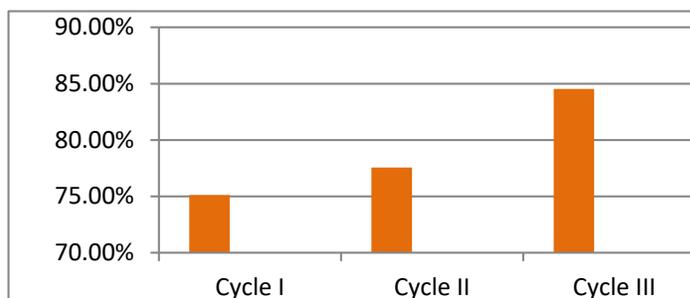
This is a comparison table of student learning outcomes in cycles I, II and III

Table 3. Comparison of student learning outcomes in cycles I, II and III

Aspects of improvement	Cycle I	Cycle II	Cycle III	Criteria Results
Average increase student learning outcomes	75, 12%	77. 56%	84,54%	Increase

Student learning outcomes data can be seen from the diagram below:

Diagram 3. Data on student learning outcomes using interactive multimedia to improve critical thinking skills



From the tables and diagrams above, it can be seen that student learning outcomes have increased from cycle I, cycle II and cycle III. The average percentage of student activity in using interactive multimedia increased from the first cycle of 75.12% not fulfilling the expected criteria, namely if the completeness of learning outcomes reached 80%, in the implementation of the second cycle student learning outcomes increased to 77, 56, the results were also not reaching 80%. When implementing the third cycle 82.43% during the second cycle and 85.65 % in the third cycle. There was an increase in student mastery learning with a percentage reaching 84, 54% and fulfilling the criteria for achieving 80%. In accordance with Trianto's opinion that the percentage of increasing student learning outcomes must be more or equal to 80% and cooperative learning can improve student learning outcomes. [9]

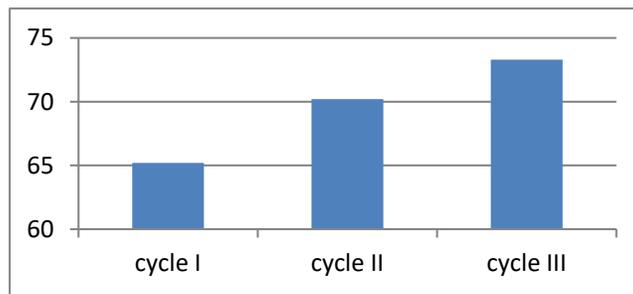
**Results of Student Critical Thinking Skills**

This is a comparison table of the results of students' critical thinking skills in cycles I, II and III

Table 3. Comparison of the results of students' critical thinking skills in cycles I, II and III

Aspects of improvement	Cycle I	Cycle II	Cycle III	Criteria Results
The average increase in students' critical thinking skills	65,2	70,2	73,3	Increase

Diagram 3. Data on the results of critical thinking skills students use interactive multimedia to improve critical thinking skills



From the tables and diagrams above, it can be seen that student learning outcomes have increased from cycle I, cycle II and cycle III. The average percentage of critical thinking skills of students using interactive multimedia increased from cycle I 65.2 not fulfilling the expected criteria, in the implementation of the second cycle students' critical thinking skills increased to 70.2, these results have reached the expected criteria are very critical. And when implementing the third cycle the results of students' critical thinking skills have increased to 73.3. These results have shown the fulfillment of the criteria that students have experienced improvement in accordance with the expected indicators. In accordance with Arikunto's opinion that critical thinking skills are said to be successful if the students' skills fall into the critical category ( $66 \leq N \leq 79$ ). [10]

**Student response**

The results of student responses from questionnaires filled in each cycle, students fill out questionnaires in cycle I, cycle II and cycle III, shown in the table below:

Table 4. Comparison of student responses from cycles I, II and III

Aspects of improvement	Cycle I	Cycle II	Cycle III	Criteria
Students respond to the use of interactive multimedia in improving critical thinking skills	82,14%	87,01%	87,57%	Increase

The results of comparisons of student responses are also presented in the following table:

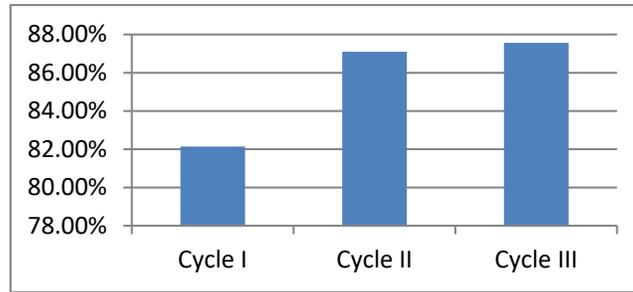


Diagram 4. Data of student response in social science of implementation Two Stay Two Stray

From the tables and diagrams above, it appears that in the first cycle students' responses are still low because students never use interactive multimedia as a medium of prior learning. The results of student responses in the first cycle of 82.14% have not reached the expected rate of 80%. The response of students in the second cycle increased to 87.01%, indicating a good improvement and achieving the indicators of this study. In the third cycle, there was an increase in results even though it was not significant. The response of students in the third cycle was 87.57% and had reached indicators that were more or equal to 80%. [11]

From the description above it can be seen that interactive multimedia makes it easier for students to understand and enjoy applying learning material that contains information about facts, time (time) and attitudes such as social science in developing economic activities in people's lives. In the implementation of interactive multimedia, results are obtained by increasing teacher activity, increasing student activity, improving student learning outcomes, increasing students' critical thinking and increasing student responses to learning that has been done. This is in line with Muhtadi's opinion which states that multimedia used in the right direction can improve psychomotor development for the better and strengthen the visual process of the users. [12] Multimedia also provides opportunities for students to develop learning techniques so as to produce maximum results. Interactive multimedia implementation is one of the ways and variations that can be used by teachers to improve student learning outcomes, especially in critical thinking skills. In this study, not only focuses on improving children's learning outcomes in but also includes other observations, namely competency skills and attitudes.

#### IV. CONCLUSION

Based on the results of this study, the use of interactive multimedia to improve critical thinking skills in 5th grade students of Dukuh Menanggal I Elementary School Surabaya can be summarized as follows: 1) the results of the average teacher activity can be concluded that the use of interactive multimedia to improve critical thinking skills has increased from cycle I to cycle III; 2) the average results of student activities experience an increase from cycle I, cycle II, to cycle III; 3) the use of interactive multimedia to improve critical thinking skills also improves student learning outcomes and critical thinking skills, this can be seen from the percentage of classical completeness in cycle I to cycle III; 4) the results of student responses can be seen in the questionnaire on the use of interactive multimedia to improve critical thinking skills also increased. The application of this learning multimedia makes students attractive and reduces learning difficulties in social studies subjects.

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# Arduino based bi-functional Automated Bridge System

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**Abstract** Many bridge systems have been presented but there are still some limitations in terms of the high cost. One function and difficulty of use that is not satisfactorily reliable and cannot be developed. There are two portions in this system. They are toll gates control system and auto bridge plates system. Arduino Uno is also used to control the stepper motor to lift bridges plates and servo motors are used to control tollgates. Therefore, the aim of this research project was to design and develop a prototype for an auto bridge system. It has a user-friendly interface, scalable and reliable by using an integrated system of hardware and software. The hardware such as Arduino Uno, servo motors, stepper motors, variable registers and wires are utilized to develop the prototype of an auto bridge system.

**KEYWORDS:** Auto Bridge, Arduino Uno, Servo Motor, stepper motor, registers

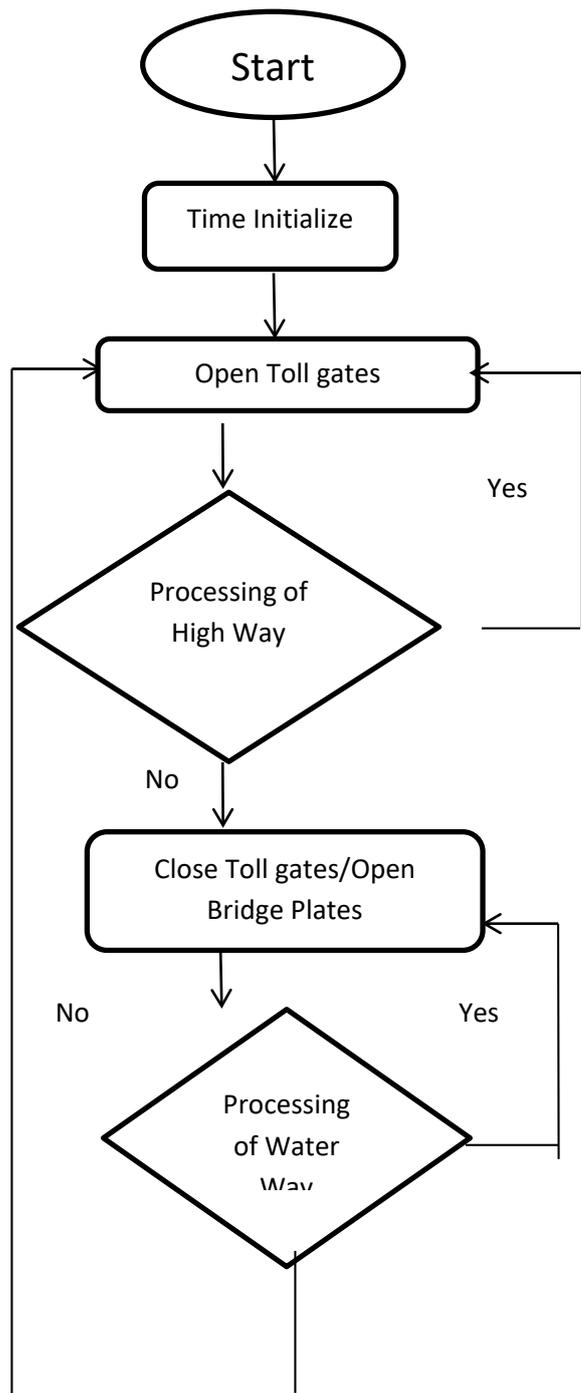
## 1. Introduction

Nowadays, increasing traffic volume causes congestions commonly around the toll gate of highway. Therefore, the new technique is urgently required to reform the problem of congestions. Automated bridge system is one of the methods to solve the above conditions. The automated bridge system is composed of several subsystems. Automated bridge system can bring the several sectors for toll gates as saving time and reducing the human workers. Develop the prototype model, which reproduces the operation states of various toll gate systems: passing time and waiting time. The main objective is to implement a low cost acquisition system intended for control applications using the Arduino prototyping platform.

## 2. Experiment

### 2.1 Experiment apparatus

My native is Rakhine state in Myanmar. It is coastal region and it has plenty of rivers. Many bridge systems have been presented but only one transport, high way. This system is provided bi-functional transport, high way and water way .There is can be used by various vehicles above the bridge and ships and boats can be passed under the bridge. The use of automated bridges system in many metropolitan cities would be an efficient step towards the overcrowding of the city highways in heavy congestion of traffic. It provided with two toll gates at each end of the bridge. Toll gate is made with Servo motor to lift up and down of toll gate's hand. While vehicles pass the bridge toll gate's hand is lifted, water way is closed. When toll gate's hand is down, it doesn't allow passing the vehicle. Bridge is provided joining by two bridge plates in the middle. One end of bridge is provided with two stepper motors to lift up and down the bridge plates. When both toll gates are closed, the signal LED is on and the water way is opened by lifting the bridge plates from two ends of the bridges. Opening the water way, the vehicles aren't allowed to pass above the bridge by closing the toll gate and ships can pass through the bridge plates. This project is made by using cardboards and system only. As we all know, transportation is the strength of our country's economy. My project paper will support to carry many loads and passengers by the ships and the boats. The system has been evaluated with the previous works and it was demonstrated to obtain some feedback on the prototype. The testing of the prototype demonstrated that the system was an integrated practical and easy to use and any new device could easily be installed into the system. The aim of this research project has been achieved successfully.



**Figure1. Flowchart of the System**

**2.1.1 Hardware Modules**

The major components of the gate control system are as follow:

1. Arduino Uno Board
2. Servo Motor

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**3. Stepper motor**

**1. Arduino Uno Board**

Arduino is an open source, computer hardware and software Company. A user community that designs and manufactures microcontroller kits for building digital devices. Interactive objects that can be sensed and control objects in the physical world. The project's products are distributed as open-source hardware and software. Arduino Uno is embedded board used in our system. It is an open source hardware and software for developers. It is basically easy to code and easy to use. It is used when same program is to be performed under nested loops. Arduino is connected with Computer attach at toll booth. [1]

**Software Components** Arduino programming: The purpose of the Arduino programming is to control the operation of the Arduino microcontroller. This program is fed into the printed circuit board through the ports in order to perform required task. It is simple and it controls the overall process on the basis of the conditions given in the program.

**Hardware Components**

**Microcontroller:** The Arduino microcontroller UNO is the brain of the entire system. The controller receives the commands from servo motor and stepper motor. [4]



**Figure2. Arduino Uno board**

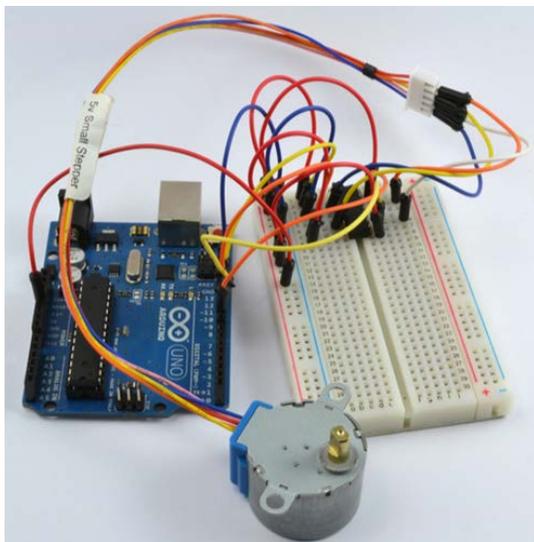
**2. Servo Motor**

Servo motors have several distinct advantages over steppers. They can generate high torque over a wide speed range on demand, and are available in wider torque ranges and higher voltages (up to 480 Vac). They respond to disturbances with a torque much greater than their continuous capability and use only the power required to accomplish the commanded motion and are compact. Two servo motors are used to lift up and down the tollgate's hand in this project.



**Figure3. Servo Motor**

### 3. Stepper motor



**Figure4. Connection of Stepper motor and Arduino**

The stepper motor is an electronic device that converts digital pulses into mechanical shaft rotation. The most significant advantage of stepper motor is its ability to be accurately controlled in an open loop system. It is simple motor used to rotate the barrier which is connected to the Arduino board. It can be access by using specific servo library available  
The advantages of stepper motor are –

- Low cost and high reliability
- High torque at low speeds and a simple
- Rugged construction that operates in almost any environment

There are two types of stepper motor. They are unipolar stepper motor and bipolar stepper motor. The unipolar stepper motor is used for this system because its winding is made relatively simple with the communication circuit than bipolar

stepper motor in open loop system. The supply voltage for motor is 12V. This motor is used to lift up and down of bridge plates.



**Figure5. Circuit connection of Arduino, Stepper motor and Servo motor**



**Figure6. Auto bridge system**



**Figure7. Toll gate with Servo motor**

### 3. Analysis

The main aim of this paper was to develop an auto bridge system by implementing of stepper motor and servo motor. Servo motor is light but it give out high output power. This means that it lift heavy power. This project paper used two servo motors for toll gate and two bridge plates are lifted with 4 stepper motors. The servo motors are connected directly to Arduino Uno by connecting the wires of the servo motor to Arduino Uno. The servo motor is principally connected by three wires to Arduino Uno: ground, power and signal. The ground wire was connected to the ground pins of the Arduino board and the power wire was connected to the 5-volt power pin. The signal wire of servo motor connected to the digital Input/ Output pins. The whole system was assembled in auto bridge prototype which was designed to accommodate all of the Hardware components. [2]

### 3.1 Discussion

In the first, each of Bridge plates is connected with servo motor to lift the bridge plates. Lifting is quickly and no systematically in the first. Later is become systematically. So, I prepared this project by replacing with two Stepper motors. Stepper motors have several major advantages over servo systems. They are typically lower cost, have common NEMA mountings, offer lower torque options, require less costly cabling, and their open loop motion control component makes machine integration simplistic and provides ease-of-use to end users. It is all about utilizing these technologies with balance to achieve the desired process performance for a given machine design while balancing cost versus the capability of the required mechanism. Machine designers shouldn't limit utilization of steppers or servos by a predetermined mindset or comfort level, but learn where each technology works best for controlling a specific mechanism and process to be performed. Servo motors are extremely repeatable because they run closed loop. But steppers can be just as repeatable in many applications, especially when running in one direction. [5]

## 4. Conclusion

In conclusion, the main goal of this project was to design of an auto bridge system by the overcrowding of the city highways and waterway in heavy congestion of traffic by using an Arduino Uno, two servo motors, two stepper motors and it has been achieved. As we all know, transportation is the strength of our country's economy. This research project also represented a good beginning point to develop an auto bridge system that could be someday met at low cost that is easy to use and reliable. It strengthens the argument made in this research that due to the advancement of technology; it is possible to improve systems at low cost and in two transport way which required a relatively low level of maintenance. The

testing of the prototype demonstrated that the system was easily used and any new devices that are reliable, scalable for development and of the very low cost compared to the current products available in the market can be installed on it. The overall cost of the system was approximately \$50. It was determined as the price of each component that has been utilized in this project. Nevertheless the price of the prototype will be reduced when it is presented in the market so all individuals; especially in developing countries can take advantage. System testing of software and hardware has been applied to conduct on a complete. The integrated system also to evaluate the system's compliance with its specific requirements. And the result was all stages work fine. Finally, this research provides useful lessons and information that could be utilized to support future research. This prototype of the system is designed as to be simple, low cost and easy to use. Nevertheless, the prototype still requires further development and improvement in terms of the functionality of the system.

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# A Transformation of Foothills of South Uzbekistan (In The Sample of Kashkadarya Basin)

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**Abstract-** The changes in plant ecology in the Kashkadarya basin area in Uzbekistan have been investigated since 2012. According to the result of the investigation, the number of livestock and pasture are increasing as the population increases, as well as soil erosion, greenhouse effect and desertification. More eco-friendly and sustainable education should be implemented for conservation of ecosystem in this area.

**Index Terms-** pasture, degradation, Uzbekistan, plant, livestock, grazing, ecology, greenhouse effect, desertification

## I. INTRODUCTION

In this paper, we share information on the ecosystem in Uzbekistan and address the issue of development and conservation in this region.

The Kashkadarya region includes of Karshi depression in southern Uzbekistan, bordered in the north by the mountains of Koratepa, Zirabulok, Ziyevuddin, in the east - by the foot of the southwestern part of the Gisar ridge [3]. As a result of the study, we analyzed a plant of mountain pastures and determined the current state of pastures in the Kashkadarya basin. The territory belongs to the temperate climatic zone. The climate is dry continental with long, hot and dry summer season; the winter season is short with mild frosts and little snow. The average annual temperature is 13° C - 14° C, the average temperature of January is 0° C - 2° C, average temperature of the July is 26° C - 28° C, the annual precipitation is 400 - 600 mm [6].

One of the leading branches of agriculture is animal husbandry, and it is important to conduct a scientific, practical study, assessment of the material source of its development - natural food (source of hay) - pasture types. This work arose in the process of implementation and the requirements of economic development, subsequently the requirements of the national economy, and is one of the urgent tasks of modern science and technology. The types of pastures - natural territorial complexes with similar climate, soil, fertility, season, when cattle and types are grazed - are determined by the edificatory types of plant families. There is a need to determine their ecological status: structure, composition, fertility, and degree of damage (degradation, transformation), types of damage factors (damage), and other quantitative and qualitative indicators. The foothill pastures of the Kashkadarya basin are one of the main bases for the development of animal husbandry, in recent years the fertility

of which is reduced under the influence of metrological factors [4]. Uzbekistan took an active part in working out the United Nation's Convention on Desertification Control and ratified it in 1995.

Scientific and practical works on the ecological study and restoration of pastures were carried out in several countries. An investigation of the pasture monitoring in New Zealand was studied by Dave Clark, Annette Litherland, Gonzalo Mata and Robert Burling-Claridge. 20% of the farmer's budget is satisfied by pastures, and to increase this indicator by 50% is the main aim. In California, 52 of plant species are grown in 4 categories. These are: 1. Pasture herbs. 2. Broad leaf pastures herbs. 3. Irrigated pasture herbs. 4. Irrigated broad leaf pasture herbs [2].

The decline in forests in the Central Asian countries has been influenced primarily by anthropogenic factors. Since 1996, 1 million hectares of forest areas have been lost. However, forests are estimated at about 28% in Uzbekistan [1].

Uzbekistan, a part of which is the Kashkadarya basin forests, is also diverse. The unique geomorphological structure and climatic conditions of the Kashkadarya basin, that the diversity of natural conditions are essential and these determine the richness of region's flora, seasonal and regional distribution are specific for the basin.

The main sources of statistical analysis of the foothill pasture of the Kashkadarya basin are the «Flora of Uzbekistan» and «The determinant of plants in Central Asia». First edition of «Flora of Uzbekistan» in 6 volumes was published in 1941-1961. 3666 species of vascular plants, belonging to 1153 genera and 125 families were included in this revision. About 500 species of cultivated and introduced species were listed in this edition as well. Since 1969-1991 a large team of former Soviet Union botanists published the «Conspectus Florae Asiae Mediae» with about 9000 species (in 10 volumes). The area of this revision includes of 5 republics (Uzbekistan, Turkmenistan, Kazakhstan, Kirgizstan and Tadzhikistan). Starting from 2012 Uzbek botanists are working on new 2 edition of «Flora of Uzbekistan» planned e-flora in the Internet. Still new species are found and described every year at this area. Nowadays there are about 4500 species naturally growing here. First edition of Red Data Book of Uzbekistan was published in 1984 with 124 species. In 2009, 4th edition was published with 321 species of vascular plants. Amount of disappeared species increased from 4 to 18.

II. MATERIAL AND METHODS

The area of research is situated in Kashkadarya basin foothills. Foothills and the lower mountain belt are characterized by ephemeral-ephemeroid and sagebrush-ephemeroid communities, formations of halophytes and gypsophytes, fragments of xerophytic shrubs (*Amygdalus spinosissima* Bunge). Large areas are covered by rained crops and fallow lands with ruderal vegetation. Tall grass communities with domination of *Elymus hispidus* (*Elytrigia trichophora*) and sparse juniper woodlands are developed in the middle mountain belt. The territory belongs to the temperate climatic zone. The climate is dry continental with long, hot and dry summer season; the winter season is short with mild frosts and little snow. Field research was performed during June 2012 until now by traditional phytosociological methods with description of plant associations, collection of herbarium and photographing of surveyed plots [5, 7].

III. RESULTS AND DISCUSSION.

The majority of sheep and goats are grazed on the desert and semi-desert natural pastures in Uzbekistan. In the Adyr pastures of

the Republic of Uzbekistan, about 3.8 million hectares of the area can not be provided for the needs of livestock.

So we researched scientific work in southern parts of Uzbekistan that situated in Kashkadarya basin and defined about 371 of plant species: trees – 13, bush and small bushes - 34, semi-bushes - 19, semi - small bushes - 15, perennials - 316, biennial - 27, and annuals - 303. The living forms of the tree mainly belong to the family of Salicaceae and Rosaceae, forming the tugai and foothill pine trees (Table-1.2).

The presence of endemic and rare species in the flora of the Kashkadarya basin indicates that they have a unique history of development and that there is a risk of loss of certain species due to anthropogenic factors. As it is known, the ecological structure of the flora is mainly dependent on the external environment and the type of soil. If environment is more complicated, the variety of plants is more viable. The analysis of the vital form of plants leads to the linkage of the problem of its historical development (genesis). In addition, the study of the ecological composition of plants reveals one aspect of its historical development.

**Table-1. Leading family and species of plants in foothills in the Kashkadarya basin**

№	Family	Number		%	Genus	Number	%
		genus	species				
1	Poaceae	39	63	26	Astragalus	21	31,3
2	Asteraceae	23	33	14	Gagea	8	11,9
3	Fabaceae	17	45	16	Hordeum	6	9
4	Boraginaceae	17	22	10	Bromus	6	9
5	Apiaceae	15	16	8	Artemisia	5	7,4
6	Caryophyllaceae	12	23	9	Aegilops	5	7,4
7	Lamiaceae	9	15	6	Convolvulus	4	6
8	Brassicaceae	8	9	4	Delphinium	4	6
9	Liliaceae	5	12	4	Polygonum	4	6
10	Rosaceae	5	8	3	Allium	4	6
total		150	246	100	Total	67	100

**Table-2. The viable forms of plants in foothills in the Kashkadarya basin**

No.	Viable forms	Number of species	%
1	Trees	7	1,9
2	Bush	14	3,8
3	Semi-bushes	7	1,9

4	Small bush	2	0,5
5	Semi small bushes	5	1,3
6	Perennials	175	47,2
7	two year old herbs	13	3,5
8	One year old herbs	142	38,3
9	One year old or two year old	6	1,6
	Total	371	100

We can see from the table, uncontrolled feeding of livestock and collection of medicinal plants without taking into account the vegetative process leads to a significant shortening of the ecological amplitude of these species. Particularly, Komarovia Korovin, which is characterized by the mono-endemic of Zarafshan mountain ranges on the border of the Zarafshan Range (The part of Kashkadarya basin) and Kitab Geological Reserve, was observed to have an increased influence of anthropogenic factors. If we do not fulfill the safeguard measures, the number of plant species would be increased in the Red Book. Also, Iris svetlanae (Vved.) F.O.Khass. is an endemic species grown on the slopes of the mountain chain in Gissar and grows from Dehkanobod to the Baysun village. There is a need to maintain the range of this species.

[1]

#### IV. SUGGESTION

The Aral Sea and water disputes in Central Asia are well known. However, the degradation of grasslands will be continued, caused by the development of animal husbandry. In order to prevent this, more environment and sustainable development education should be implemented.

All primary schools in Uzbekistan cover environmental issues in the subject "Surrounding World" at levels 1 and 2, and in the subject "Man and Nature" at levels 3 and 4. There are no environment courses as such in the secondary and high schools. Some environmental subjects are integrated in courses on natural sciences and on health and human life. Manuals were developed on Biodiversity, Man and Earth, Man and Air and on Water as Source of Life for levels 5 to 9 as supplementary learning materials.

However, teachers and schools are less interested in environmental and ecological changes. Before the problem

becomes more serious and difficult to reverse, it is needed to promote public awareness and education about ecosystem conservation more actively.

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# Influence of Supply Chain Management On Performance of Textile Firms in Kenya, A Case of Nairobi City County

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**Abstract-** This study was to establish the influence of Supply chain management on performance of textile firms in Nairobi City County. All the four variables had a strong effect on the influence of supply chain management in the performance of textile firms in Kenya and this study recommends a further study on other textile firms from other counties in Kenya. So as to validate the existing findings, with this new finding, hence arrive at a general consensus.

**Index Terms-** Inventory management, relationship management, information flow and Lead time

## I. INTRODUCTION

Supply chains have grown more global and interconnected; as a result they have increased their exposure to shocks and increased the frequency of disruptions. Supply chain speed only exacerbates the problem. Even minor missteps and miscalculations can have major consequences as their impacts spread like viruses throughout complex supply chain networks (Greve & Davis, 2013). As compliance mandates, suppliers and information flows multiply, supply chains are becoming more complex, costly and vulnerable. Organizations are finding it increasingly difficult to respond to these challenges, especially with conventional supply chain strategies and designs (Godinho & Veloso, 2012).

In Kenya measurement of the supply chain performance is highly dependent of satisfying the needs of the consumer at a minimal cost as possible this requires that indicators of performance at every stage of the chain are contributing adequately enough to the production of the final product not only financial but also any other supportive activities (David & Solomon, 2012). There has been a lot of issues on transport issues in the Kenyan textile market due to jams and high cost of transport even this cost are transferred to the customers which make the products more expensive than the imported textile material. In order to minimize this cost companies should strive to embrace techniques as just-in-time whereby an order is only processed when a demand has raised. Over the decades there is high interest that different practitioners have increased attention to the benefits gained from an effective supply chain management (SCM) practices because of high competitiveness in any type of industry not only the textile firms (Brown & Hyer, 2010)

In Nairobi city county textile firms have gained huge recognition due to its potential in play a key role in employment and increasing economic diversification for Kenyan citizens hence

in the long run offering new opportunities for Kenyan businesses to get an increasing share of the global market. The textile sector played a substantial role in underpinning the African Growth and opportunity act. It also shows there is offers more opportunities for growth and job employments to the young citizens through the increased value capture and logistics systems that are streamlined (Toroitich, Mburugu & Waweru, 2017). The textile sector in Kenya grew at 3.5% in 2015 and 3.2% in 2014, contributing 10.3% to gross domestic product (GDP). On average, however, textile has been growing at a slower rate than the economy, which expanded by 5.6% in 2015. This implies that the share of textile in GDP has been reducing over time. As a result, it can be argued that Kenya is going through premature deindustrialization in a context where textile and industry are still relatively under-developed. Kenya seems to have 'peaked' at a point much lower than in much of Asia (Chandra, 2010).

## 1.2 Inventory Management

Inventory is the total amount of commodities or materials contained in a store house or warehouse at a given time. It can refer to both the total amount of commodities and the act of counting them (Subba, 2016). Inventory management refers to the tracking and management of commodities which includes the monitoring of commodities moved into and out of stockroom locations and the reconciling of the inventory balances. Inventory management plays a crucial role in providing efficient flow of materials from upstream side of the supply chain to the downstream. In the long run this ensures the required goods and services for the textile firm are readily available to the market at an affordable prices. In the firm, all inventory policies must be of benefit by driving period operating expenses and working capital requirements (Solomon & Ayebale, 2017). There are many reason to keep stock but in an industrial sector like textile where completion is very strive stoking to much can be detrimental because that is tying down capital that can be used elsewhere to generate revenue for the organization. Assuming that all stages in a supply chain there is a warehouse so stoking to much in every level the cost of holding cost could be so high that even some firms can end up spending too much on administration cost, obsolescence and deterioration of materials which in the long run will make majority of the participants in an specific chain whereby the supply chain management isn't taken seriously end up being under- receivership (Shiferaw, 2015).

## 1.3 Relationship Management

This is an approach used by many organizations in aid to improve and strengthen their relationship with the suppliers in order to improve the customer satisfaction in the long run. It also helps in engaging the suppliers in a specific level that will improve the organizations performance. In this case this mean that in any perfect competition market where by the similarities among product are heterogeneous and difficult to differentiate their cannot be a single strategy that can be applicable to all suppliers due to different costs involved by every supplier in producing a single unit (Pervan, Pervan & Ćurak, 2017) In the textile market the is always high level of competition hence more emphasis and focus is shifted to very small elements that impact the returns of the organization. In order for relationship management to work collective unit in improving the performance of the textile firm in relation to the supply chain management improvement all employees and stakeholder in the firm must understand the majority of the benefits accrued by ensuring the organization has health long term relation with their suppliers at all times. This will ensure that all workers in the firm work towards ensuring the procurement goals and organizational resources are collectively utilized in yielding value for money for the customer hence contributing more to the firms demand function (Owuoth & Mwangangi, 2015). According to Pervan *et al.* (2017), the intense competition worldwide and the concept of globalization has led to smaller firms struggling in balancing their expenses with their cost because at the end of the day the market will always remain the same and the primary goal for every firm is to maintain or rather increase their market share on routine basis and the main difference between a world class business that has flourished for more than 10 years with other businesses is how they manage their cash flow and suppliers.

#### 1.4 Information Flow

Managing information flow (MIF) can often give firms a competitive advantage by providing the right information to the right people in the right format and at the correct time. In many cases, firms and individuals are willing to pay firms for this type of information. The primary purpose of an MIS is to help an organization achieve its goals by providing managers with insight into the regular operations of the organization so that they can control, organize, and plan more effectively and efficiently (Osei-Tutu, 2016). One important role of the MIS is to provide the right information to the right person in the right fashion at the right time. In short, an MIS provides managers with information, typically in reports, that support effective decision making and provides feedback on daily operations. Note that business transactions can enter the organization through traditional methods or via the Internet or an extranet connecting customers and suppliers to the firm's transaction processing systems ((Pervan *et al.*, 2017). According to Omisore (2014), the use of management information systems spans all levels of management. That is, they provide support to and are used by employees throughout the organization. Data that enters an MIS originates from both internal and external sources. The most significant internal source of data for an MIS is the organization's various TPSs and ERP systems and related databases

#### 1.5 Lead Time

According to Normanyo, Ansah and Asante (2016) It is obvious to take note that these days especially in the textile sectors demand and supply will never be the same at all time but one of the main priorities in majority of the organizations is to come up with mechanisms to reduce the taken in distribution and supply of the products demanded at the market. These also require a continuous update and follow up of the cycle of demand by forecasting the quantities which might be ordered in the next purchase. Due to increased competitive levels and changes in the market it almost uncertain that any firm can know for sure their demand level. Regardless of the time take from point of order to need satisfaction proper understanding of the competitive nature from other suppliers and distributors in order to stay proactive and remain competitive win not only the local market but also the global market. According to Lysons and Farrington (2013) When firm compete the main focus should be to ensure that they remain at the market and retain their market share especially in the textile industry whereby their products are heterogeneous this will ensure that the cost of production is reduced, minimum waste and increasing returns

#### 1.6 Performance of Textile Firms

Performance is the competency of an organization to transform the resources within the firm in an efficient and effective manner to achieve organizational goals (Barasa, Simiyu, & Iravo, 2015). Organizational goals vary depending on the purpose for which they are established. Business organizations, like textile firms, have profit, growth and survival as the main goals. The popular ratios that measure corporate performance can be summarized as profitability and growth: return on assets (ROA), return on investment (ROI), return on equity (ROE), and return on sale (ROS), revenue growth, market shares, stock price, sales growth, liquidity and operational efficiency. According to Chandra (2010), proposed two measures of return on assets and sales growth for measuring firm performance: objective (actual amount) and subjective (perception). If objective performance measures are available, they should be utilized otherwise, subjective performance measures will be the alternative due to the absence of accurate objective performance measures. The competition keeps on increasing in today's and the only firms that remain at the global markets are those with strong supply value chain with a back bone of a reliable competitive advantage. In any case supply chain as a benefit to many firms seeking to flourish in this dynamic world by helping the firms in solving and managing risks also complexities in the global are sourcing market. Integration and team work is so crucial for the success of an effective and efficient supply chain activity from upstream to downstream. Also the participants of the supply chain function must focus on achieving the same goals and objectives, the supply chain function is characterized by long health relationship with the suppliers, the flow of materials from the right source, at the right or rather best price, at the right quantity, right quality and distributed to the right location at the required time (Ogot, 2014).

## II. RESEARCH DESIGN

The research design in this study was descriptive research design. The study describes the phenomena of this study in details with the help of both qualitative and quantitative research design.

This approach allows both the qualitative and quantitative approaches to complement each other in addressing the research problem the study is trying to solve (Cheng, Fung Kei, 2014).. The design was very helpful considering the level of competition which increases every minute it is imperative to ignore the times of events that have a cause-effect on the performance of textile industry and this approach puts more emphasis on matters at hand rather than the past and the future which is uncertain. Finally it provides facts and suggestions on relationship between variables and their apparent causes (Franzosi, Roberto; Doyle, Sophie; McClelland, Laura; Putnam, Caddie & Civari, Stefanie, 2013).

**2.2 Reliability Analysis**

This study undertook a pilot test of the research instruments in a view to determine reliability of the data collection instruments, also known as the questionnaires. The Cronbach’s alpha was used to measure internal consistency of the operation under this study. According to (Saunders et al., 2012) the Alpha value threshold results at 0.7 and above is good. Alpha values greater than 0.9 ( $\alpha \geq 0.9$  is Excellent) can be considered excellent,  $\alpha \geq 0.7$  but  $< 0.9$ , considered good,  $\alpha \geq 0.6$  but  $\alpha < 0.7$  considered acceptable,  $\alpha \geq 0.5$  but  $< 0.6$  considered poor, while alpha values less than 0.5 ( $\alpha < 0.5$ ) are considered unacceptable. This is in line with Kothari (2011). The study benchmarked its reliability test against these alpha values for all the variables under this study.

The results, shown in table 4.2 below, all the variables were found acceptable with alpha levels above the 0.7 threshold. More specifically, inventory management had the highest reliability ( $\alpha=0.891$ ) followed by performance of textile firms ( $\alpha=0.871$ ) then

relationships management ( $\alpha=0.788$ ), then information flow ( $\alpha=0.783$ ) and lead time was ( $\alpha =0.793$ ) had the lowest respectively. This finding is in line with the findings of Osorio et al. (2015). The study found that the analysis was reliable and could be used for further investigation.

**Table 2.1 Reliability Coefficients**

Variable	Cronbach’s Alpha
Inventory management	0.891
Supplier Relationship	0.788
Information Flow	0.833
Lead Time	0.793
Performance of Textile firms	0.871

**2.3 Pearson Correlation Analysis**

The study further conducted inferential statistics entailing both Pearson and regression analysis with a view to determine both the nature and respective strengths of associations between the conceptualized predictors (independent variables) and performance (dependent variable) for Textile firms.

**Table 2.2 Model Correlation of all Variables**

		Inventory Management	Relationship Management	Information Flow	Lead Time	Performance of Textile Man.Firms.
Inventory Management	Pearson Correlation	1	-.239	.000	.837**	.250
	Sig. (2-tailed)		.454	1.000	.001	.486
	N	86	86	86	86	86
Relationship Management	Pearson Correlation	-.239	1	.258	-.200	.583
	Sig. (2-tailed)	.454		.418	.533	.077
	N	86	86	86	86	86
Information Flow	Pearson Correlation	.341	.258	1	.258	.327
	Sig. (2-tailed)	1.000	.418		.418	.356
	N	86	86	86	86	86
Lead Time	Pearson Correlation	.837**	-.200	.258	1	-.250
	Sig. (2-tailed)	.001	.533	.418		.486
	N	86	86	86	86	86
Performance of Textile Man. Firms.	Pearson Correlation	.250	.583	.327	-.250	1
	Sig. (2-tailed)	.486	.077	.356	.486	
	N	86	86	86	86	86

\*\* . Correlation is significant at the 0.01 level (2-tailed).

From the findings, a positive correlation is seen between each variable and performance. The strongest correlation was established between Inventory Management and performance ( $r =$

0.570), and the weaker relationship found between Inventory Management and performance ( $r = -0.112$ ). Relationship Management and information flow were found to be strongly and

positively correlating with performance of Textile firms correlation coefficient of -0.053 and 0.178 respectively. This is tandem with the findings of Kothari (2011), who observed that all the independent variables were found to have a statistically significant association with the dependent variable at over 0.05 level of confidence.

### III. REGRESSION ANALYSIS

To establish the degree of influence of Textile firms on performance, a regression analysis was conducted, with the assumption that: variables are normally distributed to avoid distortion of associations and significance tests, which was achieved as outliers were not identified; a linear relationship between the independent variables and dependent variable for accuracy of estimation, which was achieved as the standardized coefficients were used in interpretation. The regression model was as follows:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon$$

Performance of Textile firms =  $\alpha + \beta_1$  (Inventory Management) +  $\beta_2$  (Relationship Management) +  $\beta_3$  (Information Flow) +  $\beta_4$  (Lead Time) + error term.

Regression analysis produced the coefficient of determination and analysis of variance (ANOVA). Analysis of variance was done to show whether there is a significant mean difference between dependent and independent variables. The ANOVA was conducted at 95% confidence level.

#### Model Goodness of Fit

Regression analysis was used to establish the strengths of relationship between performance of textile firms for (dependent variable) and the predicting variables; Inventory Management, Relationship Management, information flow and lead time (independent variables). The results showed a correlation value (R) of 0.761 which depicts that there is a good linear dependence between the independent and dependent variables. This is tandem with the findings of Githui (2012).

**Table 2.3 Model Goodness of Fit**

R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Std. Error of the Estimate
0.851	0.761	0.798	0.057

a. Predictors: (Constants), Inventory Management, Relationship Management, information flow and lead time  
b. Dependent Variable: performance of textile firms

With an adjusted R-squared of 0.761, the model shows that inventory management, relationship management, information flow and lead time explain 76.1% of the variations on performance of textile firms while 23.9% is explained by other indicators which are not inclusive in study or model. A measure of goodness of fit synopsis the discrepancy between observed values and the values anticipated under the model in question. This finding is in line with the findings of Mbaka (2017).

#### 3.2 Analysis of Variance (ANOVA)

From the results in table 4.22, analysis of variance statistics was conducted to determine the differences in the means of the dependent and independent variables to show whether a relationship exists between the two. The P-value of 0.05 implies that performance of textile firms has a significant relationship with Inventory Management, Inventory Management, Relationship Management and information flow which is significant at 5 % level of significance. This is in line with the findings of Kamau (2013), who observed that this also depicted the significance of the regression analysis done at 95% confidence level. This implies that the regression model is significant and can thus be used to evaluate the association between the dependent and independent variables. This is in line with the findings of Mogere, et al. (2013) who observed that analysis of variance statistics examines the differences between group means and their associated procedures.

**Table 3.1 ANOVA**

	Sum of Squares	df	Mean Square	F	Sig.
Regression	4.143	1	1.046	.451	.003
Residual	6.432	85	.485		
<b>Total</b>	<b>10.57</b>	<b>86</b>			

#### 3.3 Regression Coefficients of Determination

To determine the relationship between the independent variables and the dependent variable and the respective strengths, the regression analysis produced coefficients of determination. Findings in table 4.23 above reveal a positive relationship between motivation of employees for job satisfaction and all the independent variables. Taking the regression model:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon; \text{ where,}$$

Y= Performance of Textile firms;

$\alpha$  = Constant;  $\beta_1 - \beta_4$  = Beta coefficients;  $X_1$  = Inventory Management  $X_2$  = Relationship Management;  $X_3$  = information flow;  $X_4$  = Lead time and  $\epsilon$  = Error term, from the result shown below, it's clear that when all the independent variables are regressed against the dependent variable the constant gives a negative result meaning there is a strong relationship and how each predictor has an effect on the dependent variable.

**Table 3.2 Regression Coefficient Results**

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-.183	.060		-1.143	.023
Inventory Management	.423	.112	.838	5.471	.000
Relationship Management.	.249	.068	.162	2.471	.041
Information Flow.	.374	.059	.587	4.386	.000
Lead Time	.647	.115	.321	2.654	.017

a. Predictors: (Constants), Inventory Management, Relationship Management, information flow and lead time

b. Dependent Variable: performance of textile firms

A unit change in Lead time would thus lead to a 0.647 effect on performance of textile firms for ceteris paribus; while a unit change in Lead time would have an effect of .647 change in on performance of textile firms, a unit change in inventory management would have an effect of .423 change in on performance of textile firms also a unit change in Relationship Management would have an effect of .249 change in on performance of textile firms and finally a unit change in information flow would have an effect of .374, change on performance of textile firms. This finding is in line with the findings of Mbaka (2017). This implies that among other factors, Inventory Management, Relationship Management, information flow and Lead Time are significant determinants of performance of textile firms.

#### IV. CONCLUSION

In view of the above findings, the following conclusions were drawn in line with the research objectives. Inventory management remains central to the performance of textile firms in Nairobi City County. Involvement of inventory management is paramount and has direct impacts on performance of textile firms. Relationship management is fundamental to the understanding of poor performance of the textile firms and has direct impacts on performance of textile firms in Kenya. The use of information flow has positive impact on performance of the textile firms in Kenya. However, the information flow of the textile firms is not elaborate enough to support firm's functions. Adherence to lead time is crucial for the understanding of firm performance and has direct impacts on performance of textile firms in Kenya. Lead time help in streamlining procurement processes in the firms by, for instance, setting out the Re-order Levels for the purpose of expediting the orders when need arises and the application of Just in Time as the best practices.

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# Caregiver factors influencing seeking of Early Infant Diagnosis (EID) of HIV services in selected hospitals in Nairobi County, Kenya: A qualitative Study

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**Abstract** – Early Infant Diagnosis (EID) is the practice of testing babies for the HIV virus within the first 4–6 weeks of life or at the earliest opportunity thereafter. In order to correctly inform caregivers the HIV status of their infants, and link HIV-infected infants to care and treatment, a 'cascade' of events must successfully occur. This cascade of events involves early detection, and retention into care and treatment protocols.

The current study aimed at assessing maternal factors influencing seeking of EID of HIV services in selected hospitals in Nairobi County. More specifically, caregiver-level factors were assessed to establish maternal perceptions towards EID service delivery, knowledge, attitudes and practices. The study was conducted at Mathare North Health Center, Mbagathi District Hospital and Kibera South Health Center in Nairobi County, which serve the catchment area of Kibera, Kawangware and Mathare slums. Qualitative data was collected using Focused Group Discussions (FGDs) guide.

Six FGDs were conducted with women of different age-groups, two FGDs in each of the 3 selected facilities. Trained local facilitators were used to conduct the FGDs in Swahili. All FGDs were audio-taped, transcribed, translated and stored safely in a computer. FGDs were discussed and interpreted using the Health Belief Model (Tarkang & Zotor, 2015) and presented according to the emerging themes. The findings of the study were used to inform ways of improving infant health outcomes as they go through the EID program.

Some of the key findings of the study were that: mothers appreciated having the EID program as it ensured that their infants got ART prophylaxis. Additionally, the mothers got counselling services from the providers on how to reduce MTCT. Some of the challenges the mothers cited included; stigma and discrimination from their partners, family members and neighbors, long waiting times while seeking EID services,

difficulty in disclosure of status to their significant others and lack of funds to cater for transport costs to the healthcare facilities to attend their scheduled clinics. Gaps in knowledge were also identified from the focus groups such as lack of adequate knowledge in prophylaxis dosing for their infants and feeding methods.

Recommendations given by the mothers during the focus groups included; improved counselling for partners to reduce stigma and discrimination, provider assisted disclosure and provision of funds to cater for transport costs. We recommend that maternal education to be heightened during PMTCT and EID through rigorous educational packages for HIV positive mothers and their partners to reduce stigma and discrimination. Additionally, telephone reminders and home visits would enhance adherence improving infant health outcomes

Use of qualitative methods are a critical component to better understand why ART eligible mothers choose not to initiate their infants into the EID program on time or continue with treatment to achieve desirable infant health outcomes.

**Index terms:** Early Infant Diagnosis, Caregiver factors, HIV, health outcomes, qualitative.

## Introduction

HIV infection continues to be a global public health concern with an estimated global prevalence of 36.7 million people living with the HIV virus at the end of 2015 (UNAIDS, 2016). In spite of being a preventable disease if effective prevention interventions are not put in place, it will continue to cause morbidity and mortality amongst populations.

In Kenya the prevalence of HIV is estimated at 6% with 1.6 million People Living With HIV/AIDS (PLWHA), of whom

179,894 are children aged 0-14 years. MTCT rates remain high in Kenya with estimates of 14% and 10,390 HIV infant deaths in 2013 (Government of Kenya, 2014). In the absence of timely HIV testing and timely ART initiation, one third of infants living with HIV die before their first birthday, and more than half die before the age of 2 years. Thus, EID is a key driver for the implementation of early initiation of infant ART and is associated with lower mortality and morbidity of HIV infected/exposed infants (Tejiokem, et al., 2011).

Prevention strategies that are effective in reducing disease burden among infants include PMTCT (Prevention of Mother to Child Transmission) and EID (Early Infant Diagnosis). An estimated 430,000 new HIV infections occurred in children of which 90% were as a result of Mother To Child Transmission (MTCT) of HIV and 90% of these children were found in Africa (WHO, 2013).

The EID cascade includes the offer and acceptance of EID testing among HIV-exposed infants, including those for whom HIV exposure was unknown, accurate specimen collection, transport, and laboratory processing, relay of results to both healthcare providers and infants' families/caregivers and linkage to care, cotrimoxazole prophylaxis, and ART for infants identified as HIV infected (NASCO, 2014).

Without any interventions, between 15 % and 45 % of infants born to these women will acquire HIV with 5–10 % during pregnancy, 10–20 % during labor and delivery, and 5–20 % through breastfeeding of their infants (De Cock, et al., 2000). Encouraging progress has been made in scaling up and improving the quality of programs. In 2012, approximately 900,000 pregnant women living with HIV in low and middle income countries received ARVs to prevent MTCT. ART primarily for their own health or the most efficacious antiretroviral prophylaxis (UNAIDS, 2013). This represents one third more than the number who received it in 2009.

Care-givers are at the center of the EID program since the infants are totally dependent on the care-giver for the attendance and completion of the EID cascade. HIV positive women face a number of challenges that affect their health and ultimately the health of their infants. Health systems need to respond well to the needs of women to ensure comprehensive service delivery that caters for their different requirements (Vancouver/Richmond Health Board, 2001). Some of the barriers that were identified that led to poor uptake and retention of infants in the EID program as reported by the care-givers included; stigma and discrimination i.e. In a study conducted by Boender, et al (2012), a care-giver reported that she had not disclosed to her mother about her HIV status since she feared that her mother would disclose her status to everyone and she would end up being stigmatized and discriminated;

“I never got married and feared to tell my mother. She is harsh and will tell everybody to stigmatize me. Nobody knows about

my and my daughter's HIV status. They discriminate you, even at work”.

Onono et al, (2015) also demonstrated that stigma and discrimination played a big role in determining whether the caregivers would bring their infants to the EID program. Most mothers in this study experienced at least an episode of stigma or discrimination due to their HIV status and they hence reported that it was a great barrier to seeking services.

Partner disclosure was also reported as a barrier to the completion of EID cascade of care i.e. Males in the African community are still visualized to be the key decision makers in the households and therefore male involvement has been seen to improve ANC (Antenatal Clinic) which increases PMTCT uptake and is associated with reduced MTCT and infant mortality (Boender, et al, 2012). Other caregiver level barriers that were identified and deemed to undermine the EID program included; knowledge of PMTCT, maternal adherence to ART, food insecurity, cultural factors, lack of accurate health information and social support and overcrowded health systems that caused long waiting times (Murrey et al., 2009).

## Methods

A qualitative study was conducted in three facilities: Mbagathi District Hospital, Mathare North Health Center and Kibera South Health Center in October 2018. The study was undertaken using a semi-structured Focused Group Discussion (FGD) Guide. For analysis, the authors were interested in HIV positive women who had infants less than one year old enrolled into the EID program, so as to get a description of the women's perceived susceptibility, severity, benefits, barriers and cues to action towards the EID program of HIV. Hence, the data included in this paper were only from Focus Group Discussions that were conducted in the three selected facilities. The findings of this study will be used to inform policy on the key things that affect caregivers as they seek EID services and increase women's knowledge on how to reduce HIV transmission to their infants, this will also encourage increased access to EID services.

The first author trained three women in FGD facilitation, so that they could assist in conducting the FGDs, which were conducted by the first author and the trained women. The three women were selected because of their roles as facility mentor mothers and their influence in the community of the selected study areas. During the training, we reviewed written informed consent in both Swahili and English, went through the research ethics and practiced note taking. We also practiced facilitation of the FGD with the use of a tape-recorder to ensure that the three women were well prepared to assist in undertaking the FGD.

We conducted a pre-test of the FGD in Kibera Health center for practice of facilitation with the trained women. The focus groups in the three facilities were divided into two sessions, session one was for women below 18 years to 24 years and mothers between 25 years to 49 years. The inclusion criteria for the younger women was that they were able to give consent, and those less than 18 years had next of kin to give consent after the accent was

obtained from the mother. The other inclusion criteria that applied across to all the women was that they all attended their CCC clinic in the selected hospitals.

The exclusion criteria was mothers who were “on transit” in the selected hospitals and mothers who were not caregivers to the infants. Other demographic data were not collected for the purpose of the FGD.

The participants were selected by the facility mentor mothers within the selected hospitals. All the participants were read an informed consent in both English and Swahili, depending on their preference, and written informed consent was obtained from all the participants. If a participant could not read or write, the consent form was read to her and an X on her form marked her consent, along with a signature of a witness. All focus groups had 4-6 participants each. Participants were given a snack after their participation and reimbursed transport costs as well. Ethical approval was sought from Kenya Medical Research Institute (KEMRI) Scientific Ethics Review Unit (SERU). Clearance to carry out the study was given by Board of Postgraduate Studies (BPS) of Jomo Kenyatta University of Agriculture, Science and technology (JKUAT). Permission also sought from Nairobi City

Council and the Medical Superintendent of the facilities where the study was undertaken.

The FGD guides covered the following areas: Exploring maternal knowledge and understanding of; services that will be offered to her and her infant during the EID program, feeding practices, Infant ART and prophylaxis, reduction of MTCT, Attitudes towards the EID program, Perceived benefits of the EID program, Perceived Challenges of the EID program and finally, ways to improve EID services offered to the mother infant pair so as to meet their various needs and expectations. The focus groups were translated to Swahili and focus group participants were given a choice of whether to participate in English or Swahili. All focus groups were recorded and transcribed, note taking was also done concurrently. The first author listened to all the recordings and read all focus group transcripts and transcribed them according to the emerging themes.

The Health Belief Model by Tarkang & Zotor (2015) was used to cluster the mothers’ responses thematically. The model is outlined in the table shown below;

Table 1: Health Belief Model by Tarkang & Zotor (2015)

<b>Concept</b>	<b>Definition</b>	<b>Application</b>
Perceived susceptibility	Mothers’ opinion on chances of getting a condition or passing on the condition to the infant	Perceived heightened risk or low perceived risk of HIV transmission to the infant, based on personal traits or behaviors
Perceived severity	Mothers’ opinion of how serious a condition and its consequences are	Perceived consequences to the infant by virtue of the mother being HIV positive
Perceived benefits	Mothers’ belief in the efficacy of the advised action to reduce risk or seriousness of impact	Perceived positive effects or benefits to be expected following the EID program initiation and completion
Perceived barriers	The mothers’ opinion of the tangible and psychological implications and costs of attending the EID program	Identify and reduce barriers through reassurance, incentives and assistance
Cues to Action	Strategies to activate readiness	Perceived solutions to the challenges that the mothers felt were affecting them and possible ways that could improve their experience as the mother-infant pair go through the EID program
Self-Efficacy	Confidence in one's ability to take action	Provide training, guidance in performing action.

The other authors read the transcribed content and gave their input. All focus group participants were asked the same questions, and emerging themes noted. The quotes are

representative of what was said about the particular theme, unless otherwise noted.

The unit of analysis was the focus group. The frequencies of the emerging themes were entered and noted in an excel spreadsheet.

## Results

### Perceived susceptibility

All mothers were aware that their infants were at a risk of HIV infection due to the HIV positive status. Some of the respondents reported as follows;

P1: "If I have cracked nipples I will not breastfeed my child because the baby might get infected if he suckles from my cracked nipple"

P2: "Taking my ARVs well is important so that I can keep the amount of virus in my body low, so as to not pass the HIV virus to my infant".

(FGD1)

The mothers were all very determined to ensure that they do not pass the virus to their infants and were willing to do what it takes to ensure that they have healthy HIV free infants, P4: "I will do wherever the healthcare providers tell me to do so that I do not pass on the virus to my infant".

(FGD5)

### Perceived severity

All the mothers were aware of the severity of their illness the consequence of the disease to themselves, their infants and their partners as well. None of the mothers wanted their infants or HIV negative partner to acquire the disease due to the burden associate with living with HIV. Some of their sentiments were as follows;

P1: "HIV is not an easy disease to live with because you have to take ARVs every day to keep you alive"

P2: "If I don't take my ARVs well, my viral load will become high and I risk passing on the virus to my infant when he is breastfeeding"

(FGD2)

P1: "My partner and is HIV negative, so we have to use condoms so that I don't pass on the virus to him. Sometimes he however refuses to wear a condom, I become very worried when this happen because I don't want him to become sick too, if we both die, who will take care of our children?"

(FGD3)

### Perceived benefits

#### *Benefits to the mother*

Some of mothers indicated that some of the many benefits that they got from attending the EID program was that they able to easily and quickly access ART and prophylaxis for their infants,

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and that they were encouraged by the healthcare providers to stick to the EID program even though they did not want to keep the pregnancies

P3: "I had lost all hope as I did not even want this pregnancy in the first place, but the providers gave me a lot of hope and encouraged me, I was able to continue with the EID program well thereafter".

P4: "I had even stopped taking my ARVs but when I started this program, the health workers gave me courage and hope to restart my ARVS, now am well with my infant".

The mothers were also walked through the EID journey by the health workers through constant encouragement and follow up to ensure that they adhered to the treatment program.

(FGD6)

Mothers also reported on benefitting from education about appropriate feeding practices to avoid passing the HIV infection to their infants.

P2: "We are given education on giving prophylaxis, appropriate feeding practices and PMTCT infections".

Another mother reported that meeting other HIV infected women during the EID process in the clinic gave her an opportunity to share her experience with the other mothers and in so doing, encourage each other.

P3: "When we come to the clinic we meet other HIV positive mothers and we encourage each other, we give each other hope and the mentor mothers also encourage us"

(FGD3)

All mothers reported that at the very least, they were able to get their ART and education about PMTCT.

#### *Benefits to the infant*

The mothers reported to have gained knowledge on appropriate feeding practices for their infants to avoid spreading of the virus especially during the breastfeeding period. One of the mothers reported that she had actually seen a great difference between the other children that she had given birth to and not enrolled into the EID program, and the current baby that is enrolled into the EID program.

P1: "My other babies were always sick with either diarrhea or influenza, but this baby has never been sick since we started this clinic because we are given good education on raising the baby well, and close baby monitoring has also helped".

P2: "We are taught on good infant feeding practices by the healthcare providers" reported another mother.

(FGD4)

P3: "I did not have a lot of milk and I almost wanted to do mixed feeding a few weeks after delivery, this is because my baby was crying a lot and my relatives and friends were pressurizing me to give the baby food but I refused. The healthcare providers encouraged me to keep breastfeeding to increase milk supply".

(FGD1)

Pressure to mix feed infants from relatives is usually a big barrier towards the achievement of exclusive breastfeeding for 6 months, more so for out HIV exposed infants who stand a risk of getting infected with HIV if appropriate feeding practices are not enforced.

### Perceived barriers

The mothers had a number of challenges that were affecting them and their infants. The researcher identified the key emerging challenges as reported by the mothers. One of the greatest challenges that the mothers were facing was cost of transport to attend their scheduled infant and mother clinics.

P3: "Sometimes getting bus fare is a big challenge, I am forced to borrow 100 Ksh from friends so as to be able to attend my scheduled clinics"

(FGD2)

On average the mothers reported that 200 Ksh is what they would need to cater for transport associated costs. The mothers reported that they would keep borrowing since they cannot ask the healthcare facility to provide for them transport. This is because they would only be advised to transfer to the nearest healthcare facility, which was not an option for them due to fear of stigma and discrimination.

The facilitator probed the mothers further and asked them if there was a healthcare facility that offered EID services near where they lived so that they do not have to incur transport charges. Majority of the mothers reported there were nearby healthcare facilities that offered EID services but that was not an option for them due to fear of stigma and discrimination from the community.

P3: "Transport money to the facility is a big challenge and when we discuss this with the healthcare providers they advise us to go to the nearest facility to reduce transport costs. This is not an option for me because in the nearby facility my neighbors might see me going to CCC and the services are better here anyway"

(FGD3)

Stigma and discrimination was also cited as a great concern by most of the mothers in the FGD. Stigma was originating from various sources such as the mothers partners, neighbors and other relatives. It was seen as a major barrier to adherence and accessing EID services, since it hindered some mothers from attending their scheduled clinics. All the mothers reported to have at least one or more incidents of stigma and discrimination

P4: "My partner is HIV negative and is aware of my positive HIV status, he agreed to marry me despite him knowing my status. He sometimes stigmatizes me by blaming me for my HIV status which really hurts me. He accuses me of being unfaithful to him especially when I am coming for my CCC appointments."

In response to this statement one of the mothers advised the other mothers that the only way to earn respect from their spouses and reduce stigma and discrimination is to be economically empowered.

P5: "I want to encourage women to look for ways to generate income and be self-sustaining this way your husband will respect you and you will not have to keep borrowing money every time you want to attend your clinic" (FGD4)

Some partners did not support the mothers financially especially to come for their appointments.

P3: "My husband will not give me a coin to come for my appointments despite the fact that I am unemployed. I am forced to save from the little money he leaves for food. Sometimes I call the healthcare providers in EID in advance and tell them that they will have to give me transport back home since I only have money for one way trip. They usually help but you cannot borrow each time"

P2: "Some neighbors know my HIV status so whenever I leave the house they start gossiping me, one neighbor even insulted me pertaining my status and I felt very bad because I did not ask for this disease".

(FGD5)

Another mother also had fear of stigma and discrimination from the neighbors due to the close proximity of the houses which were semi-permanent and had very little privacy.

P1: "Our houses are connected wall to wall so whenever I want to swallow my drugs, I cover myself with blankets to reduce the noise the medicines make in the tins so that they don't know that I am taking medicine"

On the same breath, another mother conveyed the same concerns;

P2: "Those ARV containers make a lot of noise, so whenever I come to pick the medicine I must roll them in a sweater to reduce the noise made by the tablets in the plastic containers and put the medicine in at least 3 bags to reduce the noise they make so that when I am walking people will not hear that I am carrying ARVs in my bag"

(FGD4)

Another mother reported how stigma and discrimination had affected her life and adherence to ART

P4: "I was really discriminated and stigmatized by my nuclear family when I disclosed my HIV status to them. I defaulted on

my treatment for a long time and this caused treatment failure on first line, am now on second line treatment and very keen to take my drugs not to have treatment failure again”

(FGD1)

Another challenge reported by the mothers was that sometimes getting food or at least one meal that is balanced was a problem. Adequate nutrition is a key factor in the management of HIV clients. It is important for the mothers to have an adequate and balance diet so that this can boost their immune system, as well as ensure sufficient nourishment for their children from breast milk.

P1: “My husband ensures that the baby food is available but doesn’t bother to ensure that I get a balanced meal. Sometimes the money left behind is too little so I buy food for my infant and sacrifice myself.”

Another mother reported that she doesn’t care much about her own food as long as her baby gets food. She went further to explain that lack of adequate food sometimes made her not adhere to her drugs due to the effects of taking the ARVs on an empty stomach.

P2: “My husband gives me very little money for food so I mostly buy for my baby food and eat whatever else is available”. “I sometimes don’t get enough food for myself and my child. I can sometimes only take porridge only the whole day. This is usually very bad because the night ARVs give you a lot of dizziness if you take them on an empty stomach”

(FGD2)

Disclosure of HIV status was another big challenge to majority of the mothers. Mothers feared the consequences of disclosing their status to their spouses or other close relatives and friends. Disclosure is a great barrier to drug and clinic adherence both to the mother and the infant. Provider assisted disclosure improves adherence

P2: “I am married as a second wife, my husband’s other wife and I have never met. I have not disclosed my status to my husband, and he does not know my status either. I find it difficult to disclose to him my status, with time I will. He gives me very little financial support and at times I go hungry with my other children”

P3: “I do not visit my rural home because I have not disclosed my status to anyone and I will not be able to explain why I am taking medicine every night and why child is also taking medicine every day. I don’t want them to stigmatize me”.

P4: “Long ago when I used to visit my rural home, since I have not disclosed my status to anyone, I used to remove my tablets from the medicine bottle and put in a paper and hide under my mattress, my viral load went very high and I had to disclose to the healthcare workers that I was removing my medicine from the dispensing bottle. I was discouraged from doing this, now I don’t go to my rural home anymore”

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(FGD4)

P1: “I have not disclosed my status to anyone else other than my husband, I would like help in disclosing to my sister as well, she is very sensitive and might get blood pressure and we are very close”

P2: “I disclosed my status to my nuclear family members and they were very supportive, they even remind me to take my medicine”

P3: “I am a student in college and I sometimes delay to take my medicine because I get delayed in school. I have not disclosed my status to any person in school so I cannot carry my medicine to school”

(FGD2)

Partner support was yet another challenge that affected majority of the mothers which ultimately undermined care and treatment efforts for both mother and child.

P1: “My partner is HIV positive and he says that he was infected by someone and has vowed to keep spreading the disease. I am aware he has multiple partners and he refuses to use a condom. I have to pick for him his ARVS and remind him to take the medicine otherwise he will not take the medicine.”

P2: “My husband had refused to take medicine and attend his CCC clinics, I had to come to pick the medicine for him and even then, sometimes he would refuse to take the medicine. One day he just changed and stated taking his medicine and attending clinics.”

P3: “My husband knew his HIV status after I disclosed to him my HIV status. He refused to go for testing until he was very sick and admitted to hospital and tested positive then and started on ARVs. He defaulted on his medication for a while and would only take medicine if I went and picked them for him. He also refused to use condoms. My problem is that my husband has turned me into his drug mule, he can never come for his medication or come for clinics, if I don’t pick his medication for him, he will not take his medicine. I have talked to the healthcare providers and they advised me to bring his card and telephone number then they will talk to him”

P4: “My husband will only take medicine if I bring them myself, he refuses to come for his own medicine, I have no problem picking the drugs for him as long as he swallows them”

(FGD4)

Of great concern was that some partners had behaviors that could increase the mother’s viral load and put her infant at risk as well. For instance one mother reported that;

P3: “Since I told my husband my HIV status he has been very supportive, he even calls from work to remind me to take medicine, he also gives me money to come to hospitals for my appointments. The only challenge is that my partner has refused

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to come for testing, the mentor mothers who support us in the treatment program have attempted to call him on several occasions to come to the hospital, but he has never agreed to come. I don't know his HIV status and he doesn't take ARVs".

P4: "My husband's medicine was changed to the new type of ARVs, since then my husband has refused to take these medicines and instead takes mine which are the same as the ones he used to take"

(FGD2)

Another partner behavior that increased the risk to the mother and infant as reported by some of the mothers was refusal to use condoms during coitus.

P5: "My partner has completely refused to use condoms, every time I pick them they expire in the house. He says he will not use condoms with his wife since he is not having sex with any other person outside their union. If I insist that we will not have sex, he says that he will go and seek sex elsewhere"

P6: "I knew my HIV status with this current pregnancy, with the other pregnancies I was HIV negative. When I disclosed my status to my husband he was very cross with me and he said not to bring up the topic again. We do not use condoms because he refuses, I am aware that he is adding me his virus but there is nothing I can do about it, he gets very angry when I speak about my HIV status"

(FGD4)

Long waiting times as the mother-infant pair sought for services was yet another challenge reported by the mothers. Long waiting times reduce adherence to scheduled CCC and EID clinics.

P1: "The healthcare workers take very long health breaks delaying our treatment and increase waiting times. So I don't come early, I finish my work first in the house then come at noon so that I don't stay for too long in the hospital"

P2: "Often the consultation room services begin very late, some doctors come in late in the morning which makes us stay in the hospital for very long. I wish the services would start on time so that we can be attended to quickly and so that we can go back to our other issues at home"

(FGD6)

P4: "The delays in the general CCC could be a contributory factor to our men refusing to come for their own drugs. My husband initially used to come to pick his own drugs, but the long waiting time in the general CCC made him to stop coming for the drugs because he said that he is wasting too much time in the CCC and this could make him get fired from his workplace. I don't mind getting him the drugs, because at least he is agreeing to swallow the drugs"

(FGD3)

Most of the mothers also reported that they experienced some side effects due to swallowing the ARVs such as dizziness, abdominal discomfort, diarrhea, nausea and vomiting when they were first put on ARVs. However they also reported that the symptoms disappeared after some time. These side effects did not stop them from continuing their treatment all the same

P1: "Initially the ARV drugs gave me a lot of dizziness and with time the effects disappeared"

(FGD5)

All the mothers reported that that they had not experienced ARVs stock outs but had to buy medication for co-morbidities and other opportunistic infections as these drugs were often out of stock.

P2: "There has never been a stock out of ART, however if you have co-morbidities you will not get any medication, you have to purchase in the chemist"

(FGD6)

None of the mothers reported challenges in prophylaxis administration to their infants.

### Cues to Action

Cues to action were the perceived solutions to the challenges that the mothers felt were affecting them and possible ways that could improve their experience as the mother-infant pair go through the EID program. The cues to action were reported as perceived by the mothers as follows.

1. Reduction of waiting times in the consultation rooms and in the laboratory;

"Patients should be seen in the order they have come and not skipping other patients."

"Start clinics on time so that mothers can leave on time as well"

"There are too many processes before one is seen and you can enter up to 5 rooms a day before you are done with the final process the services should all be offered under the same room"

"Separating drug dispensing points for HIV patients and the general population to reduce waiting times"

2. To ease the cost of transport;

"If we can be given a little money to come for clinic appointments, this would go a long way in ensuring that we do not miss our scheduled appointments due to lack of bus fare"

"Giving long appointment dates such as three months or six months can reduce the cost of coming to the hospital by reducing the number of hospital visits"

3. To improve partner support;

“Invite our partners to come for counselling in order to understand more so our negative partners, this will reduce stigma and discrimination”

4. To improve adherence;

Economic empowerment so that the mothers can be independent and not rely so much on their spouses, relatives and friends “If you hear of any casual work kindly let me know so that I can generate my own money”

“Telephone reminders two or three days before the appointment days would go a long way in ensuring we keep our scheduled appointments”

### Self-Efficacy

All mothers were aware of how to take their ARVs and were confident that they would not pass on the virus to their infants if they adhered to the education and instructions given to them by the healthcare providers. Some mothers however felt that in addition to the routine hospital education they received, additional take away materials to read at home would increase their awareness on PMTCT.

In addition to use of the Health Belief Model by Tarkang & Zotor (2015) maternal Knowledge, knowledge gaps, Attitudes and Practices (KAPs) were also explored. The findings were as indicated below:

### 1) Exploring knowledge on how to reduce Mother To Child Transmission (MTCT)

All mothers knew at least one way of preventing MTC infections during the antenatal, delivery and breastfeeding periods

#### *Prevention during pregnancy/antenatal clinic*

Mothers reported the following ways of reducing chances of infection to their unborn infants: maternal ART adherence, infant prophylaxis, condom use, starting ANC early enough by 3 months. One of the mothers reported that:

P1: “In early pregnancy I was vomiting a lot and by the time my pregnancy was 7 months, I had a very high viral load. The doctors told me that it was because I was vomiting my ARVs, something that could have been prevented. I however was put on good medicine and my viral load went down”

(FGD3)

All mothers reported that they were given prophylaxis drugs for infant before birth and given instructions on how to take the drugs. Some mothers however reported that they did not know why they were giving the prophylaxis especially the septrin:

P3: “I was given 3 types of drugs which I cannot recall the names while I was pregnant, and instructed on how to give the

baby, I however was not told why I was giving my baby these drugs.”

P4: Another mother reported that “septrin is given to my baby to prevent HIV infection just like Nevirapine and another ARV drug that I cannot recall the name”

(FGD2)

From the above sentiments it was clear that some mothers did not know the use of the medication given to them during pregnancy. They all however reported to administer the medicines given to them to their infants immediately after birth.

#### *Prevention during delivery*

All mothers’ reported to have been given prophylaxis for their infants immediately after birth, and all were hospital deliveries. The mothers reported as follows;

P1: “I was given prophylaxis for my infant during pregnancy, after delivery I not sure of how to give the medicine so my husband explained to me that I should give the baby the medicine first before breastfeeding”

(FGD1)

P4: “When I was admitted in labor, I called the nurse and told her that I was HIV positive and that I had carried my infant prophylaxis drugs with me. The nurse was very happy and assured me that immediately after birth my baby would be weighed and given the drugs”.

(FGD2)

P5: “I need to ensure I deliver in the hospital for safe delivery of my infant”

(FGD5)

“I ensure that I take my ARVs very well to reduce chances of infection to my baby and also give my baby prophylaxis on time every day”

(FGD4)

From the above sentiments, mothers were well knowledgeable on how to ensure they do not transmit the virus to their infants during the delivery period. They all reported to have gained this knowledge primarily from the healthcare facilities during the antenatal care clinic visits.

#### *Prevention after delivery and during breastfeeding period*

Some of the ways that mothers thought could reduce transmission of HIV during the breastfeeding period included;

P5: “One should avoid rubbing children gums with traditional medicine to relieve teething pain as this could pass on the virus if the baby has bleeding gums”

P6: "To prevent infection to my baby during breastfeeding, I check to ensure I have no wounds in my breast, and seek medical attention if I see breast wounds"

(FGD4)

All mothers also knew the various ways of reducing HIV transmission to their infants during the breast feeding period. On further probing by the facilitator, all the mothers also knew that maternal ART adherence reduced their viral load reducing transmission during the breast feeding period.

## 2) Exploring Knowledge on infant prophylaxis, (drug type, dosing, side effects and benefits)

Most of the mothers knew the infant prophylaxis types and benefits of the drugs however there was a knowledge gap on drug dosing and drug side effects as reported by some mothers:

P1: "I only know that I give my baby septrin, I don't know the names of the ARV Prophylaxis I am giving my infant"

P2: "I can't remember the names of the drugs that I give to my infant, but I know the dosing since I am given instructions for use in the hospital"

(FGD2)

One thing of great concern was that Majority of the mothers did not know the correct dosing for the infant prophylaxis and were not aware of when they should stop the drugs

P4: "I do not know when I should stop the drugs for my infant but I will continue to give my baby prophylaxis drugs until the healthcare worker tells me to stop"

(FGD5)

It is imperative for the mothers to be able to recognize drug side effects and dosing to avoid adverse drug reactions to the infant.

## 3) Knowledge on maternal ART (drug type, dosing, side effects and benefits)

Only one mother knew the ARV types she was taking. All the other mothers did not know the names or the potential side effects of the ARVs they were taking. They however were aware of the dosing schedule. All mothers were aware of septrin and dosage of the same.

"I don't know the type of drugs I take nor the side effects but I am aware of my dosing schedule which is one tab in the morning and one tab in the evening"

"I can't remember the names of my ARVs, I only remember septrin as one of the drugs that I take"

(FGD3)

## 4) Knowledge on feeding practices

All mothers practiced exclusive breast feeding up to six months and introduced other foods at 6 months. A few mothers however had no knowledge on when they should stop breastfeeding.

"I practiced exclusive breastfeeding for 6 months and introduced other feeds at 6 months, I however don't know for how long I should continue breast feeding my infant perhaps you could tell me"

(FGD6)

## 5) Exploring maternal attitude towards the EID Service delivery

All mothers were willing to bring their infants for the 18 months period EID program irrespective of the infant HIV status. There were no reported cultural barriers hindering the mothers from bringing their infants for care.

The mothers reported that the services offered to them were generally good other than long waiting hours to see the clinicians. They also reported good interpersonal relationships with the healthcare providers:

P1: "I am happy with the services and attitudes of the health workers in the EID program. I wish we could be retained here and not discharged back to the main CCC clinic after the 18 months"

(FGD3)

All the mothers expressed dissatisfaction with services offered in the general CCC because of long waiting times: P3: "In the general CCC you have to wake up at 5am so that at least by 12 pm you have been discharged"

(FGD1)

However the mothers expressed dissatisfaction with lab services offered to them. They reported that they had to queue for long periods of time to get their blood drawn for viral load counts and PCR testing for their infants. This made their infants to become distressed and delayed them from going back to their duties back at home. They also reported delays in the receipt of their infants PCR results as well as their viral load counts. The mothers' reports were as follows:

P5: "You have to wait in the queue like any other patient and it takes a very long time"

(FGD3)

The mothers requested to have alternative lab/testing area for their infants and themselves as well as their infants. P4: "We request to have our own lab/bleeding area specifically for HIV exposed infants, this would reduce on waiting times"

(FGD3)

Long Turn-around time from collection of the sample to receipt of the same to the caregiver was also reported as a challenge by the mothers. Most mothers reported an average waiting time of two to three months:

P1: "I received my 6 weeks PCR results when my baby was four and a half months. They say that the results take some time these days"

P3: "I waited for about two months and decided to enquire about my baby's results during one of my normal hospital visits."

(FGD6)

There were also reports that the lab results would get misplaced and you would be required to repeat the test:

"Sometimes the results get misplaced and you are force to repeat the test"

(FGD4)

However, mothers in one of the facilities reported that they were removed lab samples in the service delivery rooms and did not have to go and queue in the lab for sample removal. In the same facility, mothers got their infants PCR results in the next visit which was scheduled between one or two months.

All the mothers were very satisfied with the counselling services offered to them as reported below:

P4: "Counselling is done very well such that even if you had decided not to take medicine, you will be counselled to start"

P5: "I had defaulted on my PMTCT visit and the mentor mothers looked for me in my house and restarted me on ART. My husband and I had separated and the counsellors looked for him and reconciled us."

(FGD3).

## Discussion

The success of the EID program is pegged on ensuring that the caregivers understand the benefits of timely initiation of their infants into care. High maternal knowledge was attributed to improved EID attendance, in a study conducted by Makau, Okwara, & Oyore (2015), this also lead to improved health seeking behavior in the mothers and good infant health outcomes. A study by Adeniyi et al., (2015) demonstrated that nearly all the study participants were not aware of how soon or the right time for ARVs to be initiated to their infant with HIV infection. This could lead to delay in initiation into care with consequent poor infant outcomes.

Stigma and discrimination also undermine the efforts of PMTCT strategies, Adeniyi et al., (2015) point out that Stigma resulting from their own disclosure to others reduced their likelihood of recommending other members of their community into the EID program. Similarly, a study by Hassan et al., (2011) cited that

lack of appropriate social support structures to facilitate disclosure and handle possible stigma and discrimination. One of the caregivers stated the following concerning disclosure: "...you might tell one who ends up taking you to the chief... you might be jailed and asked to pay a lot of money; you cannot tell anyone about this illness, people are taken to court... you cannot tell anyone, it is your secret". Inappropriate social support structures for disclosure were seen to be a contributing factor to general drop-out of caregivers from the EID program.

A study with similar findings by Hlarlathie, et al., (2014) demonstrated that non-disclosure to partners and other persons in the caregivers lives had many different complex dimensions where the fear of disclosure was very real and put the mother and infants life at great risk especially due to poor adherence.

Makau, Okwara, & Oyore (2015), study demonstrated that mothers stated the following factors that negatively influenced EID uptake; inaccessibility of health services due to long distances to the hospitals, long waiting times at the service delivery points and lack of transport to attend their scheduled clinic.

Although no direct costs were incurred by the caregivers while seeking EID services, indirect costs were mentioned by the caregivers in our study such as cost of transport as they come for EID services and cost of buying non-ART drugs for opportunistic infections.

These findings were similar to those of Hassan et al., (2011) where the authors stated that caregivers complained of cost implications of travel to the healthcare facilities and long waiting times to get services. The caregivers recommended longer appointment schedules to reduce the number of hospital visits. Transport costs was also cited as a perceived barrier by Hlarlathie et al., (2014), where caregivers pointed out that it was a great barrier to accessing services to them. These authors also found out that stigma and discrimination, lack of or inadequate male partner support and the influence of men and other women living in the household of the caregiver influence her ability to seek EID healthcare services or not. These factors therefore needed to be explored further to assess the impact they had on maternal health seeking behavior as they go through EID.

Our study had limitations found in most qualitative studies where findings of the research were not tested to discover whether the findings were statistically significant or due to chance. Further, no attempt was made to assign frequencies to the linguistic features which were identified in the data. Despite these limitations, the study was able to learn from the participants the EID process the way the mothers experience it, their perceptions and interpretation of EID concepts in real time. Central themes were able to be identified and emerging issues documented for future action and recommendations.

## Conclusion

Despite the good knowledge of mothers about infant HIV infection and the availability of treatment, inadequate knowledge

on appropriate feeding practices, ART therapy and prophylaxis for both mother and child undermine PMTCT efforts. Additionally, stigma and discrimination as well as fear of disclosure reduce adherence to care and treatment. These challenges need to be addressed through urgently through community education, partner counselling and assisted disclosure as part of the PMTCT package in our country so as to improve adherence and ultimately improve infant health outcomes.

### Competing interests

The authors declare no competing interests.

### Authors' contributions

Elizabeth Mueke Kiilu development of the concept and manuscript, Simon Karanja and Gideon Kikuvi critically reviewing of the document from its conception, up to manuscript submission and the final approval. All authors read and agreed to the final version of this manuscript and equally contributed to its contents and to the management of the case.

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# The role of foreign trade in the GDP in the Libyan economy during the period (2000-2012)

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**Abstract-** The objective of this paper is to highlight the reality of Libyan exports and imports and their contribution to GDP growth for the period (2000-2012) by studying the foreign trade coefficient, the average export tendency, the average import tendency, In terms of whether it is in the interest of the national economy or not.

**This study emerged with a series of results, most notably.**

- 1 - The dependence of the export sector on the export of one commodity is crude oil, which indicates the high contribution of oil exports in the growth of GDP, in return for the decline in the contribution of non-oil exports in this output.
- 2 - The Libyan economy is an economy open to the outside world at high rates.
- 3 - Growth rates in the gross domestic product of the Libyan economy is unstable, for dependence on the revenues of oil exports.

**Index Terms-** foreign trade , economic growth , GDP, exports – imports , diversification of the economy .

## I. INTRODUCTION

Foreign trade plays an important role in the economies of both developed and developing countries. However, the importance of the foreign trade sector varies from one country to another depending on the stage of growth of the economy, its economic structure and the factors determining its growth.

The importance of foreign trade in general is increasing in developing countries due to the low elasticity of the productive sector. Through foreign trade, countries, especially developing countries, can obtain the necessary inputs to implement their development programs.

Foreign trade plays an important role in economic growth and development, according to most economic theories, because of its expansionary role in the production and marketing of the national economy by opening up new markets for local products.

In the study of the foreign trade sector in Libya, it is clear to us the great role of this sector in the movement of economic activity because of its effective influence in the various economic and productive activities and thus on the GDP.

This study aims to identify the role of foreign trade in the GDP of the Libyan economy by studying a number of topics:

**First:** The percentage of foreign trade in GDP (foreign trade coefficient).

**Second:** the proportion of exports and imports in GDP (average export trend, average import trend).

**Third:** the proportion of the absorption of imports of export earnings.

We conclude the study with a set of conclusions and recommendations that the researcher deems necessary.

**the study Problem :**

The Libyan economy is an economy open to the outside world due to the relatively small size of this economy on the one hand or the characteristics of the structure of foreign trade on both sides of exports and imports on the other hand. Crude oil, whose prices vary from one period to the next, as renewed in the global market, which is affected by factors of demand and supply, which in turn are affected by what is happening in the world from time to time of political crises and strategic changes on the international scene. Biting organizations (**Kaliope**). With regard to imports characterized by the commodity and geographical diversity of their export-related components, any fluctuation in their yields has an impact on imports, and exports are the engine of growth and economic development.

The decline will lead to fluctuations in imports and therefore this will have an impact on the GDP growth rate of the Libyan economy.

Hence, the idea of this study to discuss this problem and the possibility of identifying, and provide solutions.

**the importance of studying:**

The importance of this research stems from the scientific importance of the study by knowing the effective role of foreign

trade in GDP by studying and analyzing the components of foreign trade represented in exports and imports.

This will allow greater flexibility for policy makers to choose appropriate export and import policies, which will contribute to raising scientific efficiency to achieve the objectives of this policy on the one hand, and to achieve and promote sustainable development in the economy.

#### **Objectives of the study :**

##### **This study aims to:**

**1** -To know the impact of foreign trade on the GDP of the economy and the change in the structure of exports and imports as a result of the economic development process.

**2**- To know the percentage of exports and imports (**the average inclination of each**) in the GDP.

**3** - Know the percentage of the absorption of imports of export earnings in the Libyan economy, and the impact on GDP.

##### **Study Hypothesis:**

#### **This study proceeds from the following hypotheses:**

**1**- Achieving stability and economic development and accelerating growth rates in Libya, especially in the present and future, depends on diversification of sources of income from foreign currency

**2** - Increasing the degree of openness in the country, which will affect the economic growth rates in Libya, and this increase in openness is increasing in both exports and imports, the real demand for exports reflected on the growth rate of GDP, and increased openness Which will work to increase inflation rates in the country, and this indicates a positive relationship between each Export growth rate, growth of intermediate and capital imports and growth rate of Libyan GDP.

#### **Methodology of the study:**

The methodology of the study is defined as a specific analytical method that is followed to achieve the objectives of the study.

In economic research there are many analytical methods that can be adopted and applied, and one of the most important methods used in the analysis of economic variables.

(Descriptive analytical method of economic variables), (quantitative analytical method of economic variables).

In this study, the methodology will be descriptive analytical method based on the collection of statistical data and tabulation in the form of tables, indicators and extraction of the most important percentages and their averages and description and analysis to clarify the relationship between Libyan trade and GDP in line with the objectives and objectives of the study.

#### **The limits of the study :**

**Spatial boundaries:** The study will be limited to studying the role of foreign trade in the GDP of the Libyan economy.

**Time Limits:** The study covered the period of time (2000-2012)

#### **Data and information source:**

The problem of this research was analyzed and prepared based on data and information provided by the National Authority for Information, Documentation, Economic Reports and Economic Publications of the Central Bank of Libya and some reports of the various committees.

#### **Previous studies :**

Several empirical and applied studies dealt with the relationship between foreign trade and GDP by estimating and analyzing, using statistical methods and different research methods. Among these studies, **we find, for example:**

#### **1 - Michel study (1977):**

In this study, the ratio of exports to GDP was used to test the hypothesis that rapid export growth leads to an increasing growth in the GDP of two groups of countries, industrial and developing countries. Through this study, Between exports and GDP growth, especially in less developed countries (**Mufraj Al-Qahbani, 2002: 685**) .

#### **2 - Ajanta study (1979):**

The purpose of this study is to examine the relationship between foreign trade and economic growth in Nigeria during the period (1954-1974), in which the ratio of exports to GDP was used, in addition to using the regression of change in output to change in exports using current prices. To prove the hypothesis of export leadership for economic growth, and this study confirmed a strong positive relationship between exports and economic growth.

In terms of imports and their relation to economic growth, Fajana used a variable regression equation, the ratio of imports of capital goods to GDP, and the ratio of exports to GDP to measure the effect of imports on economic growth for the period 1954-1974 using data on previous variables in prices This study found a positive relationship between imports of capital goods, raw materials and economic growth, but this relationship is not strong (**Mohammed Al-Quraishi, 1990:11**) .

#### **3 - Study of Abdullah Amhamed Shamia ((1970-1986):**

This study examines the effect of the import substitution policy and the export promotion policy in the Libyan economy (1970-1986). This study used the real annual growth rate of GDP, the growth rate of total exports, oil exports and non-oil exports to measure the correlation between Growth in exports and economic performance as an indicator of export promotion policy. Finally, this study concluded that there is a strong positive correlation between the growth rate of output GDP and oil exports, while the correlation coefficient between the rate of growth of output and non-oil exports is negative and has a relatively low value, which confirms that the growth of the Libyan economy depends on oil exports (**Abdullah Shamia ,1990 :39**) .

II . The percentage of foreign trade in GDP (foreign trade coefficient

Foreign trade plays an important role in the economic life of the country. This importance is reflected in the role played by foreign trade in economic development in the export revenues that contribute to the development of other economic sectors. Foreign trade is one of the most important economic activities in the Libyan national economy. The economy of foreign markets for the disposal of Libyan products to various sectors of the national economy, and the provision of foreign exchange necessary to support and finance various programs and development plans, and to secure the need of the national economy of goods (industrial, consumer, and productivity) Produced by developed countries.

The most important indicators that measure the extent of the opening of the national economy to the outside world is the ratio of foreign trade to GDP. The higher this percentage, the more open the national economy is to the outside world, and some economists believe that the economy is open to the outside if this

percentage (40%) or more (**Abdullah Amhamed Shamia, 1991:139**).

This indicator expresses the relationship between the total value of foreign trade (exports + imports) and the gross value of GDP, calculated by calculating the percentage of foreign trade value of the value of GDP.

It is true that the rise of this indicator in some developed countries (Britain, Germany) does not necessarily mean the dependence of the economy of these countries abroad, but this means the ease of exposure of their economies to external influences, and this is especially true for developing countries that rely on the export of a few commodities in raw form. Therefore, the rise of this indicator is evidence of the dependency of the economy of these countries abroad and its vulnerability to fluctuations in the export markets.

The impact of foreign trade on the national economy is illustrated by the relationship between the total value of foreign trade and GDP, noting that there is a positive correlation between the components of foreign trade (exports, imports) and GDP.

Thus, the higher the rate of openness to the outside, the greater the impact of external factors and variables on the national economy, especially in light of the dependence on the export of one commodity (oil), which means that any volatility in foreign markets can move its effects to the Libyan economy, Oil, for example, or low prices leads to a drop in oil revenues, which would upset the development plans and economic stability in Libya.

**Table (1)**

The growth of foreign trade in GDP (**foreign trade coefficient**) during the period (2000-2012)

**Table (1)**

* foreign trade coefficient (%)	GDP	The volume of foreign trade	Imports	Exports Total	Non-oil exports	Exports Oil	the year
% 24.8	33126.7	8226	2106	6160	230	5930	2000
% 28.8	33290.2	9615	2895	6720	256	6464	2001
% 68.7	33163.5	22784	9493	13291	354	12937	2002
% 77.7	37423.3	29106	9386	19720	906	18814	2003
% 103.5	39678.9	41092	13110	27982	1150	26832	2004
% 132.7	44087.2	58519	15683	42836	1181	41655	2005
% 156.2	46583.6	72785	16659	56126	1447	54679	2006
% 170.6	48898	83424	21698	61726	1473	60253	2007
% 204.9	50228.7	102965	25938	77027	1784	75243	2008
% 148	49854.3	73822	27503	46319	1693	44626	2009
% 179.8	52009.9	93539	31881	61658	1808	59850	2010
% 183.2	20146.3	36918	13664	23254	465	22789	2011
% 273.3	39922.7	109136	32243	76893	1538	75355	2012

**Table of the researcher's numbers based on the data received from:**

1. Central Bank of Libya, Forty-third Annual Report, Fiscal Year 1999, pp. 58-61.
  2. Previous source, Forty-sixth Annual Report, fiscal year 2002, pp. 54-55.
  3. Previous source, Fifty-first Annual Report, Fiscal Year 2007, pp. 32-33.
  4. Previous source, Fifty-third Annual Report, fiscal year 2009, pp.37-38.
  5. Central Bank of Libya, Economic Bulletin, Volume IV, First Quarter, 2014, pp. 67-69.
  6. National Information and Documentation Authority, Foreign Trade Statistics, multiple editions of the year (2000-2012).
- \* Foreign Trade Factor = Volume of Foreign Trade \ Gross Domestic x100

**Table (1) notes the following:**

The rates of openness of the Libyan economy to the outside world are very high, as the average rate during the study period (2000-2012) (134.7%).

In general, this percentage did not fall below (24.8%) during the study period. The highest rate was in (2012) (273.3%) while the lowest level was (24.8%) in (2000).

According to the results obtained in this study, increasing the degree of openness of the Libyan economy to the outside world will affect the economic growth rates in Libya. This increase in openness will increase in both exports and real imports and inflation rates in the country. The effect on exports is reflected in the rate of economic growth, which means that this economy has a high degree of trade dependency and hence the economic dependence of the outside world. Thus, the liberalization of foreign trade improves the flow of exports abroad, leading to higher economic growth rates Starting from full trade liberalization phase.

**III. Evolution of the ratio of exports and the proportion of imports in GDP (average export trend, average import trend)**

The average export trend is one of the indicators that measures the economy's ability to export. It is measured by the ratio of exports to GDP, and the higher the percentage, the greater the ability of the national economy to export. The overall average during the study period (2000-2012) shows that the average tendency for export reached (93.6%), due to the increase in the quantity and value of oil exports during that period,

As well as the average tendency for import is one of the indicators that indicate the extent of openness of the economy to the outside world, which is measured by the proportion of commodity imports to GDP, the higher this percentage increase the opening rate of the national economy to the outside world, but some economists that The economy is open and, to a high degree, if it reaches (20%) or more, which increases the impact of external

factors on the national economy (**Ibrahim Al-Issawi, 1989 :17**).

Because this means that the national economy depends heavily on the outside world in the provision of its various

commodity needs and the increase in this tendency means on the other hand increased spending on imports.

The average year during the study period (2000-2012) shows that the average tendency of imports reached (41.0%). This means that the Libyan economy is living in the stage of openness to the outside world. This rate has been in some years low due to the decrease in oil revenues, And the slight increase in GDP at the beginning of the nineties caused by the economic returns of many development projects on the other hand, and the rise in import prices due to high prices in the countries of importation led to a decline in Libyan imports,

The results were as

shown in Table (2).

**Table (2)**

Evolution of the ratio of exports and imports in GDP (average export trend, average import trend)

* Average mileage of import (%)	* Average mileage of export (%)	GDP	Imports	Exports	the year
% 6.3	% 18.5	33,126.7	2,106.0	6,160.0	2000
% 8.6	% 19.4	33,290.2	2,895.0	6,464.0	2001
% 28.6	% 40.0	33,163.5	9,493.0	13,291.0	2002
% 25.0	% 52.6	37,423.3	9,386.0	19,720.0	2003
% 33.0	% 70.5	39,678.9	13,110.0	27,982.0	2004
% 35.5	% 97.1	44,087.2	15,683.0	42,836.0	2005
% 35.7	% 120.4	46,583.6	16,659.0	56,126.0	2006
% 44.3	% 126.2	48,898.0	21,698.0	61,726.0	2007
% 51.6	% 153.3	50,228.7	25,938.0	77,027.0	2008
% 55.1	% 92.9	49,854.3	27,503.0	46,319.0	2009
% 61.2	% 118.5	52,009.9	31,881.0	61,658.0	2010
%67.8	% 115.4	20,146.3	13,664.0	23,254.0	2011
% 80.7	% 192.6	39,922.7	32,243.0	76,893.0	2012

**Table of the researcher's numbers based on the data received from:**

- 1 - Central Bank of Libya, annual reports, multiple versions of the year (2000-2012).
- 2 - Central Bank of Libya, economic publications, multiple versions of the year (2000-2012).
- 3 - National Information and Documentation Authority, Foreign Trade Statistics, various editions of the year (2000-2012).

\* Average mileage of export = exports / GDP X100.

\* Average mileage of imports = imports / GDP X100.

**From the above table it is noted that:**

1- The average export trend during the period (2000-2004) was (40.2%), which indicates an increase in revenues from oil exports due to the rise in oil prices in the global market.

The average import rate during this period reached about (20.3%), which indicates that the improvement in oil prices achieved revenues that contributed to enabling the state to spend on the establishment and development of development projects.

2- The increase in the average export tendency during the period (2005-2008) to (124.2%), which indicates the increase in the growth of the national economy compared to the previous period

(1990-1994), indicating that the oil exports positively affected the GDP.

The average trend of imports during this period also increased to (41.7%) compared to the previous period, indicating that the state's ability to establish new projects and finance and expand the projects necessary for the country's economic development process increased.

3- The average trend of exports during the period (2009-2012) was (129.8%), which indicates that oil exports recorded a clearly high relative importance in the GDP during this period.

As for the average tendency of imports during this period, it reached( 66.2%) compared to the previous period. This increase is due to the increase in imports of production goods and production requirements, as well as the increase in oil exports during this period.

**IV. Evolution of the ratio of imports to exports (absorption rate)**

The ratio of the absorption of imports to the export earnings is measured by the ratio of imports to exports.

This ratio shows the effect of the change in the export earnings on imports. Therefore, the various commodity imports are financed by the export proceeds.

The average of the study period (2000-2012) (45.4%) of the export earnings, which is high, and the higher this percentage as evidenced by the increased dependence of the Libyan economy on the outside world and as this percentage will not exceed (100%), this means that the Libyan balance of trade in the case of surplus over the period Study however it should be noted that whenever The import uptake rate of export receipts increased, which led to a decrease in the surplus of the Libyan trade balance.

The results were as shown in Table (3)

**Table (3)**

Evolution of the ratio of imports to exports ((absorption ratio))

* Import absorption ratio of export earnings%	Imports	Exports	the year
% 34.1	2,106.0	6,160.0	2000
%44.7	2,895.0	6,464.0	2001
% 71.4	9,493.0	13,291.0	2002
% 47.5	9,386.0	19,720.0	2003
% 46.8	13,110.0	27,982.0	2004
% 36.6	15,683.0	42,836.0	2005
% 29.6	16,659.0	56,126.0	2006
% 35.1	21,698.0	61,726.0	2007
% 33.6	25,938.0	77,027.0	2008
% 59.3	27,503.0	46,319.0	2009
% 51.7	31,881.0	61,658.0	2010
% 58.7	13,664.0	23,254.0	2011
%41.9	32,243.0	76,893.0	2012

**Table of the researcher's numbers based on the data received from:**

1 - Central Bank of Libya, annual reports, multiple versions of the year (2000-2012).

2 - Central Bank of Libya, economic publications, multiple versions of the year (2000-2012).

3- National Information and Documentation Authority, Foreign Trade Statistics, multiple editions of the year (2000-2012).

\* Absorption ratio Imports to exports = imports / exports X100

#### **From the above table it is noted that:**

1 -The ratio of the absorption of imports to the export earnings during the study period fluctuated between the rise and the decline. This percentage reached (48.9%) during the period (2000-2004). This means that the Libyan trade balance was in surplus during this period.

2- The percentage of imports absorbed by the export revenues during the period (2005-2008) decreased to (33.7%), which means increasing the openness of the Libyan economy to the outside world.

3- The import uptake rate of the export earnings during the period (2009-2012) increased to (52.9%) compared with the previous period (2005-2008). This increase was due to the increase in import prices during that period.

The high import uptake rate of export earnings can be attributed to two main reasons (**Hisham Ahmed , 2007 : 144**).

1- Exports (**or export earnings**) have been significantly reduced by the fall in oil prices, a serious negative side, to find industrial alternatives that contribute to the diversification of the structure of Libyan exports to mitigate vulnerability to external crises.

2 - The rise in imports may be due to the increase in prices below quantities, especially after the adoption of the Western industrial countries policies against the policy of oil-exporting countries, which aims mainly to increase the prices of manufactured goods imported by these countries.

## V. CONCLUSION

### **First: Results:**

The most important results in this study can be drawn, and summarized in the following points, which are **useful for this study**:

1 - The dominance of the oil sector on Libyan exports, by tracking the volume of Libyan exports of oil and non-oil, we find that the exports have a substantial percentage, which did not decrease throughout the years of study (93.6%) of the total exports during the study period (2000-2012) either non-oil exports Only a small fraction of the 6.4 percent of the study years remained. The Libyan economy is dependent on the export of one commodity, which makes the Libyan economy more vulnerable to price fluctuations in world markets.

As well as imports did not lose their share of the increase during the study period due to the abolition of quantitative restrictions on roses and foreign exchange control, especially in the last years of the study, stressing the dependence of the Libyan economy on imports to fill a large part of domestic demand for consumer goods and investment.

2 - The Libyan economy is considered an economy open to the outside world, as evidenced by the indicators used to measure openness, **which can be explained as follows:**

**A)** The (**Exports and imports**) and GDP, as the increase in exports by a certain percentage will lead to an increase in GDP. The ratio of foreign trade to GDP (**foreign trade coefficient**) has not decreased from (24.8%) for The study period.

**B)** The ratio of exports to GDP (**average export trend**) reached about (93.6%) as a general average during the study period.

**C)**The ratio of imports to GDP ratio (**average import tendency**) reached about (41.0%) as a general average during the study period.

**d)** Imports absorb about( 45.4%) of the export earnings as a general average during the study period.

### **Second : Recommendations:**

Based on the previous results reached through this study, we can offer a number of recommendations to raise and activate the role of foreign trade in the future, **as follows:**

1 - The adoption of the economy on the export of one commodity (oil) makes it hostage to this commodity in terms of demand and prices in the future, and this dependence will not achieve the stable economic growth required, and therefore must be diversified sources of income and find strategic alternatives to help reduce dependence on oil , Which means the need to work on the diversification of the base of exports, and the trend to industries that have to do with the oil industry and the production of crude oil because of this type of natural resources of competitive advantage, such as industries based on the inputs of the oil sector, chemical and petrochemical industries proved successful Has through the experience of previous years, which means that the interest in these industries would contribute to the diversification of even a simple structure in Libyan exports.

2 - To seek alternative sources in generating GDP and gross income, and reduce dependence on oil revenues as a source of financing development projects.

3-To limit the import of locally produced goods and to concentrate imports on goods entering the economic development process.

4 - The need to adopt the policy of expanding the base of export sectors instead of focusing on the export of crude oil in its initial form, and work on the expansion and development of other economic sectors, the most important industrial sector, service sectors, and at the same time attention to the training and qualification in these sectors. Economically and economically, with a view to local marketing in the initial phase and then export it.

5- Review the structure of the trade policy followed and lay the foundations for protecting the emerging industries by providing an appropriate environment for the success of such industries such as reducing the tariff on intermediary and capital goods used in the production process.

6 - Focus on the policy of development of non-oil exports to overcome the problem of absolute dominance of oil exports on the structure of Libyan exports and this is according to the following:

**A)** Encouraging small-scale emerging industries, especially those based on locally produced raw materials based on economic feasibility, to be the basis for export at a later stage.

**B)** Development and development of local productive resources with competitive advantage, such as marine wealth and tourism, and geographical location with a view to diversifying sources of income and GDP.

C) Developing Libyan exports through production for export, paying attention to export-supporting services, establishing Libyan exhibitions and participating in international exhibitions.

D) Development of export industries in which Libya has a competitive comparative advantage, such as petrochemical and oil-related industries, to reduce reliance on oil as a major source of foreign exchange, to make the most of the oil sector, and to diversify the structure of exports.

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# Arduino UNO and GSM Based Real-Time Home Security System Using Self-Generated Password Protection

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**Abstract—** In this work, an Arduino Uno based real time home security system using self-generated password protection scheme has been proposed. The main function of this security system is to detect the presence of human being and make the user alert about it whenever it is necessary, by sending text message to user's mobile phone-number, registered previously. In the primary stage, presence of any human being will be sensed by a Pyroelectric (PIR) motion sensor and after that, the person will have to enter the right password through a keypad. The self-generated password protection provides a double-sided benefit to this system viz. any unknown person will have to prove his/her identity by entering the right password to the security system. Every time a password is used, it expires, and a new password gets generated by the system and is sent to the registered mobile number. The real time protection has been performed using a SIM 900 TTL module which sends and receives text messages between user's mobile phone and microcontroller i.e. Arduino. This security system has provided low cost and less complicated home security protection scheme by detecting any unauthorized entry to our home or any other place that needs to be secured.

**Keywords—** Home Security, Arduino Uno, Self-Generated Password, GSM Module.

## I. INTRODUCTION

In this new age, while technology has enriched to a great extent, enhancement of theft and stealing is having a bad impact on society. Although it has been seen that since last few years, the forcible entry of burglar has been reduced but still the burglar entry has not been completely reduced. Therefore, in nowadays to restrict and resist these burglar activities, implementation of various security devices is a vital area of research. The security devices, which can be placed either inside or outside of house, to protect trespassing is generally known as home security devices [1].

At the early stage sound alarms were the only thing which is used as a home security system. But due to the development and advancement of technology as well as the increase in smartness of burglars, sound alarms are not enough for the home security. Hence microcontroller viz. Arduino, Raspberry Pi, PIC microcontroller etc. based home security system have become popular in these days. The components which are used for the home security systems are Arduino, GSM, Smart Vault, etc.

Arduino acts as the brain of the home security system. It is

an open-source electronics platform based on easy to use hardware and software. This device senses the environment by receiving inputs from many sensors and affects its surroundings by controlling lights, motors, charger, inverter, and other actuators. Today most of the projects, innovation occur by the help of Arduino [2].

Nowadays the applications of IoT (Internet of Things) [3] are developing vastly. It is a smart system where the home appliances are connected with the internet which is operated by a user-friendly application. For example, if somebody forgets to turn off the light or fan or any other appliances in the house, they can turn it off by the help of the cell phone through wireless communication system. This is the major application of IoT. For this reason, nowadays IoT are also used as in-home security system [4-6].

Camera plays an important role in the home security system. In most of the houses and building, CCTV cameras are used which records every moment happening inside as well as the surroundings [7]. Cyber Security is a system which also helps in security but this system is mostly used in offices, banks, etc. Nowadays ATMs are protected by Cyber Security [8-9].

Global System for Mobile Communication (GSM) is a system which helps to send and receive both call and messages by the help of Arduino and other microcontroller [10-13]. This system is quietly used as a home security system. Another home security system has been developed which is Finger Print

In this project, a GSM based and Arduino Uno controlled home security system has been proposed. A GSM module named as SIM900 TTL modem with active simcard has been used. Also a security keypad has been used to provide better security to this system. Whenever any person enters home or work place or where we want to know the presence of unknown people, the presence of him/her will be detected by sensor. Now if the person is known, then he/she can put a security password on the keypad which will prove that he is a known person who has entered. But if he/she fails to provide right password, then a message will be sent to user's mobile phone to ensure that an unauthorized entry has occurred. The main objective of this project is to prevent and alert user about any unauthorised entry into the desired place. The double-sided protection has provided greater security to this work along with self-generated password scheme, which changes every time an entry occurs.

## II. METHODOLOGY

To implement this security system, user should have a mobile phone with active SIM-card. Another SIM-card is also needed

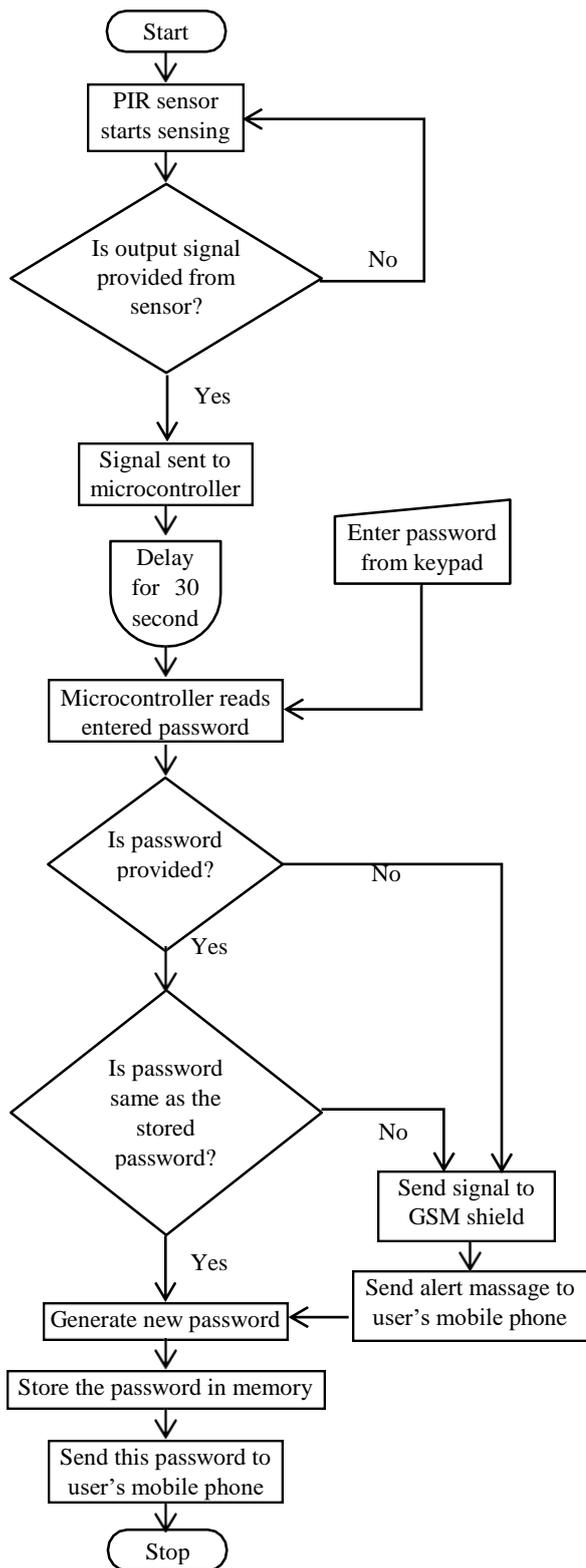


Fig.1 Signal flow diagram

to be placed inside the GSM shield with text message incoming and outgoing facility. The Arduino Uno, GSM shield is to be kept inside home with power supply on and PIR motion sensor is to be kept near door or where human presence is needed to be sensed. Fig.1 represents the signal processing flow diagram of the proposed work. Whenever human presence is sensed by PIR sensor, it sends signal to microcontroller and microcontroller waits for 30 second to receive right password, entered from keypad, failing which microcontroller sends an alert message, using GSM module, to user's phone regarding presence of any

unauthorized person. But if right password is received by microcontroller, then it generates a new password and sends it to user phone which will be treated as new password for the next time operation. The whole procedure is explained in the following five stages; 1. Motion sensing by PIR sensor, 2. Password entry through keypad, 3. GSM shield operation to send alert message, 4. Password generation and updating to user.

In the area of microcontroller based research or project works, Arduino Uno has played a vital role as a controlling device. The Arduino Uno is a microcontroller board equipped with Atmega-328P microchip and other peripheral devices and a set of input/output pins. Its working voltage is 5 Volt with operating frequency 16 MHz. Table I Shows the specifications of Arduino Uno. Now in this proposed work, Arduino Uno has been used as a primary controlling device of all other components. The connection scheme of other components with Arduino is explained in each following section.

TABLE I. ARDUINO UNO SPECIFICATION (ATMEGA328)

Operating voltage	5 V
Operating current	50 mA
Input voltage limit	7-20 V
Operating frequency	16 MHz
Analog Input/output pin	6
Digital Input/output pin	14
Flash memory	32 Kbyte
SRAM	2 Kbyte
EEROM	1 Kbyte

A. Motion sensing by PIR sensor

The Pyroelectric (PIR) Motion sensor can detect the change of infrared radiation coming from a hotter body thus ensuring its presence near about itself. In this work this sensor has been used to detect the presence of human being in its vicinity. This sensor needs 5-20 Volt DC supply to operate and if any motion or change in infrared radiation is sensed, it provides a high DC output voltage (almost 3.3-5 Volt), otherwise this output pin goes low ( almost zero voltage). The sensitivity range of this device is almost 6-7 meters with 110°×70° sensation capacity.

The sensing range of PIR sensor varies between 3-7 meter, hence the sensor is to be kept in such a place so that it can sense the presence of human body inside home. The sensing range can also be controlled using sensitivity adjustment knob as shown in Fig.2 In this work, the PIR sensor has been powered from Arduino Uno microcontroller directly from Pin-11 by keeping

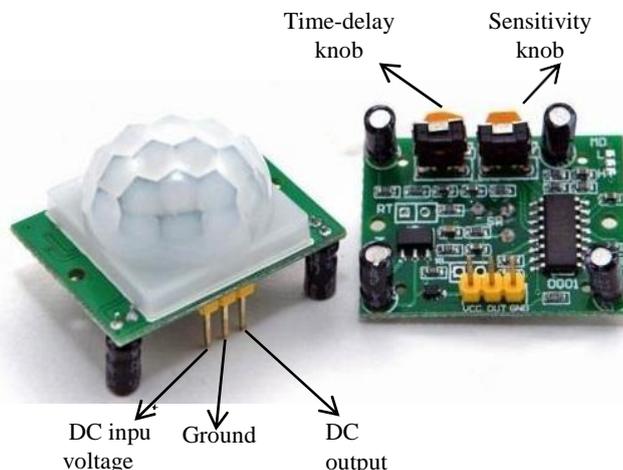


Fig.2 PIR motion sensor

this pin configuration as high output mode and the ground pin is connected to Arduino ground pin (GND). Now the output pin is connected to Arduino Pin-10. In general output signal of PIR sensor is low (viz. 0 volt) but whenever any human presence is sensed by the sensor within its range, it sends a high signal (almost 3 Volt) through its output pin which is connected through Arduino pin.

Now if human presence is sensed, then PIR sends high output signal. Arduino receives this signal and waits for 30 second for the password to be entered through keypad.

Hence, just after entering into room, the person, needs to provide the right password within this 30 second.

### B. Password entry through keypad

A 4×4 matrix keypad is used to manually provide 16 character viz. numeric character between ‘0-9’, alphabet between ‘A-D’ and two special character ‘\*’ and ‘#’, by pressing respective keys as shown in Fig.3. This keypad consist of total 8 pins where 4 pins is connected to each row and rest of 4 pins are connected to each column. Now whenever any key is pressed, respective row and column are activated and by detecting the row and column number, microcontroller can read, which key has been pressed.

In this work, a password of three digit is to be entered by the user manually through 4×4 keypad. Mainly the password is the proof of that the person who has entered, a known person. Initially, a three digit password was generated by Arduino and saved by itself. This password was also sent to user’s mobile phone through GSM shield. Thus this password would be known to user only. Now, when a person enters to room, he/she might be either known or unknown. If the person is known, then before entering, he/she can get information about the right password from user and just after entry, he/she will enter that password through keypad which ensures that he/she is a known person. Now if that person fails to provide any password or provides wrong password within this 30 second, it will be a proof of

unauthorized entry. Whenever any unauthorized entry be detected, Arduino sends signal to GSM shield to send an ‘alert message’ to user to make him/her aware of it. In this way, the PIR sensor along with self-generated password protection scheme provides a better and low cost security system.

To make aware the person about his presence has been detected by microcontroller, two signal Led have also been used. When microcontroller will sense the high output signal from PIR, a Green Led with starts glow. After 20 second it will starts blinking and whenever 30 second completes, the Green light will extinguish and a Red light will glow ensuring that ‘alert message’ has been sent to user mobile. But if the person provides right password within this interval, both light will extinguish and no message will be sent regarding unauthorized entry.

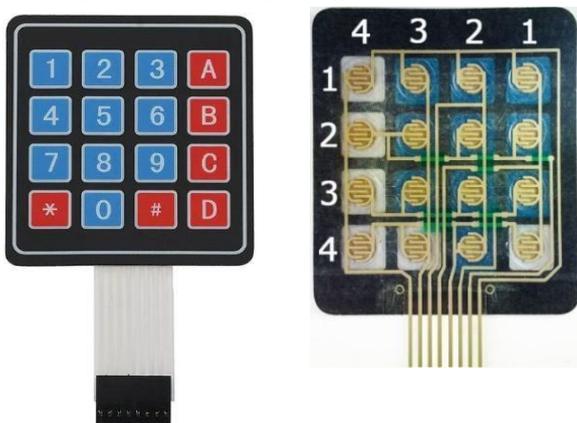


Fig.3 4×4 keypad

### C. GSM shield operation to send alert message

The SIM 900 TTL UART modem, shown in Fig.4, is a dual band GSM/GPRS module with operating frequency 900/1800 MHz. This module operates in 5-20 volt DC supply and it is equipped with SMA connector with GSM L Type Antenna. This module can be interfaced with microcontroller unit with AT commands through serial port using TX and RX pin to transmit and receive data, respectively.

In our work we have used a GSM simcard to send message from this module to user’s mobile phone. Hence after inserting this simcard, we connected the antenna and provided power supply from Arduino Uno by attaching this module with Arduino Uno. Now there are three status LED, mounted on GSM module, which are 1. PWR LED: it will lit immediately after proving power supply, 2. STS LED: it will lit after 1-2 seconds indicating the module is operating properly, 3. NET LED: it will starts to blink in fast for few seconds (searching for Network) and becomes slow blinking once the Modem registers with the Network. Now, when NET Led will starts blinking slowly, the module starts working properly. A text message was already been written inside microcontroller to alert users, and it was sent to users mobile phone whenever any unauthorized entry took place. The algorithm is written below,

Alert\_MSG=‘trespassing has been occurred’.# alert message

1. if password has been entered goto step 2, else goto step 7
2. if the entered password is right goto step 3, else goto step 7
3. generate new password
4. save new password
5. send new password to users mobile phone
6. go to step 9
7. send Alert\_MSG to users mobile phone
8. go to step 3
9. end.

Now to send Alert\_MSG, the following commands is used,

1. `mySerial.println("AT+CMGF=1");`
2. `delay(1000);`
3. `mySerial.println("AT+CMGS=\ +91xxxxxxxxxx");`
4. `mySerial.println("trespassing has been occurred");`

Where, “xxxxxxxxxx”, represents users 10 digit mobile number.

### D. Password generation

In this work, a new password generation scheme has been proposed where after completion of each operation, every time a new password is sent to user mobile, thus increasing the security procedure. This password generation procedure can be of three different types, these are 1. if any trespassing occurs, user will aware of it and after that the Arduino Uno has to be restarted and a new password will be sent. 2. if any malfunction has been occurred or any known person has entered and forgot



Fig.4 PIR motion sensor

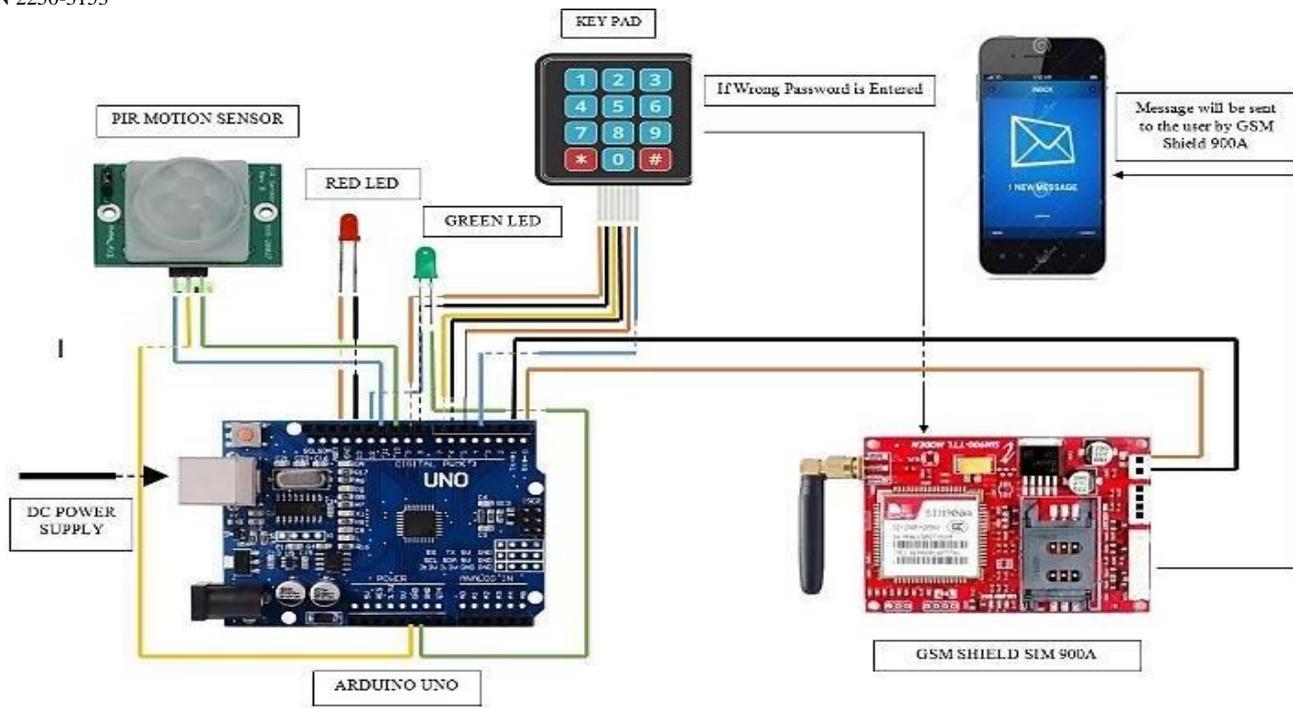


Fig.5 Connection scheme of proposed work

to provide right password, then user will still receive alert message. In that case user can send a missed call to the simcard connected to GSM shield and the device will generate new password and will start working properly. 3. if any known person has entered and provided right password, then the device to just send the new generated password o user and will start working properly.

Now, after password generation and updating of password to user, the microcontroller will treat this password as right one for the next time operation. The connection scheme of this work is explained in Fig.5.

### III. CONCLUSION

In this the main objective was to reduce technical complexity and expenses over the security system along with advancement of security procedure. After detection of human presence, this device needs a password to make user ensure that a known person has entered, failing which an 'alert\_message' will be sent t to user's mobile phone to make him/her aware of that, a trespassing has occurred. After each time operation a new password will be generated and treated as right password for the next time operation. Also this new password will only be known to user. In this way the self-generated password protection scheme provided a better security protocol.

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# Late Maastrichtian to Paleocene sediments of part of Southwestern Iullemmenden Basin, Rabah Sheet 11, Sokoto State, Northwestern, Nigeria.

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**Abstract-** The stratigraphy and sedimentary structures of the area around Gidan Marafa and environs of Late Maastrichtian to Paleocene in SW Iullemmenden Basin Nigeria. Detailed field work was carried out on a scale of 1:25,000 and two groups were encountered. However, three Formations was studied as follows starting from younger to older; (2) Rima Group; only Wurno Formation was found at the top of this group and are made up of friable, yellow-golden brown fine to medium grained sandstones which intercalates with carboniferous mudstones. This Formation is separated above with Dukanmaje Formation by bone bed with distinct boundary, (1) Sokoto Group; two Formations were analysed. At the base, Dange Formation was studied; it was formed during early Paleocene age and are made up of bluish to dark grey shale and thin beds of fibrous gypsum, fine sandstones and intercalating limestone while at the top, Kalambaina Formation was studied. It is predominantly made up of thick, white limestone bed and at some place it is sandwiched between overlying and underlying shale bed. Structures observed are parallel lamination and mud cracks. Moreover, fossils observed are echinoids, ostracods and bivalves. However, based on the sedimentological analysed results, change in energy regime and fossils present, the environment suggest to be of shallow marine.

**Index Terms-** Stratigraphy, Sedimentary structures, Gidan Marafa, Late Maastrichtian, Paleocene, Iullemmenden Basin, Wurno Formation Dange Formation, Kalambaina Formation, limestone, shale, gypsum, bioturbation, echinoids, bivalves, depositional cycle, Marine environment, coastal plain sedimentation

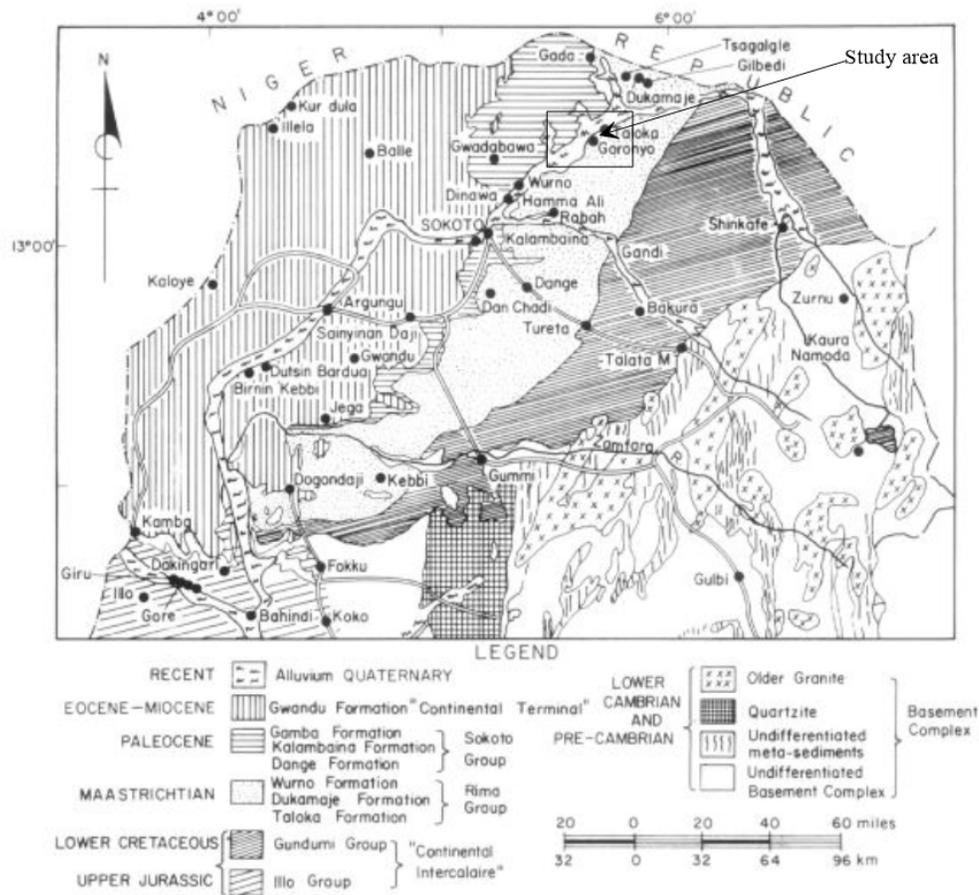
## I. INTRODUCTION

The Iullemmenden Basin is a major Sub-Sahara Inland Basin in West Africa extending about 1000 km north to south and 800 km east to west. It covers western part of Niger, some portion of Algeria, Mali, Benin and Nigeria. It is named after the Iullemmenden, a federation of Tuareg people who live in the

central region of Niger. The term Iullemmenden Basin was first proposed by Raider (1957) to describe the sedimentary basin which extends from Mali to western boundary of the Republic of Niger and Northwestern Nigeria into eastern Niger. The Iullemmenden Basin is a Cratonic Basin created by tectonic epiorogenic movement within carbonic rocks (Betrand-Safarti, 1977). Faure (1966), suggested that the emergence of plate tectonic theory and seafloor spreading to explain the origin of Iullemmenden Basin which was affected by series of marine transgressions during the Paleozoic, Mesozoic and Tertiary age respectively. These transgressions progressively affected a great portion of the in a southward direction. This implies that the tertiary marine transgression was the most extensive and covered a considerable portion of the basin. Maastrichtian and Paleocene marine beds outcrop extensively in the Sokoto region of Northwestern Nigeria, Central West Africa and continue northeastward in the neighbouring Niger Republic. The deposits consist of siltstones, shales and organogenic marls were laid down in and around the Saharan Epeiric Sea that flooded the central Sahara during Latest Cretaceous and Early Tertiary times. An embayment of the Saharan sea extended into Sokoto in northwestern Nigeria (Kogbe and Lemoigne 1976; Petters, 1978). The geological map of the Sokoto Basin of northwestern Nigeria (Fig. 1).

## II. GEOLOGIC SETTING AND SEDIMENT DEPOSITION

The Iullemmenden Basin seems to have started to subside in Permo-Triassic era and to have experienced gradual down warping during the Upper Cretaceous – Lower Tertiary eras, while steadily filling with sediments. Two prominent fault trends run NNE-SSW through the centre of the basin while, WSW-ENE faults trends are found in the northeast of the basin near the Air Mountains. The sediments from Cambrian to Pleistocene eras are 1,500 to 2,000 meters deep, with alternating layers formed when then basin was undersea and above sea level.



**Figure 1: Geological sketch map of the southeastern sector of the Iullemeden Basin (Sokoto Basin) (After Kogbe, 1981).**

The Basin extends over 700,000 km<sup>2</sup> and is bounded to the north by Adrar des Iforas the Hoggar and Air range/mountain to the west by Gourma, the Iptako and crystalline rocks of the northern boundary of Benin Republic and the Nigeria basement rocks to the south and southeast. The basement is directly overlain by Cambrian beds to the north in the Tesseli and the Hoggar Mountain. As one traverses the basin from the north towards the southwest the formations become younger in age and rest directly on Precambrian basement. This phenomenon is overlain where progressively younger beds rest on older series. According to Kogbe, (1979) the Iullemeden Basin was affected by a series of marine transgressions during the Paleozoic Mesozoic and Tertiary. The Cenomanian is marine throughout most of the Iullemeden Basin. It is characterized by the presence of neolobites a well-known Upper Cenomanian Ammonite. The Cenomanian overlies the Tegama Group of sediments unconformably and consists of

about 100 m of shale sandstone and black fossiliferous limestone. The beds are folded and represent the earliest documented evidence of the first marine transgression in the Iullemeden basin during the Cretaceous. At that time, the Iullemeden basin was marked by a series of sedimentary cycles resulting from the uplifting of the north eastern margin of the Basin (Greigret, 1966) recognized three transgressions in the Iullemeden basin during the Cretaceous transgression characterized by the abundance of the lower Turonian ammonite and the one characterized by the abundance of upper Maastrichtian ammonite *Libycoceras*. Each of the transgression overlies the preceding one in the uplifting of Air Mountain closed the North-Eastern passage of the sea east of the Hoggar.

**Geologic Deposition Sequence of Northwestern Sedimentary Basin**

**Table 1: Summary of geological sequence in the northwestern Nigeria sedimentary Basin (Kogbe, 1979).**

AGE	FORMATION	GROUP	ENVIRONMENT
Quaternary	Sandy drift, laterites	-	Continental
Eocene to Miocene	Gwanda Formation	Continental Terminals	Continental
Paleocene	Gamba Formation Kalambaina Formation Dange Formation	Sokoto Group	Marine

Maastrichtian	Wurno Formation Dukanmaje Formation Taloka Formation	Rima Group	Brackish water with brief intercalation
Lowermost Cretaceous or Older	Illo Formation Gundumi Formation	Continental Intercalaire	Continental
PRECAMBRIAN BASEMENT COMPLEX			

### III. METHODOLOGY

This study was undertaken in four stages;

- i. Desk study, which involved a detailed review of published and unpublished literature,
- ii. Fieldwork and sample collection,
- iii. Laboratory analysis,
- iv. Processing of data and Compilation

#### Desk Study

This involved detailed reviewed into the previous work carried out in and around the study area, specifically on Wurno, Kalambaina and Dange Formation respectively by past workers. Relevant materials including topographic base map, journals, textbooks, maps, published and unpublished works were consulted.

#### Fieldwork

The study area form parts of Rabah Sheets 11. It cover a total area of 13.27 km<sup>2</sup>. It falls within latitude 13° 27' 18' N – 13° 00' N and longitude 5° 30' E – 5° 34' 25'. The fieldwork was conducted during the dry season on 1: 25,000 scale topographic base maps, in order to establish sections and determine sedimentary structures. The geological map was completed using an iterative process of field mapping with the help of surfer 12.0 and Global Mapper 13 softwares. Additionally a systematic logging technique was adopted and this included measuring thicknesses of beds with the help of a measuring tape, location of different lithofacies boundaries across/or along sections with the aid of Global Positioning System (GPS) technology and photography using a digital camera. Samples were collected for hand specimen description and laboratory analysis. Stratigraphic sections were measured in several locations in the study area. The texture, sedimentary structures and bedding contacts were studied and mapping of the area are carried out. Also, samples were collected in the field for petrographic and granulometric analysis respectively.

#### Laboratory sample preparation and analysis

Analyses of the samples collected were carried out using the following methods;

- i. Granulometric analysis.

#### Granulometric Analysis

Granulometric Analyses (sieve analysis) was carried out on the sandstone samples collected in the field in the sedimentology laboratory, Department of Geology Ahmadu Bello University, Zaria. The primary aim of the sieve analysis was to determine particles size distribution and other grain size parameters such as, inclusive graphic skewness, graphic mean, inclusive graphic standard deviation, and graphic kurtosis. Several samples were

selected from different locations for sieve analysis. Samples were carefully disaggregated with the help of pestle and mortar. The weight of the bottom pan, selected empty sieves (2.00 mm, 1.00 mm, 0.5 mm, 0.25 mm, 0.125 mm and 0.063 mm) and 100 g of each disaggregated samples were obtained using a weighing balance. The sieves and the bottom pan were fastened to a mechanical shaker, and the 100 g of the sample poured on the upper sieve. The machine was switched on and allowed to shake for ten (10) minutes. Sediment in each of the sieves and the bottom pan were weighed and recorded. During the course of the sieve analysis care was taken in the separation of the sieves after shaking to avoid spillover of the retained sediments. When disaggregating the samples care was also taken to avoid crushing and grinding in order not to distort the original shape of the grains. The cumulative frequency curves resulting from the analyses are shown in Table 2. The results obtained from the sieve analysis are presented in a tabular form (see Table 3). However, the cumulative frequency curves, critical percentiles (Φ5, Φ16, Φ25, Φ50, Φ75, Φ84 and Φ95) obtained was used for the calculation of grain size parameters such as; graphic mean, sorting (graphic standard deviation), graphic skewness and graphic kurtosis; the results of the parameters for each of the samples are tabulated and shown in Table 2. The formulae for calculating these parameters after Folk and Ward (1957).

### IV. FORMULAE TABLE FOR GRAIN SIZE PARAMETERS

#### Graphic Mean (M)

$$\text{Mean} = \frac{\Phi_{16} + \Phi_{50} + \Phi_{84}}{3}$$

This is the measure of the average grain size diameter of the sediments. The table below shows the values and corresponding interpretations of the graphic mean according to Folk and Ward (1957).

φ scale	Interpretation
- 1.0 to 0.0	Very coarse sand
0.0 to 1.0	Coarse sand
1.0 to 2.0	Medium sand
2.0 to 3.0	Fine sand
3.0 to 4.0	Very fine sand
4.0 to 5.0	Coarse silt.

#### Graphic Standard Deviation (Sorting) (δ)

$$\text{Standard Deviation } (\sigma) = \frac{\Phi_{84} - \Phi_{16}}{\Phi_{95} - \Phi_5} +$$

$$6.6$$

This is a measure of degree spread of grain sizes about the mean and corresponds with the standard deviation. The values for

sorting and their corresponding interpretations according to Folk and Ward (1957) are given below;

$\phi$ scale	Interpretation
< 0.35	Very well sorted (VWS)
0.35 to 0.50	Well sorted (WS)
0.50 to 0.71	Moderately well sorted (MWS)
0.71 to 1.00	Moderately sorted (MS)
1.00 to 2.00	Poorly sorted (PS)
2.00 to 4.00	Very poorly sorted (VPS)
>4.00	Extremely poorly sorted (EPS)

**Graphic Skewness (ski)**

$$\text{Skewness (Ski)} = \frac{\Phi_{84} + \Phi_{16} - 2\Phi_{50}}{\Phi_{95} + \Phi_5 - 2\Phi_{50}} + \frac{2(\Phi_{84} - \Phi_{16})}{2(\Phi_{95} - \Phi_5)}$$

This is a measure of bias in the grain size distribution either towards the coarser or finer grained end of the size range. Positively skewed samples have an excess of fine grains, negatively skewed samples have an excess of coarse grains. The values for skewness and their corresponding interpretations according to Folk and Ward (1957) are given below;

$\phi$ scale	Interpretation
> 0.30	Strongly fine-skewed
0.30 to 0.10	Fine-skewed
0.10 to -0.10	Near symmetrical
-0.10 to -0.30	Coarse-skewed
> -0.30	Strongly coarse-skewed

**Graphic Kurtosis (Kr)**

$$\text{Kurtosis (Kr)} = \frac{\Phi_{95} - \Phi_5}{2.44(\Phi_{75} - \Phi_{25})}$$

This is a measure of flatness of the grain size distribution as it would appear on a simple frequency curve. Flat distributions are Platykurtic and peak distributions are leptokurtic. The values for kurtosis and their corresponding interpretations according to Folk and Ward (1957) are shown below:

$\phi$ scale	Interpretation
<0.67	Very platykurtic
0.6 to 0.9	Platykurtic
0.9 to 1.11	Mesokurtic
1.11 to 1.50	Leptokurtic
1.50 to 3.00	Very leptokurtic
> 3.00	Extremely leptokurtic

**V. RESULTS**

The formations studied within Late Maastrichtian to Palaeocene falls under two groups which are as follows; (i) Rima Group; only one formation is available, which is Wurno Formation while, (ii) Sokoto Group; two Formation were studied which are Dange and Kalambaina Formation respectively.

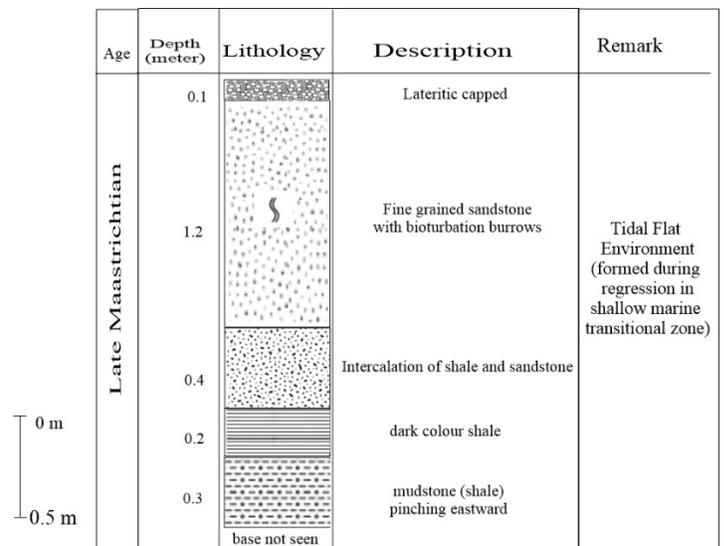
Stratigraphic sections were logged and sedimentary structures were observed. The following are the results and interpretation based on age, form older to younger.

**VI. WURNO FORMATION**

This consist of the oldest sediments in the study area, over 2.2 meters thick was logged (Fig. 2),

Description of section from bottom to top;

They are composed of 0.3 m thick of mudstone pinching eastward (shale), 0.2 m thick of dirty brown of paper shale, 0.4 m thick of intercalating of sandstone with mudstone, 1.2 m thick of fine grained sandstone and 0.1 m thick of ironstone laterite exposed at top. (Pl. 1). It is deeply weathered and gives rise to lowland with flat topography and thick soil cover and underlies most of the study area. Parallel lamination, mudcracks and bioturbation burrows are the dominant structures,



**Figure 2: Lithostratigraphic log of Wurno Formation, Rima Group.**



**Plate I: Wurno Formation, Rima Group, photograph of uneven parallel, fine grained sandstone showing bioturbation burrows.**

### VII. DANGE FORMATION

This is part of the section of Dange Formation consists of the oldest Palaeocene sediments (Fig. 3). This formation consists of indurated shale as well as finely laminated bluish-grey shale in different places (Pl. II, III).

Description of section from bottom to top;

0.2 m thick of unconsolidated grey limestone bed, 1.2 m thick of bluish-grey mudstone, 0.2 m thick of intercalating mudstone with sandstone, 0.2 m thick of medium to fine grained sandstone, 0.2 m thick of sandstone, 0.6 m thick of dark brown mudstone, 0.1 m thick of yellowish brown sandstone and 0.1 m thick of laterite soil.

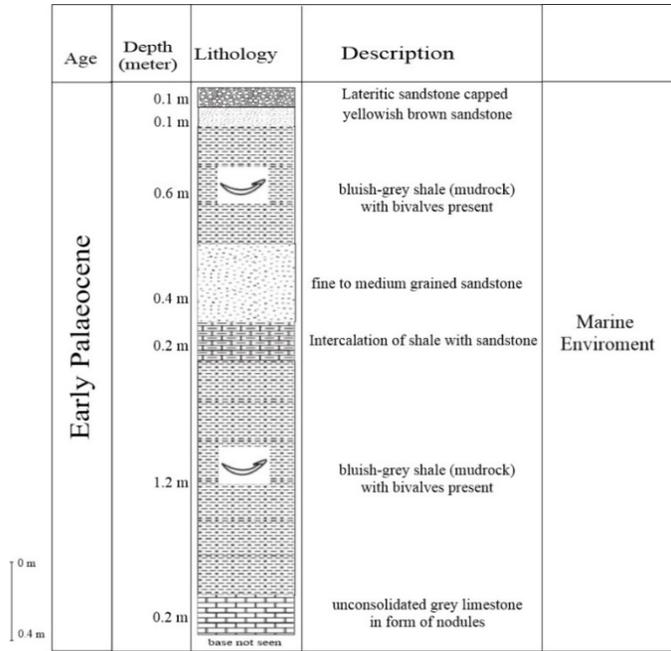


Figure 3: Lithostratigraphic log of Dange Formation, Sokoto Group.



Plate II; Dange Formation, Sokoto Group, photograph showing bluish-grey coloured mudrock (shale) intercalating in between dark coloured mudrock.

The shale include bands of fibrous gypsum with a large number of irregular shaped phosphate nodules. The limestone intercalations are located mostly towards the base of the formation

where they occur in few bands which are usually unfossiliferous. However, the fossils are filled with calcareous materials



Plate III: Dange Formation, Sokoto Group, photograph of bivalves (*Lucina paraonis*).

### VIII. KALAMBAINA FORMATION

This formation is found at different locations but the thickest bed among it was logged, the limestone bed is sandwiched between an overlying and underlying shale bed with fossils present (Fig. 4; Pl. IV, V). This forms the middle part of Palaeocene sediments

Description of section from bottom to top;

0.7 m thick of parallel bedding bluish shale, 0.2 m thick of intercalation of shale and limestone, 0.3 m thick of intercalation of limestone with sandstone, 1.2 m thick of white limestone, 0.1 m thick of intercalation of limestone with shale, 0.3 m thick of grey shale and 0.1 m thick of lateritic material capping the top.

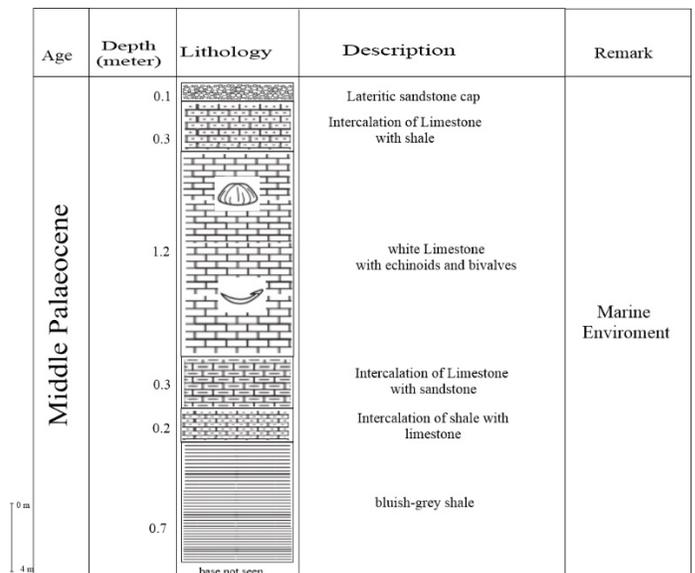


Figure 4: Lithostratigraphic log of Kalambaina Formation, Sokoto Group.



Plate IV: Kalambaina Formation Sokoto Group, Limestone sandstone intercalating with shale

The fossils found are observed along river channels, they are echinoids, bivalves and brachiopods.

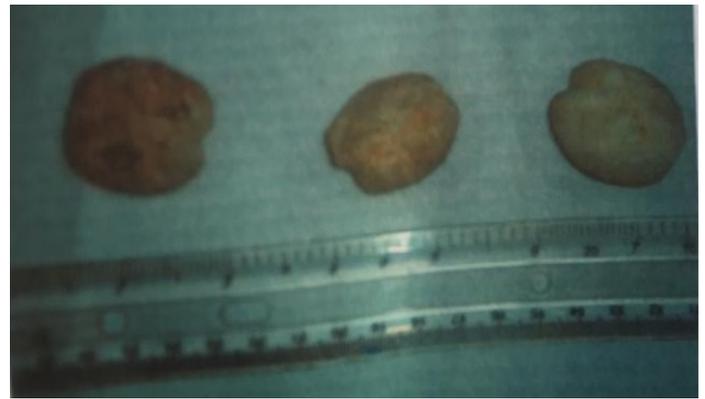


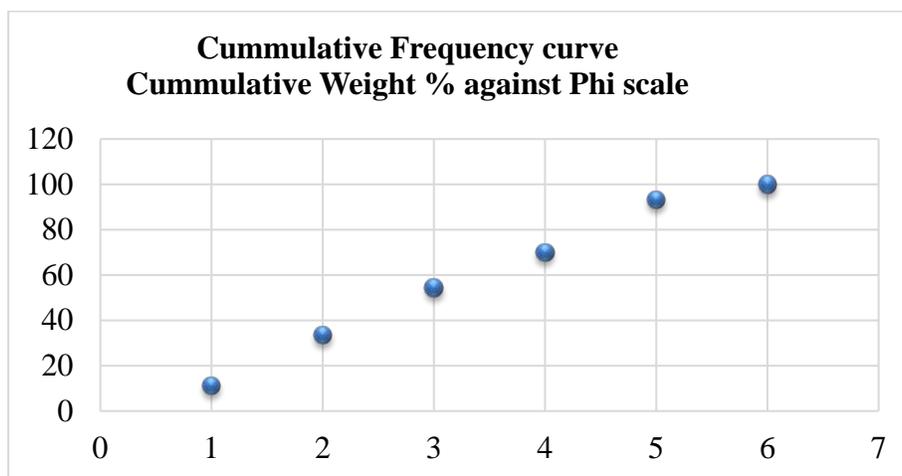
Plate V: Kalambaina Formation, Sokoto Group, photograph of echinoids (*Linthia sudanesis*).

### IX. GRANULOMETRIC ANALYSIS

A total of five (5) samples were analysed and the raw data's are tabulated below

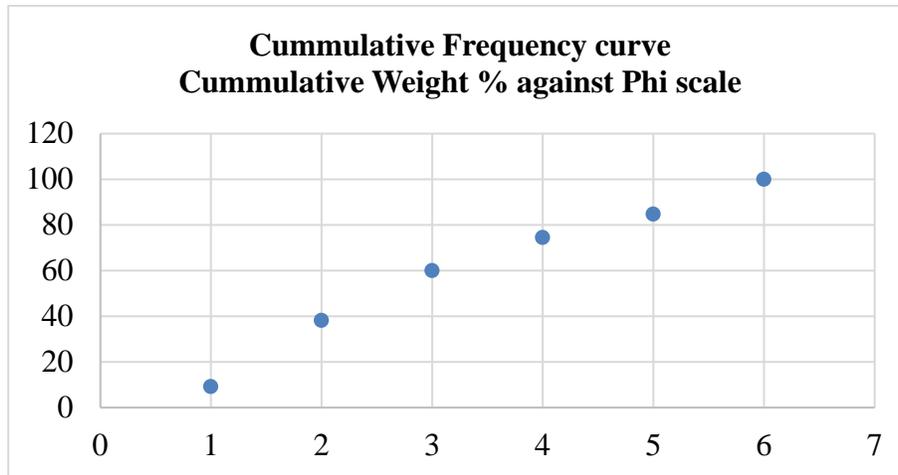
**Table 2: Cumulative frequency weight distribution of Kalambaina Formation, Sokoto Group.**

Sieve Size (mm)	Phi Scale (φ)	Weight of Sieve (g)	Weight of sieve + Sample retained (g)	Weight of Sample (g)	Weight % of Sample Retained	Cumulative Weight %
1.18 mm	- 0.25	347	358.2	11.2	11.2	11.2
600 μm	+ 0.75	349	371.7	22.7	22.7	33.7
300 μm	1.75	367	387.4	20.4	20.4	54.4
150 μm	2.75	325	340.7	15.7	15.7	70
75 μm	3.75	313	336	23.0	23.0	93.2
Pan	> 3.75	301	308.1	7.1	7.1	100
<b>Total</b>				99.9	99.9	



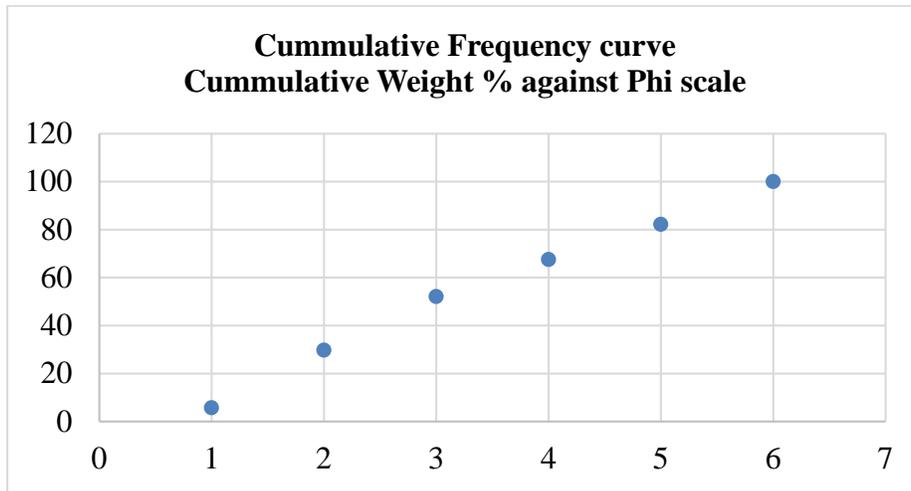
**Table 3: Cumulative frequency weight distribution Kalambaina Formation, Sokoto Group.**

Sieve Size (mm)	Phi Scale ( $\phi$ )	Weight of Sieve (g)	Weight of sieve + Sample retained (g)	Weight of Sample (g)	Weight % of Sample Retained	Cumulative Weight %
1.18 mm	- 0.25	347	357.2	9.2	9.2	9.2
600 $\mu$ m	+ 0.75	349	378	29.0	29.0	38.2
300 $\mu$ m	1.75	367	388.8	21.8	21.8	60
150 $\mu$ m	2.75	325	339.5	14.5	14.5	74.5
75 $\mu$ m	3.75	313	323.2	10.2	10.2	84.7
Pan	> 3.75	301	316.3	15.3	15.3	100
<b>Total</b>				100	100	



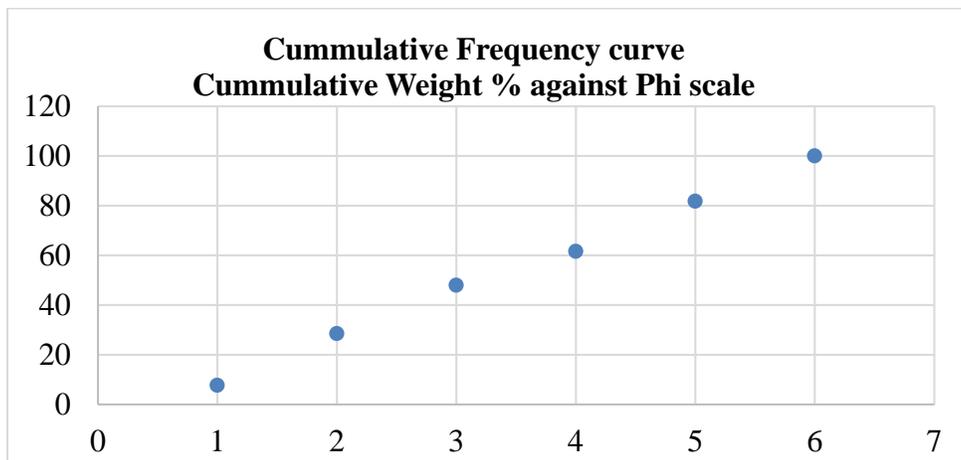
**Table 4: Cumulative frequency weight distribution, Kalambaina Formation, Sokoto Group.**

Sieve Size (mm)	Phi Scale ( $\phi$ )	Weight of Sieve (g)	Weight of sieve + Sample retained (g)	Weight of Sample (g)	Weight % of Sample Retained	Cumulative Weight %
1.18 mm	- 0.25	347	352.7	5.7	5.7	5.7
600 $\mu$ m	+ 0.75	349	373	24	24	29.7
300 $\mu$ m	1.75	367	389.4	22.4	22.4	52.1
150 $\mu$ m	2.75	325	340.4	15.4	15.4	67.5
75 $\mu$ m	3.75	313	327.7	14.7	14.7	82.2
Pan	> 3.75	301	318.8	17.8	17.8	100
<b>Total</b>				100	100	



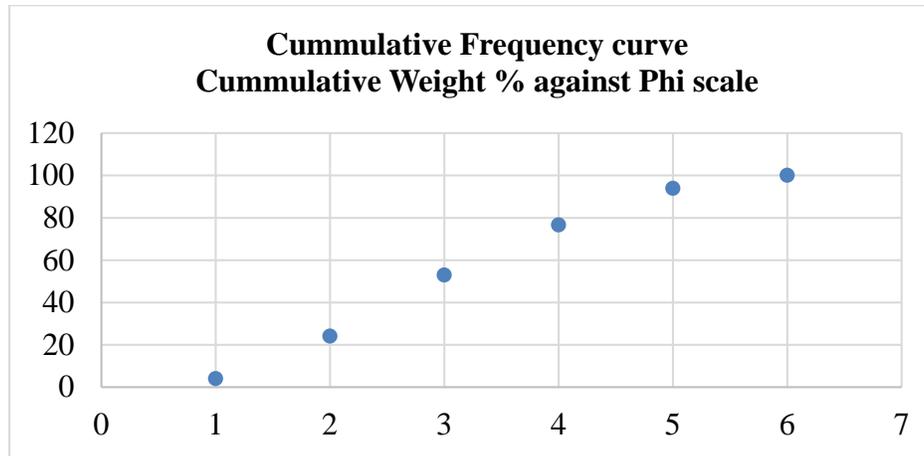
**Table 5: Cummulative frequency weight distribution, Kalambaina Formation, Sokoto Group.**

Sieve Size (mm)	Phi Scale (φ)	Weight of Sieve (g)	Weight of sieve + Sample retained (g)	Weight of Sample (g)	Weight % of Sample Retained	Cumulative Weight %
1.18 mm	- 0.25	347	354.7	7.7	7.7	7.7
600 μm	+ 0.75	349	369.8	20.8	20.8	28.5
300 μm	1.75	367	386.5	19.5	19.5	48
150 μm	2.75	325	338.6	13.6	13.6	61.6
75 μm	3.75	313	333.2	20.2	20.2	81.8
Pan	> 3.75	301	319.2	18.2	18.2	100
<b>Total</b>				100	100	



**Table 6: Cummulative frequency weight distribution, Kalambaina Formation, Sokoto Group.**

Sieve Size (mm)	Phi Scale (φ)	Weight of Sieve (g)	Weight of sieve + Sample retained (g)	Weight of Sample (g)	Weight % of Sample Retained	Cumulative Weight %
1.18 mm	- 0.25	347	351	4	4	4
600 μm	+ 0.75	349	369.1	20.1	20.1	24.1
300 μm	1.75	367	395.8	28.8	28.8	52.9
150 μm	2.75	325	348.7	23.7	23.7	76.6
75 μm	3.75	313	330.3	17.3	17.3	93.9
Pan	> 3.75	301	307.2	6.2	6.2	100
<b>Total</b>				100	100	



X. INTERPRETATION OF RESULTS

Table 7: Summary results obtained from cumulative frequency curve

Sample No.	Φ 5	Φ 16	Φ 25	Φ 50	Φ 75	Φ 84	Φ 95
1	0.1	1.0	1.6	3.0	4.3	4.8	5.4
2	0.1	0.9	1.3	2.9	4.2	4.8	5.7
3	0.2	1.3	1.8	3.2	4.5	5.15	5.7
4	0.3	1.3	1.9	3.2	4.8	5.0	5.8
5	0.4	1.4	1.8	2.7	4.1	4.8	5.8

Table 8: Result of grain size analysed

S.No	Graphic mean (mz)	Sorting	Graphic skewness (ski)	Graphic kurtosis
1	Fine Grained 2.63	Poorly sorted 1.75	Near symmetrical -0.073	Platykurtic 0.81
2	Fine Grained 2.6	Poorly sorted 1.82	Near symmetrical -0.013	Platykurtic 0.79
3	Fine Grained 2.85	Poorly sorted 1.78	Near symmetrical -0.046	Platykurtic 0.80
4	Fine Grained 2.83	Poorly sorted 1.76	Near symmetrical -0.036	Platykurtic 0.78
5	Fine Grained 2.63	Poorly sorted 1.67	Fine skewed +0.192	Platykurtic 0.82

**Interpretation of Wurno Formation**

This formation is made up of uneven parallel lamination fine grained sandstone that are poorly sorted, near symmetrical skewed and platykurtic with bioturbation burrows which is most vertical and intercalation of sandstone with mudrock. The fine grained indicates low energy regime environment. However, fluctuation of energy regime indicates transitional environment gave rise to the poor sorting morphology. The bioturbation causes destruction or deformation of primary sedimentary structures produced by inorganic agencies (Richter, 1963). The bioturbation structures can be divided into two broad divisions (Schafer, 1956, 1972)

- i. Deformative bioturbation structures without any definite form. These appear as formless mottled

structures or irregular flecks of different grain size, colour etcetera.

- ii. Figurative bioturbation structures which possess definite recognizable forms, such as burrows

The Wurno Formation marks the end of the Late Maastrichtian depositional cycle and a renewed phase of coastal plain sedimentation. Abba (2011), suggested that indicators of tidal are also lack of trace fossils which is found. Based on the sedimentary structures and lamination, the Wurno Formation is of tidal flat depositional environment due to the fact that tidal flat sediment body are elongated parallel to the shore line (Kogbe, 1979). Moreover, Wurno Formation positioned pre and post marine transgression which make it have distinct contact as regressive phase. That is, the Wurno Formation grades into the overlying transgressive Sokoto Group in north-western Nigeria

which is equivalent to the Paleocene Adra Douchi Formation in Niger (Greigert and Pognet, 1967). Kogbe (1979), described that near the high water line water shed sediments are muddy or clayed while, near the low water line, the sediments are sandy and the wave activity is strongest and active for the longest time as compared to higher parts of the intertidal zone. The ferruginised laterites are results of sub-aerial exposure and weathering while, lack of body fossils is possibly due to hypersalinity. The cementing mineral are goethite and haematite. The sedimentary structures exhibited by the Taloka and Wurno Formations tend to confirm a tidal flat depositional environment. The most convincing evidence for the tidal-flat environment is the presence of abundant bioturbation structures, the flaser bedding and the wavy bedding (Reineck and Singh, 1973) however, within this study area both flaser and wavy bedding were not seen but occurred in adjacent/opposite places of the same formation (starata). The results above confirm with previous authors that the environment is tidal flat.

### Interpretation of Dange and Kalambaina Formation

The formations found in Sokoto Group (Dange and Kalambaina Formations) are composed of bluish shale, fine grained sandstone, thin lens of gypsum, intercalation of shale and sandstone. The Dange Formation are made up of blue –dark brown shale, fine grained sandstone, lenses of gypsum with macro fossil of bivalves found (*Linthia Sudanesis*), the gypsum is formed during precipitation and the presence of coproliths, gypsum, as well as the remains of molluscs (lamellibranchs) in the conglomeratic bed, suggests that the base of the Dange Formation must have been affected by erosion. The siliceous and arenaceous underlying Wurno Formation also suffered considerable erosion and hence the top of the formation is absent. This erosional horizon now constitutes the Cretaceous-Tertiary boundary in this part of the Iullemeden Basin. The intensiveness of the erosion is indicated by the absence of lower Paleocene beds in the basin (Kogbe, 1981) while Kalambaina Formation are made up of limestone, shale and intercalation of shale with limestone, bivalves, brachiopods and echinoids (*Lucina paraonis*) are observed. However, at the top of both formation they are capped by ferruginised laterites and their contact is not established. In Dange Formation the variation of colour of shale from bluish-grey to brown are as a result of changes in environment from oxic to anoxic environment. The shale are enriched with high contents of micro fossils. The Limestone results from deposits resulted by precipitated calcareous materials (marl) in marine environment which occurred during the transgression in Maastrichtian that contains high amount of micro and macro fossils. As was noted in the by several authors such as ((Sujkowski 1958; Hallam 1964; Duff *et al.* 1967)), the process of formation of limestone/marl alternations as well as their ultimate cause is still unresolved. Part of the controversy has stemmed from the recognition that the lithologic contrast between limestone and marl originated from post depositional dissolution and reprecipitation of carbonate, termed *diagenetic unmixing*, These fossils forms the basis for dating in Palaeocene. Kogbe (1979), described that during the Maastrichtian the Tethys Sea extended to the southern of the interior of western Africa, this resulted in the deposition of evaporate-bearing shales. In conclusion, Dange Formation was definitely deposited during the Palaeocene transgression (Kogbe

*et al*; 1972). Furon (1934) suggested that there was a major transgression during the Late Cretaceous, when the Mediterranean Sea was linked with southern Nigeria through a zone extending between the Hoggar and the Tibesti. He remarked that the same link was re-established at the beginning of the Eocene. This latter transgression corresponds to the great Paleocene transgression recorded in Libya by Haynes (1962) (see Figure 19). Other workers (Reyre, 1966; Reymont, 1965; Adegoke, 1969; Kogbe, 1976; Blondeau, 1976; etc.) similarly believe that there was a merger of the Tethys and Guinea seas via the Niger Valley during the Maastrichtian, as well as the Paleocene. Opinions differ, however, on the actual relationship between these two transgressions. Adeleye (1975) suggested a Maastrichtian merger rather than a Paleocene one, and some workers believe that there was a continuous transgression from Maastrichtian to Paleocene with probably only a slight interruption (see Kogbe, 1976, 1979 and 1981). The microfaunal assemblage of Dange and Kalambaina Formation respectively in the Palaeocene clay-shales and limestone is indicative of tropical shallow water marine or probably estuarine condition (Reymont, 1965). This also confirmed to previous author that both Dange and Kalambaina Formations are marine in origin.

### XI. SUMMARY AND CONCLUSION

The stratigraphy and structure of Late Maastrichtian to Paleocene sediments of part of Southwestern Iullemeden Basin in Rabah Sheet 11 comprises of two groups, they are Rima Group and Sokoto Group. Rima group contain the last formation which is Wurno Formation (Late Maastrichtian), and Sokoto Group contains two formation which are Dange Formation (Early Palaeocene) and Kalambaina Formation (Middle Palaeocene). The following and summary was drawn:

1. The Late Maastrichtian sediments is found to be Wurno Formation and are made up of uneven parallel lamination fine grained sandstone that are poorly sorted, near symmetrical skewed and platykurtic with bioturbation burrows which is most vertical and intercalation of sandstone with mudrock,
2. The formation marks the end of the Late Maastrichtian depositional cycle and a renewed phase of coastal plain sedimentation,
3. The Wurno Formation is of Tidal flat environment,
4. The Early Palaeocene sediments is found to be Dange Formation which are made up of blue –dark brown shale, fine grained sandstone, lenses of gypsum with macro fossil of bivalves found (*Linthia Sudanesis*), the presence of gypsum which is formed during precipitation suggests marine environment,
5. The Middle Palaeocene sediment is found to be Kalambaina Formation and are made up of limestone, shale and intercalation of shale with limestone, bivalves, brachiopods and echinoids (*Lucina paraonis*) are observed
6. The bluish to grey colouration of the shale are as a result of high contents of micro fossils indicating anoxic environment.
7. The Limestone deposits are as results of precipitated calcareous materials (marl) in marine environment which

was due to transgression in Maastrichtian that contains high amount of micro and micro fossils,

8. The microfaunal assemblage of Dange and Kalambaina Formations in the Palaeocene clay-shales and limestone are indicative of tropical shallow water marine or probably estuarine condition and

The Dange and Kalambaina Formations are of Marine environment.

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# Person Not ‘Possession’, Child Not ‘Commodity’- A Study on Child Trafficking in Jharkhand, India

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## I. INTRODUCTION

Jharkhand has today emerged as a major source area for intra-country trafficking in India. Most of the trafficking in Jharkhand is of tribals for domestic labour to metropolitan cities where there is a demand for such work. In cities like Delhi, a number of illegal placement agencies have proliferated. These agencies take advantage of legal loopholes to traffic mostly innocent girls in the name of providing employment but instead are put into extreme condition of forced labour. 12-14 hours of work every day is a routine practice for these girls. Many of those rescued also report physical and sexual abuse. Several cases of sexual slavery have also been reported from the victims rescued in Delhi. Some of the victims were trafficked to Haryana and Punjab for the purpose of bonded labour and forced marriage.

Recent news reports also point to the emergence of trafficking of women from Jharkhand for surrogacy, deliver babies who are then sold off.<sup>1</sup>

The research portrays about trafficking of children from Jharkhand which mostly takes place through the well-organized placement agency rackets in Delhi. These placement agencies supply tribal children to the homes of national Capital Region consisting of Delhi, Faridabad, Gurgaon and Noida. These agencies mostly target the children of age group 11-16 who remain tight lipped even after exploitation. The trafficked victims are kept in congested rooms, fed barely enough for survival till they are placed somewhere. The luckier ones land in a ‘Kothi’ as a domestic help. The others are sold in marriage or to a brothel where they suffer never-ending abuse in all forms. These victims of trafficking have to go through series of exploitation starting from the source-traffickers, placement agents and employers. The Times of India reports how the death of two girls who were allegedly trafficked from Jharkhand had pushed the Delhi Government to drag its feet on draft bill on placement agencies.<sup>2</sup> According to UNODC’s (United Nations office on Drugs and Crime) (2013) India Country Assessment Report: Current Status of Victim Service Providers and Criminal Justice Actors on Anti Human Trafficking, red light areas exist in the districts of Dhanbad, Bokaro and Hazaribag. The trafficking affected districts include Garwah, Sahibganj, Dumka, Pakur, West Singhbhum (Chaibasa), Ranchi, Palamu, Hazaribag, Dhanbad, Bokara, Giridih, Kodarma and Lohardaga. Most of the women trafficked from Jharkhand belong to Oraon, Munda, Santhal (including endangered Pahariya ) and Gond tribes, out of which, maximum are from Oraon and Munda.

According to the Census of India the number of children between the age group of 5 to 14 years working in Jharkhand is 90,996 in 2011<sup>3</sup> In such a situation it would be important to draw attention to missing women and children. In a landmark study of trafficking in India, Sen and Nair (2005) revealed a link between missing women and children and trafficking. Records of rescued revealed that they had been reported missing in their native places. According to Hindustan Times a trafficked tribal girl had been found dead under mysterious circumstances<sup>4</sup>. Hence, it becomes pertinent to also look at data on missing children in the context of Jharkhand.

### Data on missing children from Districts of Jharkhand accessed through Right to Information.

Information of missing children of various Districts of Jharkhand collected through RTI Application reveals the following data from 2009-2013

Districts	No. of missing	No. of traced	FIR registered
Seraikela-Kharsawan	62	55	5
Garhwa	78	55	10
Gumla	77	26	0
Singhbhum	246	115	0
Pakur	30	14	0
Simdega	17	8	10
Godda	12	9	12
Palamu	182	100	82
Dhanbad	543	400	23
Koderma	40	22	1
Ramgarh	118	94	19
Jamtara	22	19	6
Chatra	35	33	1
Sahebganj	84	50	8

From the above data total number of missing children were 1546, number of traced were 1000 and among which only 177 children’s FIR was registered.

In order to tackle the problem of missing children the CID, Jharkhand started a missing children helpline with an organisation named Diya Seva Sansthan since October 2013. This helpline alone recorded 2298 calls in the year 2014. Out of these cases were registered by them and 79 FIRs were filed with the police. This resulted in the recovery of 112 children.

Following this better data has been retrieved from CID, Jharkhand for the years 2011-2013.

**Table 3.1.3: Number of missing children in Jharkhand, 2011-2013**

S r. N o	Distri ct	2011				2012				2013			
		R	T	U t	F I R	R	T	U t	F I R	R	T	U t	F I R
1	Ra nch i	3 5	2	3 3	0	6 0	0	6 0	0	1 1	2 4	8 6	2 3
2	Lo har dag a	1 4	1 3	1	1 4	1 2	8	4	6	3	2	1	3
3	Gu mla	2	0	2	2	1 6	1 5	1	1	4 5	3 8	7	4
4	Si md ega	3	2	1	1	6	6	0	0	5	1	4	4
5	Kh unti	7	6	1	0	1 2	1 1	1	1	5 3	2 0	3 3	4
6	Ch aib asa	3 4	3 1	3	2	2 7	2 0	7	2	1 3	8	5	5
7	Sar aik ela	2 6	2 3	3	0	1 7	1 7	0	0	1 5	1 4	1	1
8	Ja ms hed pur	2 6	2 4	2	2	5 0	4 8	2	2	3 7	3 2	5	6
9	Pal am u	2 9	2 6	3	3	1 6	1 4	2	2	2 1	2 0	1	1
10	Gar hw a	1 3	1 3	0	-	2 4	3	2	-	1 8	3	1 5	-
11	Lat eha r	6	6	0	0	1 1	1 1	0	2	1 3	1 3	0	0
12	Haz arib ag	6	6	0	0	3 7	3 3	4	4	5 1	4 5	6	1
13	Ko der ma	1 8	1 6	2	0	1 0	7	3	0	2 2	1 6	6	0
14	Gir idih	4 4	4 2	2	0	5 6	4 7	9	4	4 0	3 6	4	4
15	Ch atra	8	5	3	0	1 5	4	1	0	2 0	1 4	6	0

16	Ra mg arh	1 5	1 1	4	0	1 4	8	6	0	2 8	1 4	1 4	2
17	Bo kar o	4 1	4 0	1	1	3 5	3 2	3	3	3 6	3 2	4 4	4
18	Dh anb ad	7 9	7 8	1	1	6 9	6 8	1	1	4 3	4 3	0	0
19	Du mk a	5	5	0	-	2	1	1	-	0	0	0	0
20	Go dda	1 4	1 4	0	0	1 5	1 3	2	2	1 1	8 3	3	3
21	Sah ebg anj	7	5	2	0	3 2	2 2	1	0	1 1	6 5	0	0
22	Pak ur	4	4	0	0	6	6	0	0	9	3	6	1
23	De oga rh	3 2	3 2	0	0	4 2	4 2	0	0	3 4	3 4	0	0
24	Ja mta rah	1 1	6	5	-	1 6	5	1	-	5	1	4	-
25	Rai l Dh anb ad	4	0	4	-	1	0	1	0	0	0	0	0
26	Rai l Ja ms hed pur	3	2	1	0	4	3	1	0	2	1	1	0
Tota l		4 8 6	4 1 2	7 4	2 6	6 0 5	4 4 4	1 3 1	3 6 1	6 4 5	4 2 8	2 1 7	6 6

R- Number of Children Reported Missing  
T- Number of Children Traced  
Ut- Number of Children Untraced  
FIR- Number of First Information Reports Filed  
source: CID, Jharkhand

From the above data a total no of 1736 children were reported missing of which 452 remained untraced. Attention needs to be given to the fact that only 123 FIRs were filed, which is less than even 10% of the cases. These missing children could be exploited for forced labour, commercial sexual exploitation, adoption rackets, armed conflict, organ trade, or could be used by adults to commit crimes.

## II. STRATUM OF EXPLOITATION:

Tribal women and girls account for the most of the trafficking victims and survivors of trafficking. They are mainly exploited for domestic labour, marriage and to brick kilns. Migration of the tribal population from Jharkhand, Orissa,

Madhya Pradesh and Chhattisgarh has been taking place since the last three centuries and more. During the period 1950 and 1980, tribal people migrated to the rural areas of Bihar, West Bengal mainly to work as agricultural labour, but from 1980 onwards, they started migrating to bigger cities like Delhi, Kolkata and Mumbai (Society for Regional Research and Analysis (2010)). Also, migration of single women has increased. These migrating women and girls are vulnerable to trafficking through placement agencies whose agents are spread across Jharkhand.

- **Domestic Labour through Placement agencies:**

This is the most common sector where trafficked victims from Jharkhand are exploited. Delhi, Mumbai and Bengaluru are the most common destinations. A number of placement agencies have come up in Jharkhand and Delhi that supply women and girls as domestic servants. While all this does not sound illegitimate, the situation on the ground is not as straightforward. Intermittently the trafficked women and girls end up working in conditions they may not have agreed to in the beginning. Cases of sexual abuse by the placement agency have been recorded by police. The agencies do not pay them and ensure that the employers pay the agencies instead of the employed person. Some even experience sexual abuse at the hands of the employers apart from physical abuse. Most of the trafficked are minors and are forced to work 12-14 hours a day. ATSEC (2010) also found that a mere one fourth of the trafficked were in contact with their families. In a case stated by Hindustan time on 28<sup>th</sup> of august 2014 stating how traffickers target Jharkhand school girls to sell them in Delhi.<sup>5</sup>

- **Trafficking in the name of 'Bride' :**

Apart from the burgeoning business of placement agencies in Delhi, women and girls from Jharkhand are also getting trafficked for marriage to Haryana and Punjab. Given the low sex ratio in these regions, trafficking women and girls from poverty stricken tribal villages of Jharkhand is turning out to be profitable for traffickers.

***Minor girl sold for Rs 1 lakh to a man thrice her age for marriage in Punjab***

*15 years old Shanti (name changed) was rescued in a joint rescue operation of Jharkhand Police, Punjab Police and NGO Shakti Vahini in January, 2015 from Karoda village, Sangrur district in Punjab. The girl was allegedly trafficked from her village in Khunti for the purpose of forced marriage and was sold off for Rupees 1 lakh in the Karoda Village which is the land of Bhakra Nangal Dam. She was subjected to all kinds of slavery. Police arrested two source traffickers and two destination traffickers in the case. After a registration of an FIR at the AHTU Police Station, Khunti, the Police could apprehend the source traffickers and could learn that the child was sold off to a person in Karnal for rupees 80,000 along with two other girls. Accordingly, Shakti Vahini and Jharkhand Police planned out a rescue operation of the minor girl and after struggling for two days the team could rescue the child and also arrest two more traffickers who were involved in the case. The girl was sold off by one Mahima and her husband, a native of the same village to one Surrender in Kurukshetra who then further sold her off to one Ranvir Singh @ Nannu aged around 50 years for rupees 1 lakh. Police succeeded in arresting Surrender by letting Pradeep as a decoy customer who was asked to call the former for a deal.*

***Eight persons arrested for alleged Human Trafficking case in Jharkhand***

- **Nefariousness at Brick Kilns:**

Cases have been reported of trafficking of men and boys to brick kilns in Tripura, Bihar, West Bengal, Haryana & Jharkhand. According to the Times of India, Jharkhand haats, melas are the hotbeds of traffickers. Here the gullible tribal youths lure with jobs and marriages are shipped to Delhi and Mumbai.<sup>6</sup>

- **Sexual Exploitation:**

Although not recorded in high numbers in brothel based prostitution, women and girls from Jharkhand are forced into prostitution in unorganized and movable brothels (UNODC, 2013). Cases intervened by the Anti-Trafficking organizations revealed that the victims of human Trafficking are also being exploited sexually by the placement agents and the employer as well in some of the cases. Hindustan Times states how a 13 year old girl from Lohardaga, Jharkhand was forced to act as a surrogate mother and deliver six children by human traffickers.<sup>7</sup>

- **Trafficking in the name of Orphanage:**

The Godda district of Jharkhand witnessed trafficking of children in the name of Orphanage in Kerala for better education. The children in such cases are being sent by creating fake documents in their name and their ultimate fate is uncertain. In a recent case at least 120 children were trafficked to orphanage in Kerala. The children were among the 466 from West Bengal, Bihar and Jharkhand taken into protective custody by the Railway Protection Force in Palakkad, soon after they had got off trains en route to orphanages in Kozhikode and Malappuram. Many of them were found to be returning to the orphanages after the summer vacation, but others, including the 186 above, were new children being brought by agents with the promise of enrolling them at the Mohammed Abdurahiman Memorial Orphanage at Mukkom in Kozhikode and Anwarul Huda Orphanage at Vettathoor in Malappuram. In Godda district, from where 216 children went this year alone to Mukkom. From three children six years ago, there are now more than 300 between 4-15 years of age from Godda at the Mukkom orphanage. Following a directive by the deputy commissioner to profile all such children, the Godda district administration has tracked down 171 of them.<sup>8</sup>

- **Carpet Industry :**

Majority of the children working in the carpet sector, be it in Uttar Pradesh (UP) or in Jharkhand are migrant child labourers from Palamau and Garwa district in Jharkhand. These districts are the prime catchment area for child labourers, especially Garhwa. In any village in the district there is hardly a home where child labour does not exist. Estimates are that there are 11,000 children in Garhwa alone who are child labourers within the carpet industry (UNODC, 2013). Apart from these, trafficking for illegal adoption rackets and forced surrogacy have been reported recently<sup>9</sup>

### III. INITIATIVES TAKEN BY THE STATE GOVERNMENT:

The Jharkhand government has of late taken a lot of initiatives but most of them remain on paper and are poorly

implemented. Though the State Advisory Committee on trafficking was set up, the same has not been functioning. The Jharkhand State has formulated a state action plan to combat human trafficking but this has not been implemented so far. This section briefly glances upon some initiatives.<sup>10</sup>

**Gumption on Child Protection Systems:**

Jharkhand has appointed Child Welfare Committee in all districts. Child Protection officers and Child Protection units have also been created. Though the implementation of the ICPS has been slow since 2010 but in the last two years the Government has fast tracked it. Training and Sensitization of Child Protection mechanisms continues to be an area of concern. Child Welfare Committees were also seen to be working without basic infrastructure. There is a need for proper training of CWC members and also to ensure regular sittings of the CWCs. It is important to discuss some initiatives in details here. These initiatives mainly deal with prevention of trafficking and rehabilitation of survivors.

**Inhumane Torture: State Government extends support.**

*Rosy (name changed), a resident of Sahibganj, Jharkhand was employed as a domestic maid in Delhi since four years from the day she was rescued in a joint intervention of Delhi police, Delhi Commission for Women and Shakti Vahini. At the time of rescue the girl was found in a terrible condition with both her ears swollen, her body bearing deep gashes and several injuries and also a deeply injured scalp. According to the medical report, she was being physically abused by her owner causing multiple injuries by hitting her with sticks, brooms, knives and hot pans. She had to undergo plastic surgery in the Safdar Jung hospital, Delhi. After all the legal procedure she was restored to her family in Jharkhand. The Govt. of Jharkhand admitted the girl in a residential school-cum-rehabilitation facility in Khutti under a central government sponsored Mahila Samakhya Project with a motive to provide a better life to the child. In an interview the girl also put forth her desire to return back to Delhi as a teacher to provide education to children. The case is now under trail in Delhi court.*

**Initiatives by Jharkhand State to Combat Human Trafficking**

Sr.No	Initiative	Presence in number of District	Names of Districts (if not in all district)
1	Anti-Human Trafficking Units (Police)	Eight	Dumka, Khunti, Simdega, Gumla, West Singhbhum/ Chaibasa, Ranchi, Lohardaga, Palamu

2	Child Welfare Committees (CWCs)	All 24	-
3	District Child Protection Units (DCPU) under ICPS	All 24	-
4	CHILDLINE	Five	Ranchi, Chaibasa/ West Singhbhum, Dhanbad, Deogarh, Pakur
5	Jharkhand Mahila Samakhya Society	Eleven	Garhwa, Chatra, Giridih, Godda, Sahebganj, Pakur, Ranchi, Khunti, West Singhbhum, Saraikela Kharsawan, East Singhbhum
6	Special Juvenile Police Units (SJPU)	All 24	-
7	Shelter Homes	Under ICPS- 10	Hazaribag, Bokaro, Dhanbad, Gumla, Simdega, Ranchi, Deogarh, West Singhbhum, East Singhbhum, Dumka
		Specialized Adoption Agencies- 3	Bokaro, Ranchi Khunti
		Homes for children with Special Needs- Shelter Homes run by NGOs- 7	Bokaro, Dhanbad, Hazaribag (Govt.) Jamtara, Ramgarh, Chaibasa (NGOs) Jamshedpur, Hazaribag, Jamtara, Khunti, Simdega, Koderma, Palamu

		Swadhar Homes-1	Bokaro
8	Mahila Thana (All Women Police Station)	All 24	-

girls. It has been assumed that maximum children had been a victim of Human Trafficking.<sup>12</sup>

#### IV. CONCLUSION

Given the magnitude of trafficking of mainly women and girls through placement agencies and also the freedom with which these agencies operate, there is an urgent need for the state of Jharkhand to pass a law to regulate these agencies. At present they are taking full advantage of this legal lacunae. The Delhi Government passed an order on 25<sup>th</sup> September, 2014 recognizing this urgency for the regulation of placement agencies in Delhi. It requires a domestic worker to be above the age of 18 years. All placement agencies are to register with the Labour Department under the Delhi Shops and Establishment Act, 1954 and then also apply for a license to run a placement agency. It also has provisions for opening bank accounts for domestic workers and giving them control of the accounts where their salaries will be deposited.

With there being lack of education, employment and a vulnerable population to trafficking, safe migration practices need to be stressed to prevent trafficking. Apart from a law for regulating placement agencies, the Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979 needs to be implemented to protect workers from any exploitation from contractors and employers, regular payment of at least minimum wages. Apart from this migrating workers need to be made aware of their rights before migrating, the wages they should be demanding. They need to be provided with helpline contacts in case of any need. Police and helpline providers need to be circumspect at transit points like railway stations and bus stops where traffickers lure potential victims.

Awareness campaigns cannot only put spotlight on the negative effects of migrating. The awareness campaigns should rather make the target population aware of the legal mechanisms in case they find themselves in trouble. They should be catered with helpline numbers. They and their families should be made aware of the need of maintaining contact.

#### 2017 REPORT ON CHILD TRAFFICKING:

Sr.no	Districts	MB	MG	RB	RG	No Evidence
1	Ranchi	06	01	01	00	05
2	Khunti	14	08	11	07	04
3	Gumla	07	34	02	21	18
4	Simdega	16	31	14	28	05
5	Lohardaga	01	00	01	00	00
6	East Singhbhum	09	07	01	23	14
7	West Singhbhum	02	27	02	00	04
8	Saraikela	01	00	01	02	00
9	Palamu	11	08	08	00	09
10	Garhwa	01	00	00	02	01
11	Hazaribagh	02	09	00	00	11
12	Ramgadh	03	01	03	00	01
13	Koderma	03	01	03	01	00
14	Giridih	01	02	00	01	02
15	Bokaro	07	10	06	08	03
16	Devgarh	03	01	02	01	01
17	Sahebganj	03	01	01	01	02
18	Pakud	02	00	00	00	02
19	Rail Dhanbad	03	03	03	01	02
20	Rail Jamshedpur	12	04	09	02	05
21	Total	107	148	09	96	91

MB- Missing Boys      MG- Missing Girls      RB- Recovered Boys      RB- Recovered Girls

According to the table above total of 255 minors were missing from Jharkhand. Among them 107 were boys and 148 were girls. In various police station FIR has been filed regarding missing children. According to the survey, police have recovered 164 missing children and 91 children are still missing and no evidence have been found. Among them 39 are boys and 52 are

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# Study on Nutritional Values in Paddy Crude and Parboiled Rice

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**Abstract** - Rice has one of the biggest consumption levels all across the world. Parboiled rice is a type of rice, which has been partially cooked during the milling process and then packaged for sale for use in homes and restaurants. During parboiling starch granules of rice are gelatinized. In this project work, paddy crude and parboiled rice samples were collected from Golden Rice Mill in Patheingyi Township, Ayeyarwady Region. Some physicochemical properties and nutritional values such as moisture, ash, protein, crude fiber, fat, carbohydrate and energy value were determined by routine laboratory methods. The moisture percent was determined by oven dry method. The ash percent is a measure of the food and it was determined by ashing method. The protein content was determined by Kjeldahl method. The crude fiber content was determined by fiber cap method. Fat content was determined by Soxhlet extraction method. From the results of this work, it is rich in carbohydrates and vitamins which is excellent for healthy diet in human body.

**Keywords:** paddy crude, starch granules, parboiled rice

## 1. INTRODUCTION

Parboiled rice is produced from paddy crude through pre-treating in with heat energy and water before drying and milling. During parboiling starch granules of rice are gelatinized (Hermansson, 1996). As a result of starch gelatinization, various property changes occur in the rice. The major objectives of parboiling are to increase the total yield of the paddy, prevent loss of nutrients during milling and prepare the rice according to the requirements of consumers.

In this study the physicochemical properties and the nutritional values of paddy crude and parboiled rice were investigated. *Oryza sativa*, commonly known as Asian rice, English as rice. *Oryza sativa* is a grass with a genome consisting of 430 Mb across 12 chromosomes. These samples were shown in Figure 1 and 2.



Figure 1 *Oryza sativa* (Paddy)



Figure 2 Paddy rice and parboiled rice samples

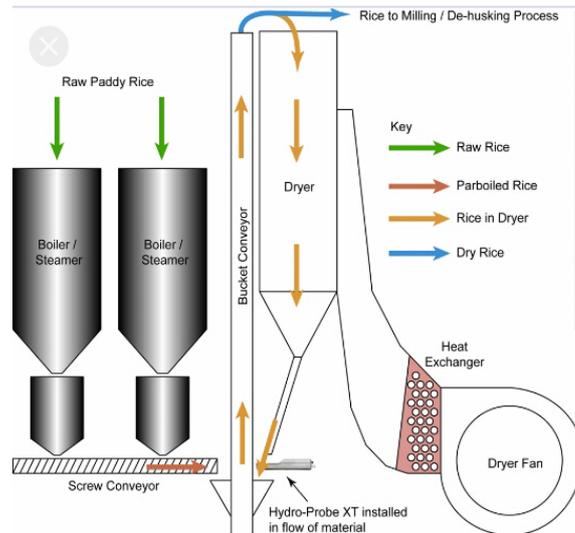
Parboiling of rice involves the partial cooking of paddy crude and involves the process of soaking gelatinizing and drying to milling. The objective is to impart a required hardness on the grain (with husk intact) in order to withstand milling operations. Rice is parboiled in the hull, which softens the kernel, allowing the surface starch, bran and other components to commingle (Eliasson, 1986). The water is then drained and the rice is carefully steam dried. The dried parboiled rice is sent through machines, which remove the hull and polish the kernels. This parboiled process was shown in Figure (3).

The uses of rice worldwide is great; principal among them include; staple food (Nutrition) both human and animals. Countries also benefit from rice production by getting foreign exchange, and above all medicine. The grain products of rice,

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include; flakes, rice flour, starch, rice milk, rice cakes, and the extended uses of rice include; rice husk for fuel, rice bran for oil and animals feed, broken rice used as snacks, rice flour and rice beverage.



**Figure 3 Parboiling process plant**

Parboiled rice has a higher vitamin content than raw milled rice. Parboiled rice is quite nutritious, being an excellent source of niacin, a good source of thiamine and magnesium and a moderate source of protein, iron and zinc (Kyritsi, 2011). Levels of vitamins and minerals fall between rice and brown rice.

The science nutrition is the study of all process of growth, maintenances and repair of living body that depend upon the digestion of food and the study of that food (Buss and Robertson, 1978). Good nutrition is the major determinant of good health, growth and development.

The elements in foods that are required for the maintenance and growth of the body are called nutrients. These are the 25 carbohydrates comprised of starches and sugars; the protein made up of 20 amino acids, fats consisting of 15 fatty acids; 20 vitamins; and 13 minerals. Most foods contain more than one nutrient but vegetables, fruits, cereals are primarily sources of carbohydrates, proteins and fats. Most foods contain various amounts of various minerals, some having more of certain vitamins and minerals than other (Henkel, et al., 1972).

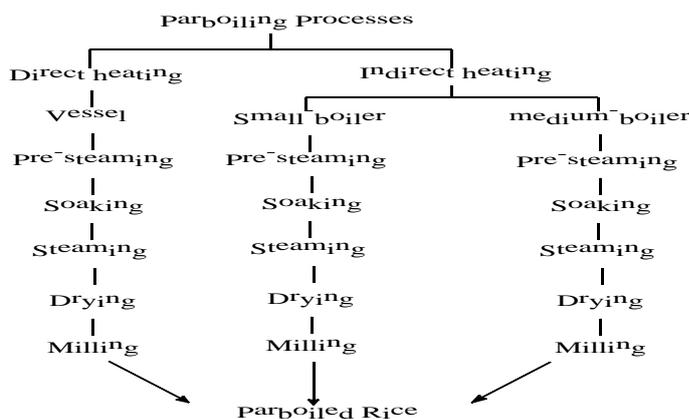
**2. EXPERIMENTAL**

**Material**

One *oryza sativa* paddy rice was used. This variety was obtained from the Golden Rice factory, Pathein Township, Ayeyarwady Region. The *oryza sativa* paddy rice and parboiled rice was stored in self-sealing plastic bags before being used.

**Method**

Parboiled rice preparation



**3. RESULTS AND DISCUSSION**

The yield percent of sample was shown in Table 1.

**Table 1 The Yield Percent and LOI Value of Paddy Crude and Parboiled Rice Samples**

Sample	Yield (%)	LOI (%)
Parboiled Rice	64.8	35.2

LOI = loss on ignition

The physicochemical properties and nutritional values of paddy crude (paddy rice) and parboiled rice samples were determined based on ASTM standard.

The determination of moisture content or rather the water content is one of the most important and most widely used analytical measurement in the processing and testing of food products. Moisture is usually determined by drying to constant weight with the loss in weight being considered as water. In this research, moisture contents of samples (paddy crude and parboiled rice) were as shown in Table 2, and Figure 4. It was found to be 13.23 % (Paddy) and 12.61 % (parboiled rice) respectively.

The ash percentage is a measure of the quality of food; the smaller the ash percentage, the better the quality of food. Ash is the most convenient assessment of the total mineral matter of food. In this work, the ash contents of the samples (paddy and parboiled rice) were shown in Table 2, and Figure 4. It was found to be 4.90 % (paddy) and 0.57 % (parboiled rice) respectively.

In the kjeldal method, the nitrogen in the sample is converted to ammonium by digestion with concentrated sulphuric acid and the ammonium is determined from the amount of ammonia liberated by the distillation of the digest with alkali. The ammonia liberated by distillation is collected in an accurately measured quantity of standard mineral acid and determined by titration of excess acid using indicators such as methyl red, bromocresol green, and methyl red-methylene blue mixtures. The rate of increase of digestion temperature plays an important role in the conversion to ammonia. Digestion at low temperatures either necessitates too long a digestion time or fails to give good results, while too high temperature may result in loss of nitrogen.

In this work, the nutritional values of the samples were shown in Table 2 and Figure 4. The protein percentage of the samples (paddy and parboiled rice) were found to be 5.80 % (paddy) and 6.14 % (parboiled rice) respectively.

Fiber stimulates the secretion of digestive fluids. Fiber stimulates the accumulation of cancer-causing materials because it shortens the retention period of waste materials. The fiber content of samples (paddy and parboiled) were shown in Table 2 and Figure 4, were found to be 10.37 % (paddy) and 0.20 % (parboiled rice) respectively.

Fats are important constituents of a normal diet and the most concentrated of all sources of calorie. Fat occurs widely in plants and animals as a means of storing food energy, having twice the calorie value of carbohydrates. In this work, fat contents of the samples (paddy and parboiled rice) were determined by Soxhlet extraction method by using petroleum ether. As seen in Table 2 and Figure 4, the fat percent of sample were found to be 2.18 % (in paddy) and 0.20 % (in parboiled rice) respectively.

Carbohydrates are composed of sugars and starches that are easily digested into glucose, with functions are the body's primary source of energy. The body stores carbohydrates as glycogen in the muscles and liver, however its storage capacity is limited. Many foods contain a mixture of different types of carbohydrate. The carbohydrate contents of samples (paddy and parboiled rice) were as shown in Table 2 and Figure 4. It was found to be 63.52 % (paddy) and 80.28 % (parboiled rice) respectively. The carbohydrate content of parboiled rice was higher than that of paddy crude.

The energy value of paddy crude and parboiled rice samples were calculated by multiplying the number of grams of carbohydrate, protein and fat by 4, 4 and 9 respectively. Then the result were added together. The results of the energy for these samples are shown in Table 2.

**Calculation of Energy Value**

Protein	=	4 x 17	=	68.0 kcal
Fat	=	9 x 9	=	81.0 kcal
Carbohydrate	=	4 x 0.2	=	0.8 kcal
				= 149.8 kcal/100 g

**Table 2 Physicochemical Properties and Nutritional Values of Paddy Crude and Parboiled Rice Samples**

No.	Test Parameter	Paddy Crude	Parboiled Rice
1	Moisture (%)	13.23	12.61
2	Ash (%)	4.90	0.57
3	Crude Protein (%)	5.80	6.14
4	Crude Fiber (%)	10.37	0.20
5	Crude Fat (Ether Extract) (%)	2.18	0.20
6	Carbohydrate (%)	63.52	80.28
7	Energy Value (Kcal/100g)	298	346

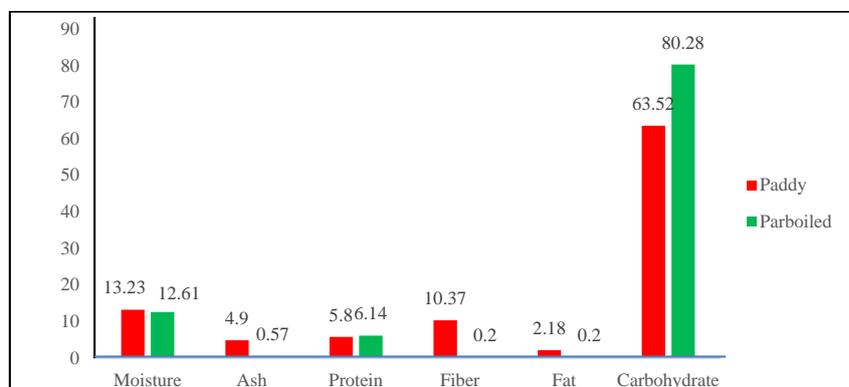


Figure 4 Nutritional values of paddy and Parboiled rice samples

### CONCLUSION

The paddy rice and parboiled rice samples were analyzed for contents of moisture, ash, protein, fiber, fat, carbohydrates and then were calculated energy values. The presence of moisture was determined by oven-dried methods. The moisture contents of samples (paddy rice and parboiled rice) were found to be 13.23 % and 12.61 % respectively. The ash contents of samples (paddy rice and parboiled rice) were found to be 4.90 % and 0.57 % respectively.

The total nitrogen percentages were determined by the kjeldahl digestion method followed by distillation. The amount of protein in samples (paddy rice and parboiled rice) was found to be 5.8 % and 6.4 % respectively. The fiber contents of samples (paddy rice and parboiled rice) were found to be 10.37 % and 0.20 % respectively. Fat contents were determined by the Soxhlet extraction method using petroleum ether as solvent. The percentage of fat in samples (paddy rice and parboiled rice) was found to be 2.18 % and 0.20 % respectively. The carbohydrate contents of samples (paddy rice and parboiled rice) were found to be 63.52 % and 80.28 % respectively.

The moisture and ash content of paddy were found to be higher than parboiled rice. The fiber and fat content of paddy were found to be higher than parboiled rice. From the result, the protein and carbohydrate of parboiled rice were found to be higher than paddy crude. According to the data, parboiled rice had higher energy value. This study pointed out that parboiled rice is excellent for the body as its rich in minerals, carbohydrates and vitamins. The diet person should be consumed it for good health.

### ACKNOWLEDGMENT

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## Preparation and Characterization of Biosorbents Beads (Bagasse-Calcium Alginate and *Jatropha curcas*- Calcium Alginate Beads)

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**Abstract** - This work concerns with the preparation, characterization and application of vegetable stalks alginate biosorbent beads (Bagasse-calcium alginate and *Jatropha curcas* calcium alginate) which were prepared by the association of bagasse waste powder or *Jatropha curcas* powder and calcium alginate via sodium alginate. Calcium alginate beads are formed when sodium alginate salt is added dropwise to a fixing solution of calcium chloride. The utilized materials in this work were sugarcane bagasse and *Jatropha curcas* stalks waste. In the preparation of three types of beads (calcium alginate beads, bagasse-calcium alginate beads and *Jatropha curcas*-calcium alginate beads) by using the optimum conditions were found to as 2% w/v of vegetable stalk powder, 6% sodium alginate and 10% calcium chloride. The physicochemical properties of three types of prepared beads such as the size of beads, moisture content, swelling percent, and pH were determined. The prepared biosorbent beads were qualitatively and quantitatively characterized by FT-IR, TGDTA, XRD, and SEM analyses.

**Keywords** : agricultural waste, bagasse calcium alginate beads, *Jatropha curcas*-calcium alginate beads, biosorbent

### 1. INTRODUCTION

Bagasse is the fibrous residue remaining after sugar cane stalks are crushed to extract their juice and is currently used as a renewable resource in the manufacture of pulp and paper products and building materials. A typical chemical analysis of bagasse might be on a washed and dry bagasse.

Cellulose	45% - 55%
Hemicellulose	20% - 25%
Lignin	18% - 24%
Ash	1% - 4%
Waxes	< 1%

The main chemical constituents of bagasse are cellulose, hemicellulose and lignin. Hemicellulose and cellulose are present in the form of hollow cellulose in bagasse which contributes to about 70% of the total chemical constituents present in bagasse. Another chemical constituent present in bagasse is lignin. Lignin act as a binder for the cellulose fibers and also behaves as an energy storage system (Monteiro *et al.*, 1998). *Jatropha curcas* L. commonly known as physic nut, belonging to the family Euphorbiaceae, is a multipurpose plant valued not only for its medicinal properties and resistant to various stress but also for its use as an oil seed crop (Heller, 1996; Staubmann, 1999; Openshaw, 2000).

Alginic acid is a heteropolymer comprising polyuronic groups. It is derived from common commercial algae extracted commonly from brown seaweeds. It has the ability to bind multivalent cations being the basis of their gelling properties, leading to the formation of covalent bonds yielding insoluble gel (Martinsen *et al.*, 1989).

Calcium alginate beads are formed when sodium alginate salt is added dropwise to a fixing solution of calcium chloride. Calcium alginate beads has been one of the most extensively investigated biopolymers for binding multivalent cations. So, it has been used for the removal of heavy metals from dilute aqueous solutions (Apel and Torma, 1993).

*Jatropha curcas* has not been fully studied for its metabolic profile. The main stem of the plant should be cut once the tree in 1 m tall. This will lead to increase branching of the tree. The more branches a plant has, the higher the production of fruits and therefore more seeds. Every year, branches grow near the base and these should be removed and replanted elsewhere. It is very important to cut the tree in time and keep it in proper shape (Sukarin *et al.* 1987). These removing or cutting branches are agricultural waste which were prepared dry *Jatropha curcas* powder and they can be used as low cost heavy metal adsorbent in this paper.

### 2. EXPERIMENTAL

Bagasse waste were obtained from Sugarcane plant from Ein Mae Township, Ayeyarwaddy Division and *Jatropha curcas* stalk waste were kindly supplied by Myanmar Five Star Line, Part of Terminal, Thaketa Township, Yangon. The waste were rinsed three times with distilled water, dried, cut and grounded to obtain a fine powder. The fine powder was

sieved to get the particle size range of 105-125  $\mu\text{m}$ . These bagasse powder and *Jatropha curcas* stalk powder were stored in separately in tightly sealed bottle and they were ready to use.

## 2.1 Preparation of Biosorbent Composite Beads from Vegetable Stalks Powder

Various concentration of sodium alginate solution (2%, 4%, 6%, 8% w/v) were prepared, corresponding to constant amount 2 g of Biomass (bagasse or *Jatropha curcas*) and the prepared solution was stirred at constant rate (~150 rpm) at 60°C for 6 hours. Using a syringe, the mixture was injected in droplets into 10% w/v of calcium chloride to form beads. The biocomposite beads were allowed to stay in calcium chloride solution with slow stirring for another 6 hours until it become harden. The beads were allowed to harden in this solution for 24 hours. After this time, hard spherical beads were dried at room temperature and collected in an air container.

## 2.2 Determination of Physicochemical Properties of Prepared Biosorbent Composite Beads

### Determination of Swelling Properties

Prepared three types of biosorbent composite beads weighing individually 0.5 g was placed in 100 mL of water at room temperature. It took 24 hours long enough to reach the equilibrium swelling of the composite beads in vacuum desiccator for about 3 hours. Based on these two values, the water swelling percent were calculated by following equation.

$$\text{Swelling Percent (\%)} = \frac{W_s - W_d}{W_d} \times 100$$

Where,  $W_s$  = combined weight of sample and water absorb at a given time  
(Weight of sample in grams swollen in water)

$W_d$  = weight of sample in grams in dry state

### Determination of Moisture Properties

Moisture content was analyzed by AOAC method (Pearson, 1976). Sample 1 g was placed in an oven at 110°C for 2 hr. Then the sample was accurately weighed and cooled at normal temperature. The moisture content was calculated by using the following equation.

$$\text{Moisture content (\%)} = \frac{(A - B)}{A} \times 100$$

Where, A = weight of sample in grams

B = weight of sample in grams after cooling

### Determination of pH

The sample 0.5 g was placed in a 100 mL of pyrex beaker and 50 mL of distilled water was added into it. Then the contents were boiled for 3 min and the water insoluble precipitate was filtered. The filtrate was cooled at room temperature and the pH of the sample was determined by using a pH meter.

### Determination of Solubility Behaviour of Biosorbent Beads

About 1 g of biosorbent beads from each type was added into 50 mL of the different types of solutions and was stirred for a period of 24 hours. The weights of the beads were determined after the test in each solution. The differences in weight before and after tests give information on the stability of beads in the solution.

## 2.3 Characterization of Prepared Biosorbent Composite Beads (Calcium Alginate, Bagasse-Calcium Alginate and *Jatropha curcas*-Calcium Alginate Beads)

The prepared biosorbent composite beads were characterized by FT-IR, UV, Thermal, ED-XRF and XRD Analysis.

## 3. RESULTS AND DISCUSSION

Figure 1 shows that the calcium alginate beads, bagasse, calcium alginate beads and *Jatropha curcas* calcium alginate beads. In the preparation of the beads, sodium alginate concentration was very important, if the concentration of sodium alginate was very low, no formation of beads and if the concentration of sodium alginate was very high, the solution was very viscous and difficult to pass through the syringe.



**Figure 1. (a) Calcium Alginate Beads (b) Bagasse-Calcium Alginate Beads (c) *Jatropha curcas*- Calcium Alginate Beads**

**Table 1. Preparation of Calcium Alginate, Bagasse-Calcium Alginate and *Jatropha curcas*-Calcium Alginate Beads**

No	Weight of Biomass/g	% w/v of Sodium Alginate	Remark
1	2	2	No formation of beads
2	2	4	Slightly aggregated
3	2	6	Spherical beads
4	2	8	Viscous to make beads

### 3.1 Physicochemical Properties of Three Types of Biosorbent Beads

#### Swelling Property

The swelling characteristics of three type of biosorbent beads were determined by the swelling the beads in water at room temperature. The degree of swelling (swelling percent) of calcium alginate, bagasse-calcium alginate and *Jatropha curcas*-calcium alginate beads in deionized water was tabulated in Table 2. The equilibrium degree of swelling, after one, of immersion time for calcium alginate beads was 9.28%; bagasse- calcium alginate beads was 30.99% and *Jatropha curcas*- calcium alginate beads was 22.24%.

The prepared bagasse- calcium alginate beads is more hydrophilic than other beads, which showed much a decreased in degree of swelling. These results showed that calcium alginate and *Jatropha curcas* calcium alginate beads are more compact than bagasse calcium alginate beads.

#### Solubility Behaviour

Solubility tests for three types of biosorbent beads were carried out using some organic and inorganic solvents at room temperature. The results of the dissolution tests are present in Table 2. It can be found that three types of biosorbent beads are significantly increased the chemical stability in acid and basic media.

#### Determination of Moisture Content

Moisture content of prepared biosorbent beads were analyzed by AOAC method (Pearson, 1976). Prepared beads 1 g was placed in an accurately weighed crucible and heated in an oven at 100°C for 2 hr to remove the water. Then, the sample was cooled until normal temperature and then weighed again. Heating and cooling were repeated until a constant mass was obtained.

**Table 2. Physicochemical Properties of CA, BCA and JCA Beads**

CA = Calcium Alginate Beads  
 BCA = Bagasse-Calcium Alginate Beads  
 JCA = *Jatropha curcas*- Calcium Alginate Beads

Sample	Moisture (%)	Swelling Percent (%)	Solubility								pH	
			H <sub>2</sub> O	Ether	HCl	NaOH	NaHCO <sub>3</sub>	H <sub>2</sub> SO <sub>4</sub>	H <sub>3</sub> PO <sub>4</sub>	Acetone		Acetic Acid

<b>CA</b>	2.92	9.28	-	-	decolorized	±	±	decolorize d	±	-	-	5.9
<b>BCA</b>	2.78	30.99	-	-	decolorized	±	±	decolorize d	±	-	-	6.2
<b>JCA</b>	2.76	22.24	-	-	decolorized	±	±	decolorize d	±	-	-	6.0

- (+) soluble
- (-) insoluble
- (±) slightly soluble

### 3.2 Characterization of Prepared Biosorbent Composite Beads

Calcium Alginate, Bagasse-Calcium Alginate(BCA) and *Jatropha curcas*- Calcium Alginate(JCA) Beads

#### FT-IR Analysis

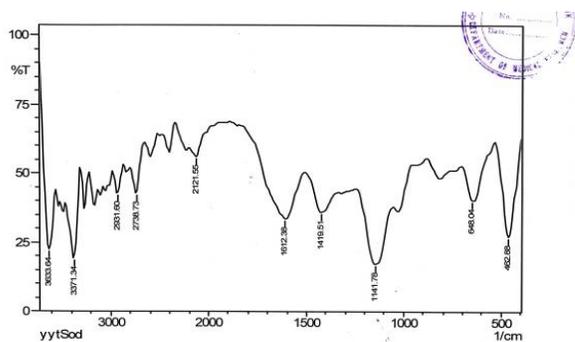


Fig.2. FT-IR spectrum of sodium alginate

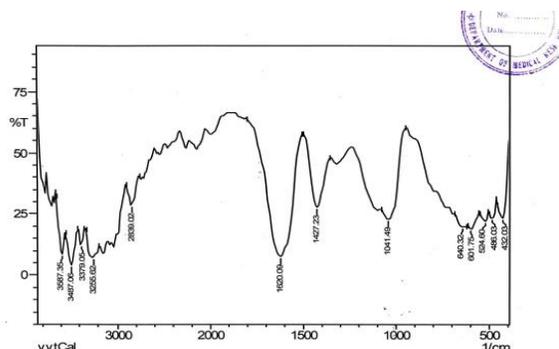


Fig. 3. FT-IR spectrum of calcium alginate bead

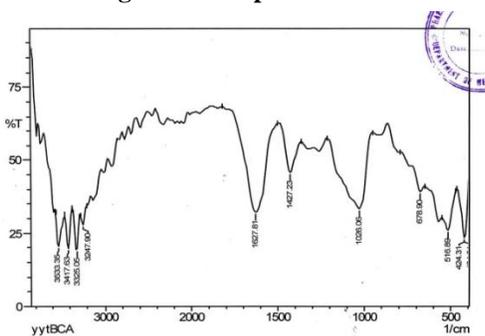


Fig. 4. FT-IR spectrum of bagasse calcium alginate beads

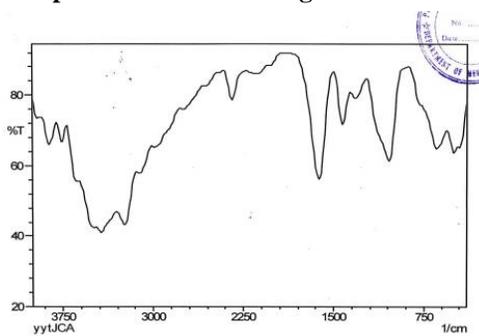


Fig. 5. FT-IR spectrum of *Jatropha curcas*- calcium alginate beads

Table 3 FT-IR Spectrum Assignment for Sodium Alginate, Calcium Alginate and Prepared Biosorbent Beads

No	Frequency of Different Samples (cm <sup>-1</sup> )				Literature* frequency (cm <sup>-1</sup> )	Band Assignments
	Sodium alginate	Calcium alginate	BCA	JCA		

1	3633	3487	3533	3244	3200, 3600	$\nu_{(O-H)}$ stretching
2	2738	2839	-	-	2800-3000	$\nu_{(C-H)}$ aliphatic, $\nu_{CH_2}$ , $CH_3$
3	1612	1620	1627	1620	1600-1950	$\nu_{asy (C=O)}$ carbonyl
4	1420	1427	1427	1420	1400-1470	$\nu_{sym (C=O)}$ carbonyl
5	1142	1041	1026	1040	1000-1200	$\nu_{(C-O)}$ alcohol, $Na^+$ is replaced by $Ca^{2+}$
6	462	486-524	424	720	450-1000	$\delta_{C-H}$ , $\delta_{C-C}$ , $\delta_{C-O}$ (aromatic)

\*(Silverstein, 1981)

### Thermal Analysis for Prepared Biosorbent Beads

On the basis of TG-DTA profiles, Figures 3.4 a, b and c present the break in temperature corresponding to dehydration, depolymerization, decomposition and phase change temperature of calcium alginate, bagasse-calcium alginate beads and *Jatropha curcas* - calcium alginate.

Figure 3. (a), calcium alginate beads shows the sharp endothermic peak at 82.54°C and weight loss of 23.23% due to loss of bound water, sorbed water and depleting of functional group. The sharp exothermic peak at 181.45°C with weight loss 26.83% which is due to decomposition of alginate fragments. Other sharp exothermic peaks at 453.48°C with weight loss 23.68% which is due to decomposition of the branch chain of alginate and Another sharp exothermic peak at 546.32°C with weight loss 14.99% is due to depolymerization of alginate.

Figure 3. (b) shows the bagasse-calcium alginate beads shows the sharp endothermic peak at 104.66°C and weight loss of 43.079% due to loss of bound water, sorbed water and depleting of functional group. The sharp exothermic peak at 358.37°C with weight loss 34.36% which is due to decomposition of alginate fragments and other sharp exothermic peaks at 531.48° with weight loss 15.49% which is due to depolymerization of alginate.

Similarly Figure 3. (c) shows the thermal decomposition of *Jatropha curcas*-calcium alginate beads and the reasons are the same mentioned in Table 3.

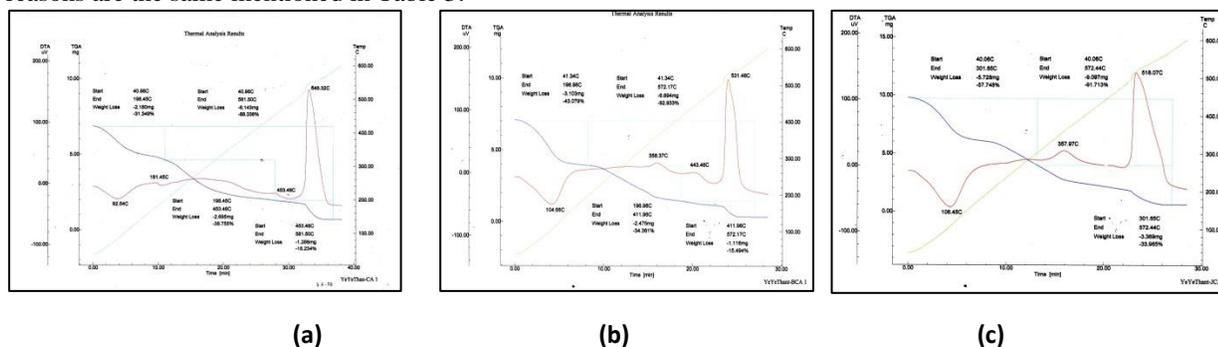


Figure6. Thermogram of (a) CA bead, (b) BCA bead and (c) JCA bead

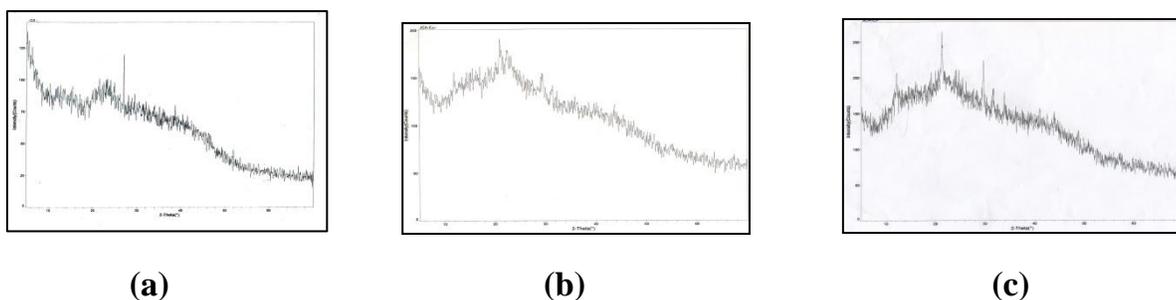
Table 4. Thermal Analysis Data for Prepared Biosorbent Beads

Type of sample	Temp. range (°C)	Break temp. (°C)	Weight loss (%)	Remark
CA	40.98-139	82.54	23.23	Loss of bound water, sorbed water and depletion of functional group
	139-258	181.45	26.83	Decomposition of some of the fraction of polymer chain

	258-511	453.48	23.68	Decomposition of alginate fragments
	511-561	546.32	14.99	Depolymerization of alginate
<b>BCA</b>	41.34-196.9	104.6	43.079	Loss of bound water, sorbed water and depletion of functional group
	196.9-411.9	356.37	34.361	Decomposition of alginate fragments
	411.9-572.1	531.48	15.494	Depolymerization of alginate
<b>JCA</b>	40.06-136	106.45	32.10	Loss of bound water, sorbed water and depletion of functional group
	136-360	357.9	38.46	Decomposition of alginate fragments

### XRD Analysis

Figures 3.6 (a), (b) and (c) show that XRD spectra of vegetable stalk alginate biosorbent beads. According to the diffractogram of prepared biosorbent composite beads can be identified to be more of the amorphous type at room temperature.

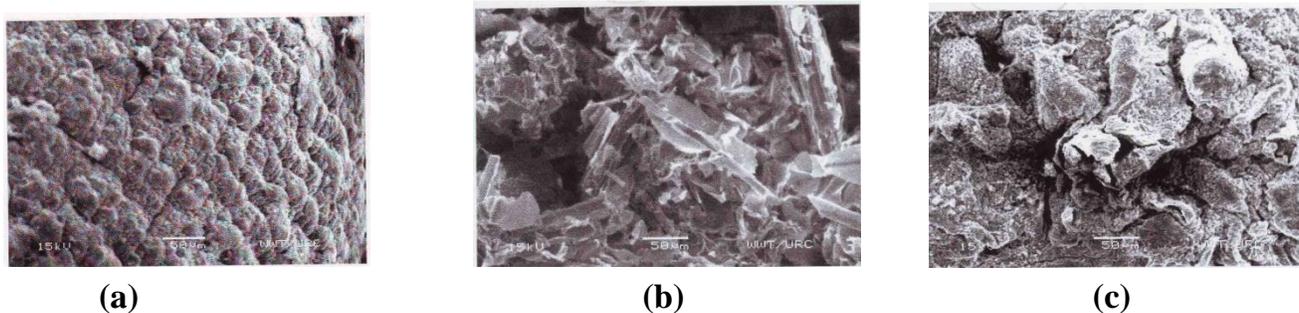


**Figure 7. XRD diffractogram of (a) CA beads (b) BCA beads (c) JCA beads**

### SEM Analysis

Figures 8.(a),(b) and (c) show the surface morphology of prepared calcium alginate beads, bagasse-calcium alginate beads and *Jatropha curcas* calcium alginate beads.

SEM images of Bagasse-Calcium Alginate Beads (Figure 8. b) and *Jatropha curcas*- Calcium Alginate Beads (Figure 8.c) revealed a cluster form of aggregate with cavitated pores. It can be also found as the beads have threaded matrix and porous nature. Therefore, these beads may be responsible for the enhanced specific adsorption properties and may be used as adsorbent for the removal of heavy metals, dyes and organic pollutants in wastewater.



**Figure 8. SEM photographs of (a) Calcium alginate beads (b) Bagasse-calcium alginate beads (c) *Jatropha curcas*-calcium alginate beads**

## CONCLUSION

The result of the investigation have shown that effective and biosorbent can be prepared by blending 6 % w/v of sodium alginate and 10% w/v of calcium chloride to form calcium alginate beads and 6% w/v of sodium alginate, 2% w/v of vegetable stalk powder and 10% w/v of calcium chloride to form vegetable stalk alginate biosorbent beads. From the investigation of physicochemical properties of three types of beads, the moisture content of calcium alginate, bagasse-calcium alginate and *Jatropha curcas*-calcium alginate beads were found to be 2.92%, 2.78% and 2.76% respectively. The solubility of three types of beads were commonly insoluble in acid and base solutions. The swelling properties of calcium alginate beads, bagasse- calcium alginate beads and *Jatropha curcas*- calcium alginate beads were 9.28%, 30.99% and 22.24% respectively. The higher the degree of swelling for water molecules, the hydrophilic nature of bagasse-calcium alginate beads were greater than calcium alginate and *Jatropha curcas*-calcium alginate beads.

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# ‘Work- Life Balance’- A Tool to Prevent Marital Breakdown: A study with reference to married women employees of the Malenadu region

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**Abstract-** India has experienced a rapid growth in many provinces from past one decade. One of the greatest growths is in the field of women empowerment. Women in India are coming forward in every field such as education, defence, technology, politics, entrepreneurship, etc. Women are entering into the workforce for career satisfaction and also for the need of the family income. But in today's world, a very big challenge faced by married women employees is, how to manage a stressful job along with the family responsibilities. It includes spending quality time with the family, spending quality time with child/children, family chores, etc. In order to manage both personal and professional life efficiently, a good work-life balance is very essential. An imbalanced work-life may result in marital breakdown among the married couples. Increase in responsibilities of women in workplace, has adverse effect on their personal life. So, this paper mainly speaks about how a good work-life balance by married women employees will help in preventing marital breakdown. The study has been conducted in some of the places of the Malenadu region of Karnataka state. The samples were working married women who are working in different sectors in the Malenadu region.

**Index Terms-** Women empowerment, work-life balance, Malenadu region, marital breakdown

## I. INTRODUCTION

Today in India ‘women empowerment’ plays a very important role in the development of women in every field such as education, defence, technology, politics, entrepreneurship, etc. An increased awareness and aspiration of personal growth has influenced women to enter into work force. Today in many of the families, women are considered as a backbone of the economical development of the family. But women employees are facing many personal and professional life challenges. They are finding difficulties to manage both professional and personal responsibilities. Hence, work-life balance is the most noticeable challenge that women face.

An imbalanced work-life may lead to many problems. Various factors such as work stress, increased family responsibilities, longer working hours, exhaustion, etc may cause for work-life imbalance among working married women. The imbalanced work-life has adverse effects on both personal and professional life. The consequences of work-life imbalance

includes stress-related illness, decreased job satisfaction, reduced productivity, lower life satisfaction, marital breakdown, substance abuse, growing problems of parenting and child/children care, etc. Among all those consequences, marital breakdown is the major consequence. The working women, who are unable to separate professional stress from their personal life, are likely to get to divorced as the solution. Majority of them are caused by work-life imbalance among all the divorced cases.

*There are many women employees who work in different sectors of the Malenadu region. The Malenadu region contains districts- Dakshina Kannada, Udupi, Utthara Kannada, Chikmagalur, Kodagu, Hasan, Shivamogga. The Malenadu women participate in different work forces. The different kind of cultural and family aspects are considered as factors to determine the work-life of married women in the Malenadu region. Marital breakdown can be caused by work-life imbalance among the working women employees. The present research paper aims at studying the work life balance of married women employees of the Malenadu region.*

### **Objectives of the study:**

- To understand the work-life balance among the working married women
- To study how work-life balance helps to prevent marital breakdown
- To address remedial measures and recommendations based on the research findings.

### **Research methodology:**

The study has been conducted on the basis of the primary data collected. The secondary data also constitutes a part of the study. The primary data was collected from among the working married women who are working in the Malenadu region; Dakshina Kannada, Udupi, Chikmagalur, Shivamogga, Utthara Kannada, Kodagu and Hasan. Randomly selected total hundred samples were considered for the study purpose. At the same time based on the requirements of the study, the data has been collected from various secondary sources such as internet, journals, magazines, etc.

### **Tools for Data Collection:**

- Questionnaire (online questionnaire as well as manual method was used)

**Tools for Data Analysis:**

- Tables
- Pie diagram
- Bar diagram

**Data analysis and interpretations:**

**Table 1: District-wise distribution of the sample**

SI No.	District	No. of respondents	%
1	Chickmagaluru	04	04
2	Hasan	04	04
3	Shivmogga	05	05
4	Dakshina Kannada	56	56
5	Udupi	12	12
6	Uttar Kannada	04	04
7	Kodagu	15	15
<b>Total</b>		<b>100</b>	<b>100</b>

**Chart 1: District-wise distribution of the sample**

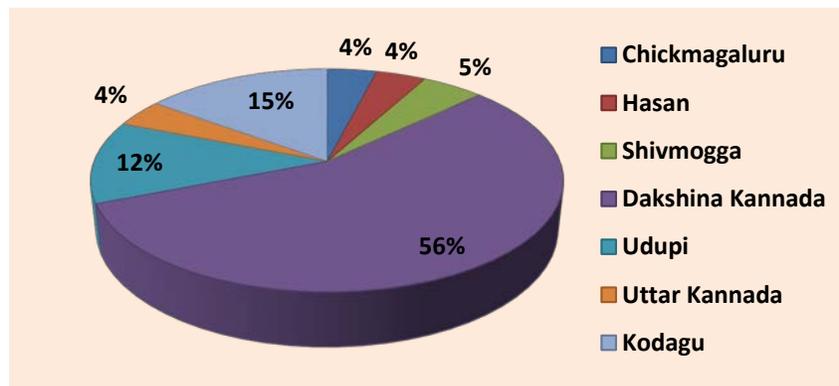


Chart 1 depicts district-wise distribution of the sample. The present study has considered the Malenadu region of the Karnataka state such as Dakshina Kannada, Udupi, Chikmagaluru, Shivamogga, Utthara Kannada, Kodagu and Hasandistricts. Majority (56%) of the respondents are from Dakshina Kannada district. Less number of respondents that is only 4% of each of them from Chikmagaluru, Hasan and Uttar Kannada districts.

**Table 2: Age-wise distribution of the sample**

SI No.	Age	No. of respondents	%
1	Below 20	01	01
2	20-30	43	43
3	31-40	40	40
4	41-50	14	14
5	Above 50	02	02
<b>Total</b>		<b>100</b>	<b>100</b>

**Chart 2: Age-wise distribution of the sample**

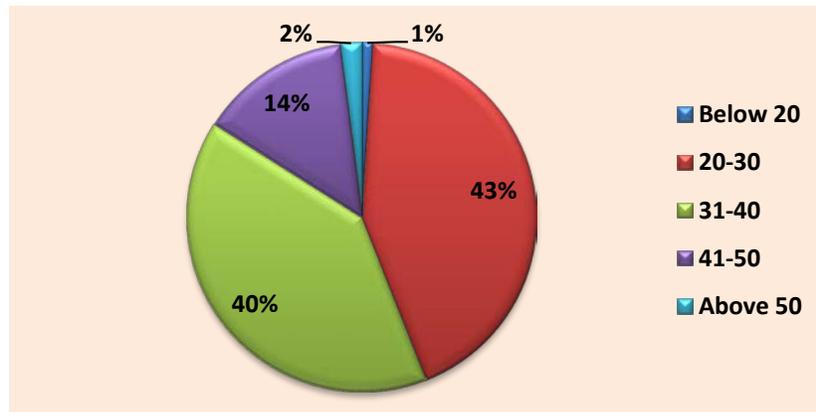
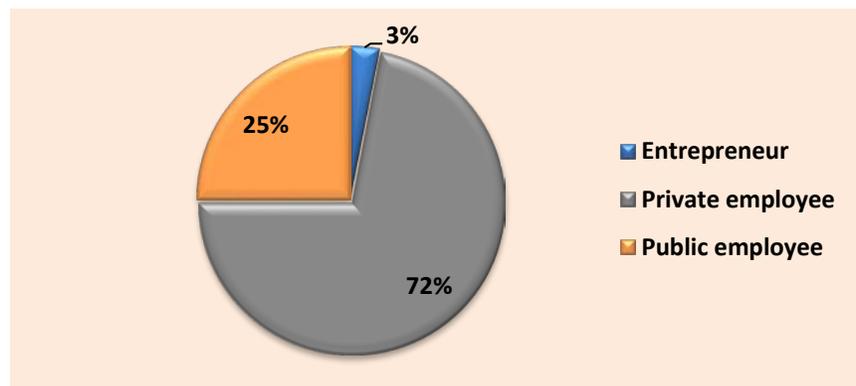


Chart 2 presents age-wise distribution of the sample. Majority (43%) of the respondents belong to the age group of 20-30 and only 1% of the respondents are below the age of 20. This shows that the research speaks high about work-life balance of young married women employees of the Malenadu region.

**Table 3: Occupation-wise distribution of the sample**

Sl No.	Occupation	No. of respondents	%
1	Entrepreneur	03	03
2	Private employee	72	72
3	Public employee	25	25
<b>Total</b>		<b>100</b>	<b>100</b>

**Chart 3: Occupation-wise distribution of the sample**



The above chart depicts the occupation of the respondents. Majority (72%) of the respondents are private employees and only 3% of the respondents are Entrepreneurs. It is understood from the above data that majority of the women are not likely to start up their own venture, they would rather prefer to work in private sectors.

**Table 4: Monthly Income wise distribution of the sample**

Sl No.	Monthly income	No. of respondents	%
1	Below 10,000	15	15
2	10,001-25,000	37	35
3	25,001-50,000	35	37
4	Above 50,000	13	13
<b>Total</b>		<b>100</b>	<b>100</b>

**Chart 4: Monthly Income wise distribution of the sample**

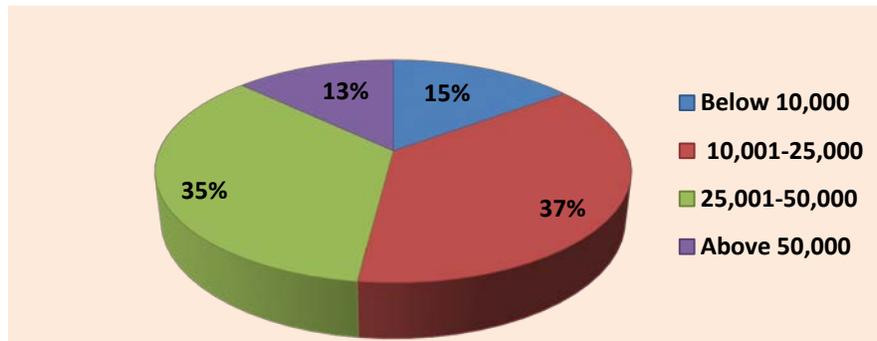


Chart 4 reveals monthly income of the respondents. Majority (37%) of the respondents draw monthly income between ₹ 10,001 and ₹ 25,000 and only 13% of the respondents draw above ₹ 50,000 monthly incomes. This gives us clear a result that women employees are paid less when it compared to men employees.

**Table 5: Response towards type of family**

Sl No.	Types of family	No. of respondents	%
1	Nuclear family	69	69
2	Joint family	31	31
<b>Total</b>		<b>100</b>	<b>100</b>

**Chart 5: Response towards type of family**

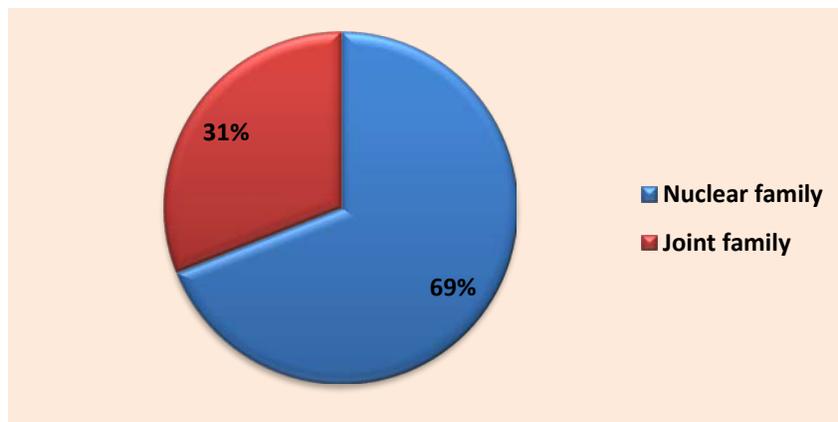


Chart 5 shows the type of family of the respondents. Majority (69%) of the respondents live in Nuclear family and less number of respondents that is 31% live in Joint family. This has given us a clear result that most of the married women employees prefer to live in Nuclear family.

**Table 6: Response towards type of marriage**

Sl No.	Type of marriage	No. of respondents	%
1	Love marriage	27	27
2	Arranged marriage	73	73
<b>Total</b>		<b>100</b>	<b>100</b>

**Chart 6: Response towards type of marriage**

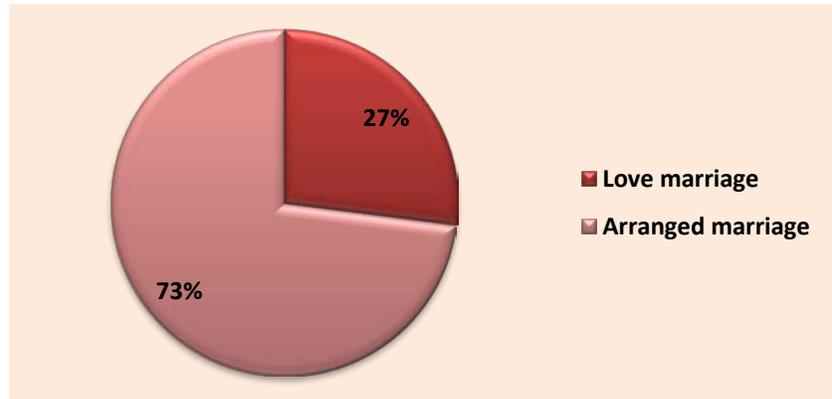
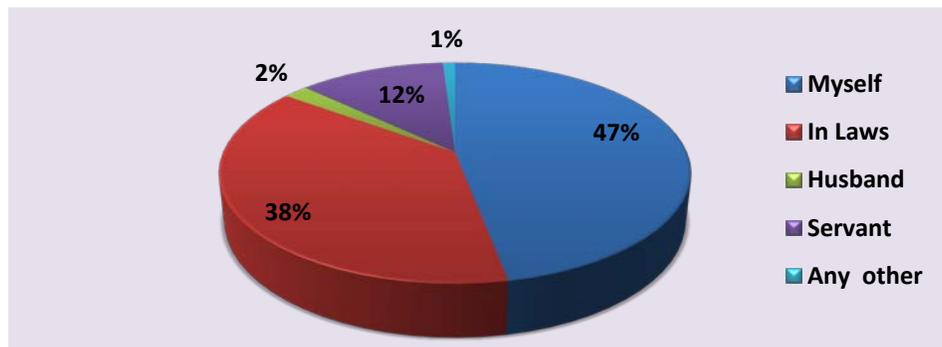


Chart 6 shows that respondents respond towards their type of marriage. Majority (73%) of the respondents opted for arranged marriage and only 27% of the respondents opted for love marriage. This shows that majority of the working women opted for arranged marriage than that of love marriage.

**Table 7: Response towards who will look after family chores at your home?**

Sl No.	Particulars	No. of respondents	%
1	Myself	47	47
2	In Laws	38	38
3	Husband	02	02
4	Servant	12	12
5	Any other	01	01
<b>Total</b>		<b>100</b>	<b>100</b>

**Chart 7: Response towards who will look after family chores at your home?**

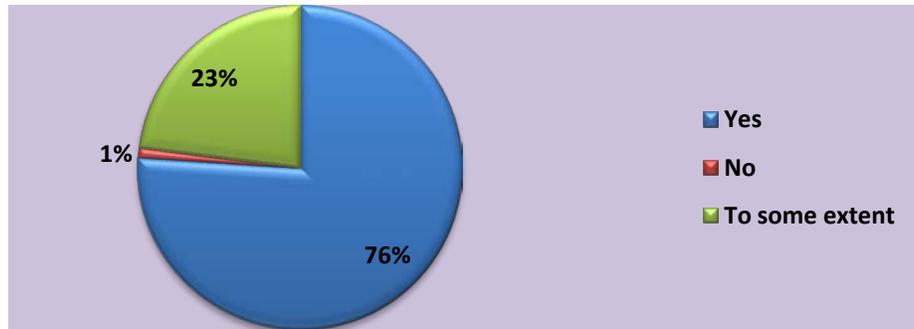


The above chart depicts respondents' response towards who will look after the family chores at home. For this majority (47%) of them responded that they themselves look after family chores. 2% of the respondents responded that their respective husbands look after family chore. Less number of respondents that is only 1% of them mentioned that is co-sisters look after family chores. This shows that majority of the working women equally share the responsibilities of both work and family and it is also understood that their husbands are not ready take part in the family chores.

**Table 8: Response towards are you able to balance professional and personal life?**

Sl No.	Particulars	No. of respondents	%
1	Yes	76	76
2	No	01	01
3	To some extent	23	23
<b>Total</b>		<b>100</b>	<b>100</b>

**Chart 8: Response towards are you able to balance professional and personal life?**



Above chart depicts whether the respondents are able to manage professional and personal life. Majority (76%) of the respondents are able to manage professional and personal life and only 1% of the respondents are not able to them. This gives us a clear result that married women are able to manage their professional and personal life.

**Table 9: Response towards work-life balance is a great challenge**

Sl No.	Particulars	No. of respondents	%
1	Yes	54	54
2	No	13	13
3	some times	33	33
<b>Total</b>		<b>100</b>	<b>100</b>

**Chart 9: Response towards work-life balance is a great challenge**

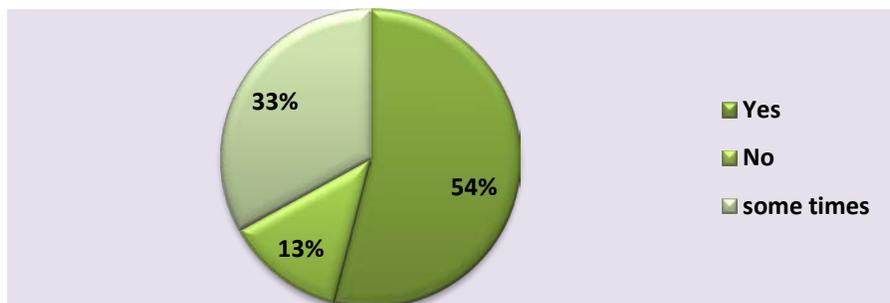
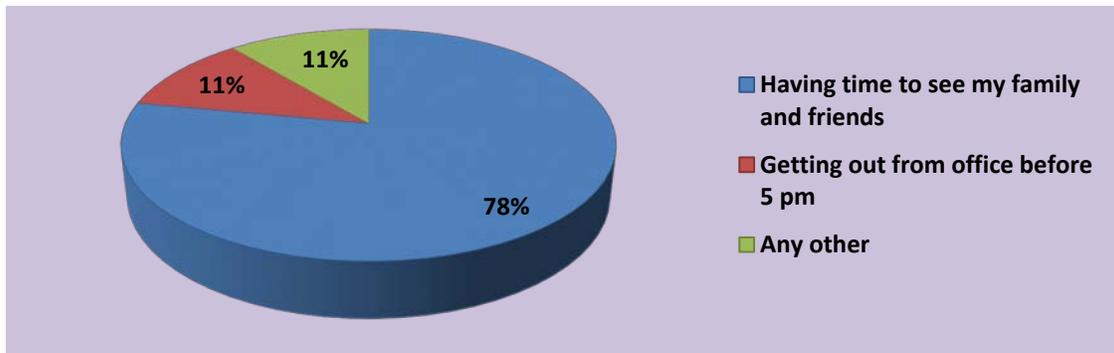


Chart 9 shows the respondents response towards the work-life is a great challenge. Majority (54%) of the respondents responded that work-life is a great challenge and less number of the respondents that is only 13% of them say that work-life balance is not a great challenge. From this data it is understood that work-life balance is a great challenge to working married women.

**Table 10: Response towards what does 'work-life balance' mean to you?**

Sl No.	Particulars	No. of respondents	%
1	Having time to see my family and friends	78	78
2	Getting out from office before 5 pm	11	11
3	Any other	11	11
<b>Total</b>		<b>100</b>	<b>100</b>

**Chart 10: Response towards What does ‘work-life balance’ mean to you?**

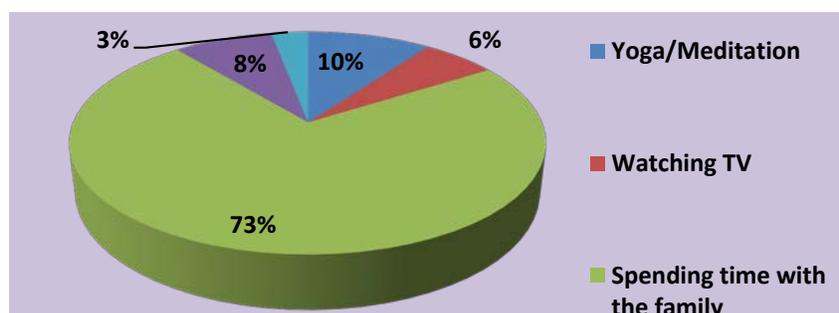


The above chart shows the response towards work-life balance. Majority (78%) of the respondents responded that having time to see family and friends is work-life balance. 11% of the respondents say that getting out from office before 5 PM considered as work-life balance and remaining 11% of the respondents mentioned other meaning for work-life balance such as looking after the family, contributing to the society, being able to put 100% effort in work and family responsibilities, completing work on time both at work place and home, giving special preference and concern towards family, child/children care, etc. This gives us a clear result that having time to see family and friends is considered as a work-life balance to married women employees.

**Table 11: Which is the best way to manage your work stress?**

Sl No.	Particulars	No. of respondents	%
1	Yoga/Meditation	10	10
2	Watching TV	06	06
3	Spending time with the family	73	73
4	Spending time in social networking sites	08	08
5	Any other	03	03
<b>Total</b>		<b>100</b>	<b>100</b>

**Chart 11: Which is the best way to manage your work stress?**



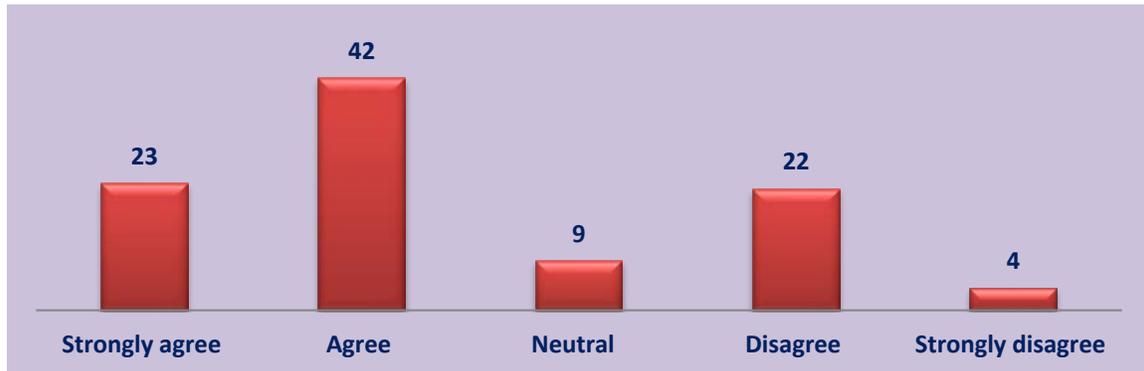
The above chart shows the respondents’ response towards best way to manage work stress. Majority (73%) of the respondents say that spending time with family is the best way to manage work stress and only 3% of respondents mentioned other ways such as sitting alone and relaxing, involving in physical activities like exercise and karate, etc. This gives us a clear result that most of the married working women spend their time with family in order to reduce their work stress.

**Table 12: Response to likert scale used toknow about work-life imbalance will lead to marital breakdown**

Sl No.	Particulars	No. of respondents	%
1	Strongly agree	23	23
2	Agree	42	42
3	Neutral	09	09
4	Disagree	22	22
5	Strongly disagree	04	04

<b>Total</b>	<b>100</b>	<b>100</b>
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**Chart 12: Response to likert scale used to know about work-life imbalance will lead to marital breakdown**

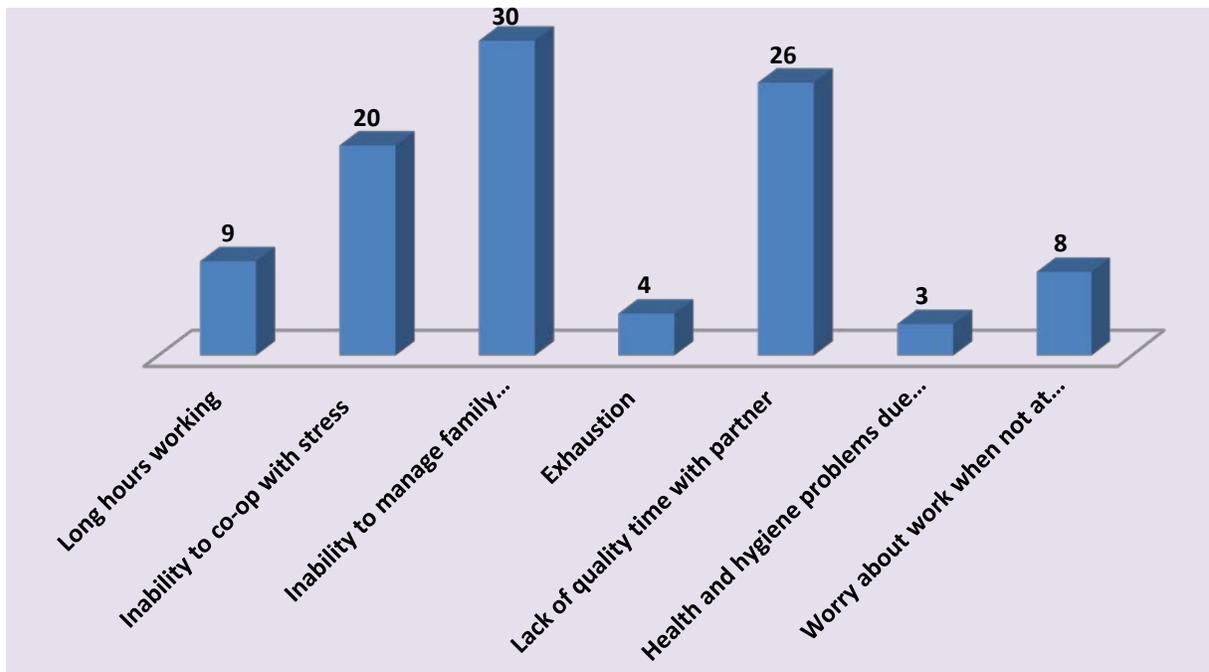


The above chart shows respondents’ response towards the statement ‘work-life imbalance will lead to marital breakdown’. It is measured through five point likert scale having options like Strongly Agree, Agree, Neutral (neither Agree nor Disagree) , Disagree and Strongly disagree. Out of the total 100 respondents majority (42%) agree that work-life imbalance will lead to marital breakdown and less number of respondents that is only 4% of them disagree this statement. Thus, from this data it is clear that work-life imbalance will lead to marital breakdown.

**Table 13: Response towards which work-life imbalance factor can lead to marital breakdown**

SI No.	Particulars	No. of respondents	%
1	Long hours working	09	09
2	Inability to cope-op with stress related problems	20	20
3	Inability to manage family responsibilities	30	30
4	Exhaustion	04	04
5	Lack of quality time with partner	26	26
6	Health and hygienic problems due to work stress	03	03
7	Worry about work when not at work place due to high work pressures	08	08
<b>Total</b>		<b>100</b>	<b>100</b>

**Chart 13: Response towards which work-life imbalance factor can lead to marital breakdown**



The above chart reveals which is the main work-life imbalance factor that leads to marital breakdown. Majority (30%) of the respondents say that inability to manage family responsibilities is a major work-life imbalance factor that causes marital breakdown. Less number of respondents that is only 3% of them says that health and hygienic problems due to work stress can cause to marital breakdown. This gives us a clear result that the working married women who are unable to manage family responsibilities are likely to end up their marital life.

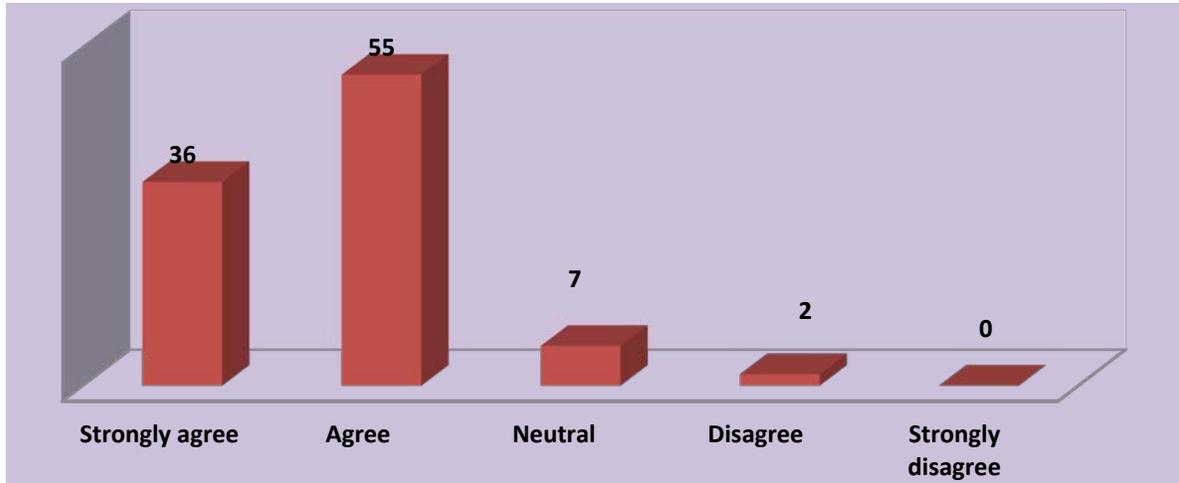
**Work-life balance as a tool to prevent marital breakdown:**

The objective of this is to find out how work-life balance among working married women helps to prevent marital breakdown. The data has been analysed and interpreted in following tables and charts. It has been done based on five point likert scale having options like Strongly agree, Agree, Neutral (neither agree nor disagree), Disagree and Strongly disagree.

**Table 14.1: ‘I am Able to spend time for my family’**

Sl No.	Particulars	No. of respondents	%
1	Strongly agree	36	36
2	Agree	55	55
3	Neutral	07	07
4	Disagree	02	02
5	Strongly disagree	00	00
<b>Total</b>		<b>100</b>	<b>100</b>

**Chart 14.1: ‘I am Able to spend time for my family’**

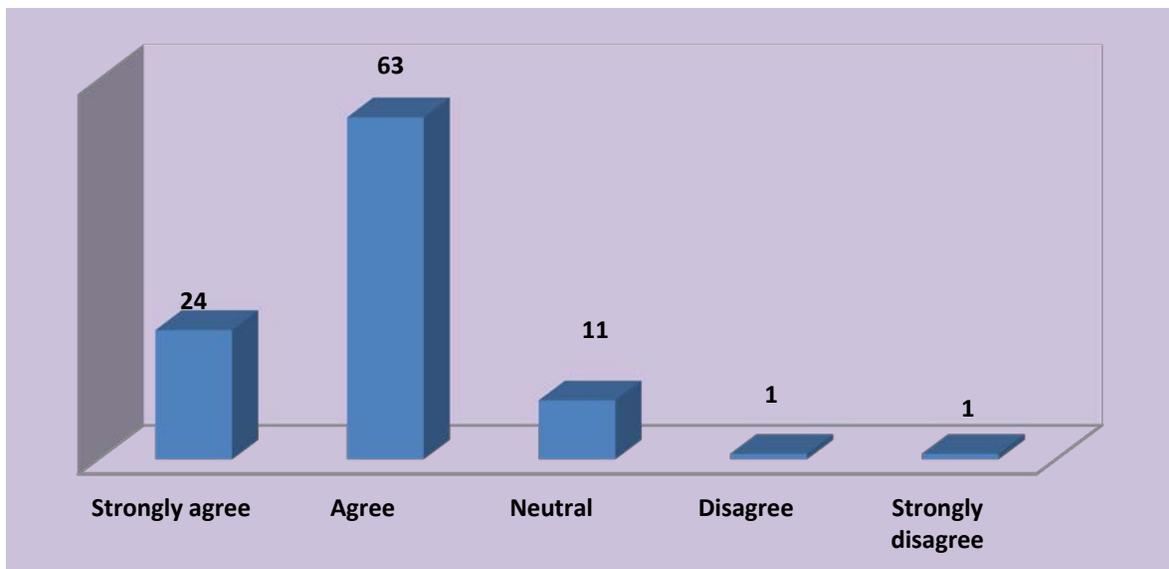


The above chart shows response towards spending time for their family. Majority (55%) of the respondents agree that they are able to spend time for their family. Only 2% of the respondents disagree. From this, it is understood that majority of the working married women are able to spend time for their family even though they have work responsibilities.

**Table 14.2: ‘I am able to take care of my professional and family responsibilities’**

SI No.	Particulars	No. of respondents	%
1	Strongly agree	24	24
2	Agree	63	63
3	Neutral	11	11
4	Disagree	01	01
5	Strongly disagree	01	01
<b>Total</b>		<b>100</b>	<b>100</b>

**Chart 14.2: ‘I am able to take care of my professional and family responsibilities’**

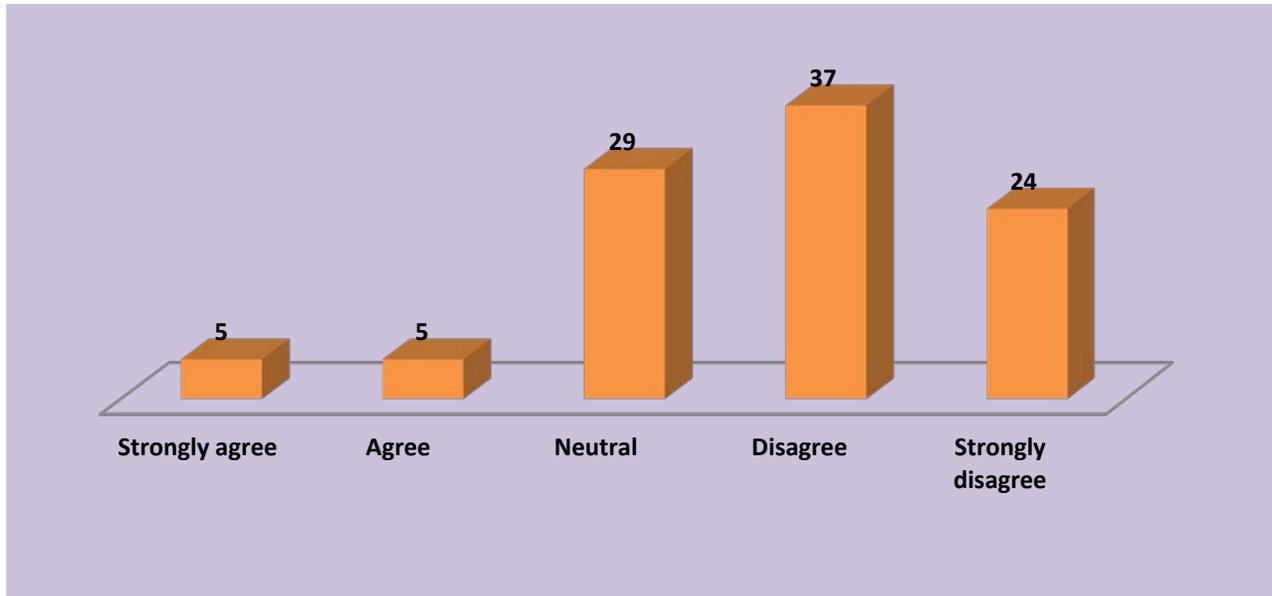


The above chart depicts response towards taking care of professional and family responsibilities. Majority (63%) of the respondents agree that they are able to take care of their professional and family responsibilities and only 1% of the equal respondents disagrees and strongly disagrees. This gives us a clear result that women are able to take care of their professional and family responsibilities.

**Table 14.3: ‘I had necessary training from my company/institution to manage the balance between work and life’**

Sl No.	Particulars	No. of respondents	%
1	Strongly agree	05	05
2	Agree	05	05
3	Neutral	29	29
4	Disagree	37	37
5	Strongly disagree	24	24
<b>Total</b>		<b>100</b>	<b>100</b>

**Chart 14.3: ‘I had necessary training from my company/institution to manage the balance between work and life’**

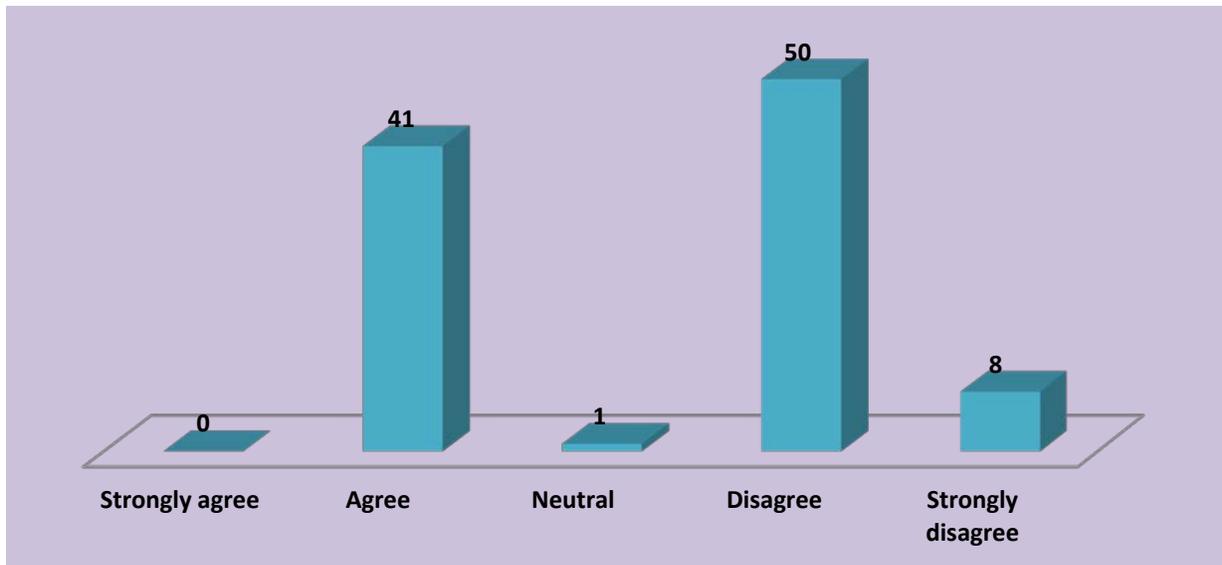


The chart 14.3 shows response towards training from company/institution to manage the balance between work and life. Equal numbers of 5% of the respondents agree and strongly agree that they had necessary training from their company/institution. Majority (37%) of the respondents disagree. This gives us a clear result that majority of the companies/institutions do not provide training for the women to manage balance between work and life.

**Table 14.4: ‘My family supports me in work-life balance’**

Sl No.	Particulars	No. of respondents	%
1	Strongly agree	00	00
2	Agree	41	41
3	Neutral	01	01
4	Disagree	50	50
5	Strongly disagree	08	08
<b>Total</b>		<b>100</b>	<b>100</b>

**Chart 14.4: ‘My family supports me in work-life balance’**

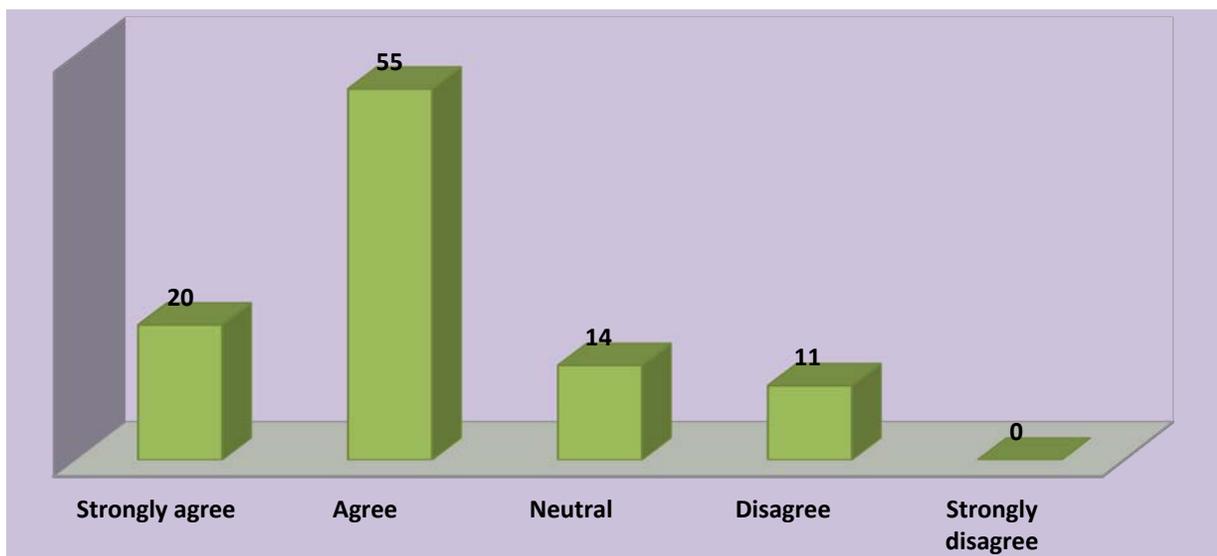


The above chart shows the result of family support in work-life balance. 41% of the respondents agree that they get family supports in their work-life balance. Majority (50%) of the respondents disagree. And only 1% of the respondents are neutral that they neither agree nor disagree. This shows that the most of the respondents do not getting family support to manage their work-life.

**Table 14.5: ‘work-life balance a tool to prevent marital breakdown’**

Sl No.	Particulars	No. of respondents	%
1	Strongly agree	20	20
2	Agree	55	55
3	Neutral	14	14
4	Disagree	11	11
5	Strongly disagree	00	00
<b>Total</b>		<b>100</b>	<b>100</b>

**Chart 14.5: ‘work-life balance a tool to prevent marital breakdown’**



The above chart shows response towards work-life balance as a tool to prevent marital breakdown. Majority (55%) of the respondents agree that work-life balance is the best tool to prevent marital breakdown. Only 11% of the respondents disagree.

## II. FINDINGS

- The demographic profile of the respondents shows that majority of the respondents are from the Dakshina Kannada district and majority of the respondents belong to the age group of 20-30. Majority of the respondents are private employees and they earn monthly income between ₹10,001 and ₹ 25,000
- The study reveals that majority of the married women employees prefer to live in Nuclear family and most of them opted for arranged marriage.
- The study gives us a result that majority of the working women equally share the responsibilities of both work and family and it is also understood that majority of the husbands are not ready to take part in family chores.
- The study depicts that married women are able to manage their professional and personal life.
- From the study it is understood that work-life balance is a great challenge to the married women employees.
- From the study it is understood that having time to see family and friends is considered as a work-life balance to married women employees.
- The study gives us clear result that most of the married working women spend their time with family in order to reduce their work stress.
- The study reveals that work-life imbalance will lead to marital breakdown. Married women who are unable to manage family responsibilities are likely to end up their marital life
- From the study it is understood that majority of the working married women are able to spend time for their family even though they have work responsibilities and are able to take care of their professional and family responsibilities.
- The study depicts that majority of the companies/institutions do not provide training for the married women employees to manage balance between

work and life and majority of them do not get family support in order to manage their work-life.

- The study shows that work-life balance is the best tool to prevent marital breakdown

## III. SUGGESTIONS

- The women employees should be given flexible schedule.
- Husband should share the family responsibilities
- The companies/institutions should provide necessary training for the married women employees to manage balance between work and life
- Family should support women to manage their work-life

## IV. CONCLUSION

At present, Indian women represent as an important section of the workforce. Working married women are witnessed as 'struggling' to achieve a balance between professional and personal life. The increased domestic responsibilities and working hours lead to work-life imbalance among married working women. Work-life balance strategies can provide positive impact on both personal and professional life of the married women employees. A good work-life balance helps in maintaining good relationship among working married couples and thereby it prevents marital breakdown.

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# Biodiversity of Freshwater Snails and Sediment Analysis as Water Quality Indicators in Badiangon Spring, Gingoog City

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**Abstract:** Water quality is the basis to determine as to how a certain body of water can be use and if it is sufficient for supporting species and ecosystem processes. Assessing water quality can be done through studying macrobenthic biodiversity- including the biodiversity of freshwater snails, and through sediment analysis. Freshwater snails are sediment-dwellers since they are benthic macroinvertebrates. Their abundance in an area can determine water quality- either if it is good quality or poor quality. Biodiversity and chemical content in the sediments are correlated with the water quality of the stream. The study was conducted in order to determine the water quality of the stream through the biodiversity of freshwater snails and sediment analysis. A total of 201 individuals were collected from 6 3m x 3m stations- 3 downstream stations and 3 upstream stations, through scoop net sampling. This includes 9 species and 1 genus of freshwater snails under the class Gastropoda which are tolerant to poor water quality. The results of the sediment analysis showed that the heavy metal contents either exceeded or are below standard values. High availability of Cu and Fe was observed and can cause harm to the inhabitants in the wet land. Therefore, it is recommended that the water from the spring should undergo purification process and rehabilitation must take place in order to improve water quality and safety.

**Keywords:** Biodiversity, Freshwater snails, Sediments, Water quality, Gingoog City

## INTRODUCTION

Water quality is the basis to determine as to how a certain body of water can be use and if it is sufficient for supporting species and ecosystem processes. Domestic and industrial waste can cause water pollution that will result to declining water quality (Benetti, et al., 2012). Thus, water quality monitoring is essential in identifying cases of water pollution and giving information for the government to give response for the improvement of water quality (Martinico-Perez, et al., 2016).

Assessment of water quality is conducted through physicochemical parameters. However, the use of

bioindicators such as benthic macroinvertebrates is proven more effective in detecting long-term pollution since they adapt to a specific environment. Studying the biodiversity of these bioindicators- including the variations in the populations of species, can detect pollution (Benetti et al., 2012).

Benthic macroinvertebrates are species lacking the presence of a backbone, can be seen by naked eye, and are inhabited in river and lake bottoms and basically, bottom-dwelling organisms. These organisms are also involved in the processes and cycles of aquatic environment (Fajardo et al., 2015). One of these organisms are freshwater snails with 5000 species that inhabit streams, ponds, and lakes. The biology, distribution, and mostly, its abundance, had gained importance in the field of research- including the assessment of water quality (Oloyede, O. et al., 2016). Water clarity is said to be improved by freshwater snail present in the environment, through releasing substances that causes suspended particles to clot. On the other hand, snails can also cause resuspension of sediments and increase nutrient release to water, that worsens eutrophication. Therefore, the presence of snails has positive and negative effects on water quality (Mo, S. et al., 2017).

Sediments act as sinks of contaminants, like heavy metals. Thereby, chemicals found on water can be found on sediments. The assessment of sediments toxicity was conducted through chemical analyses and it can be correlated to water quality together with the biodiversity of benthic macroinvertebrates such as freshwater snails (Mazurova, E., et al., 2008).

Badiangon spring is a place where people go for leisure because of the sea breeze and its ice-cold water from the spring. Badiangon spring is located 3 km west of Poblacion of Gingoog City, in the province of Misamis Oriental. The spring and the stream became the sources of water for the residents' every day drinking and domestic use. There is visible trash in the place- including the streams, such as wrappers, fallen leaves and branches, and domestic wastes brought by the residents and visitors. The quality of water is affected. The assessment of water quality is required to ensure the safety of the water and for actions to be made.

Thus, this study was conducted to determine the biodiversity of freshwater snails in Badiangon spring and to determine the chemicals and organic matter present in the sediment through chemical analysis, and correlate it with the water quality of the stream.

**MATERIALS AND METHODS**

**A. Protocol Entry**

The researchers acquired permit from the local government unit of Barangay San Juan, Gingoog City for the conduct of the study. A Gratuitous permit was also acquired from DENR Region X for the collection of freshwater snails in the area.

**B. Study Area**

The study area was located in Badiangon Spring, located 3km west of Poblacion, Gingoog City. It is a source of water for drinking and domestic purposes of the nearby residence, and a place with high socio-economic activity due to visitors and residents.

**C. Collection of Samples**

Specimens were collected from the 6 sites- 3 downstream sites and 3 upstream sites- with a 3mx3m measurement using the scoop net with 30 scoops at each site. The sediments were sampled along with the snails collected (Corpuz, M.C. et al., 2016 .and Oloyede, O.O. et al., 2016).

**D. Laboratory Analysis**

The snails were sorted, counted, and placed in a container with 70% solution ethyl alcohol. Each container was labeled and brought to the Bureau of Fishery and Aquatic Resources in Cagayan de Oro for further identification of an expert (Corpuz, M.C. et al., 2016).

**E. Sediment Analysis**

The collected sediments at each site were placed in a container and were taken to the Taguibo Regional Soils Laboratory for the identification of mineral contents (Mazurova, E. et al., 2008).

**F. Statistical Analysis**

Biodiversity indices were determined using Shannon-Weiner index in PAST Software (Corpuz, M.C. et al., 2016). On the other hand, sediment standard qualities were determined based on the standard mineral content for soils and sediments.

**RESULTS**

Table 1. Number of Individuals and Taxa

Class	Family	Scientific Name	Site		Taxa
			US	DS	
G	N	Vittina	6	0	3

a	e	chrysocolla			
s	r	Neritina			
t	i	pulligera	51	88	3
r	t	(Dusky nerite snail)			
o	i	Septaria			
p	d	lineata (Lined	6	0	3
o	a	Limpet-like			
d	e	Nerite			
a		Neripteron	1	0	3
		bicanaliculatum			
		Clithon sp.	1	2	3
		Septaria	4	6	3
		taitana			
		Clithon corona	2	16	3
		(Horned Nerite Snail)			
		Clithon spinosum	0	11	3
		Neritina cornuta	0	1	3
		Septaria porcellana	0	6	3

Table 1 shows the number of freshwater snail individuals in both downstream and upstream sites and their corresponding taxa. 9 species and 1 genus of *Clithon sp.* were collected from all sites. Higher numbers of individual can be observed downstream compared to upstream.

Highest number of freshwater snail individuals collected from both sites belongs to the species *Neritina pulligera* (Dusky nerite snail). *Neripteron bicanaliculatum* and *Neritina cornuta* species have the least number collected on both sites.

Table 2. Biodiversity indices of Freshwater Snails

Indices	Site	
	Upstream	Downstream
Taxa_S	7	7
Individuals	71	130
Dominance_D	0.5346	0.4851
Simpson_1-D	0.4654	0.5149
Shannon_H	1.038	1.117
Evenness_e^H/S	0.4033	0.4363

Biodiversity indices are shown and the values do not differ with each sites (Table 2). The numbers of individuals

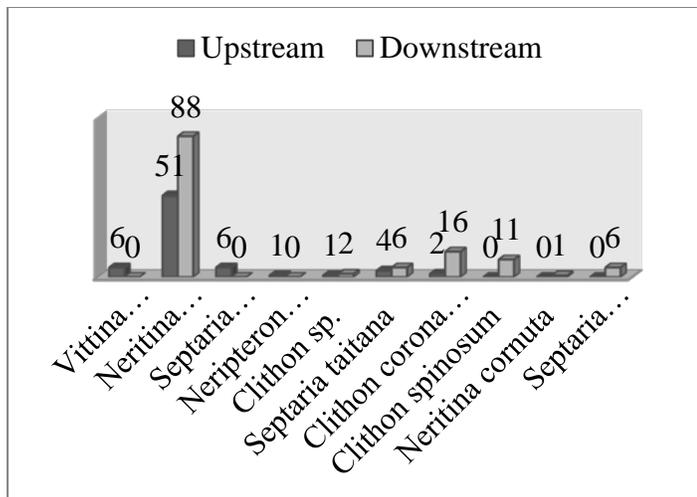
collected from each site differ. However, the values for the Dominance and Simpson index do not differ in great values. The values for the Shannon index were more than zero (0) indicating that the community has many taxa with few individuals under each taxa.

Table 3. Sediment Analysis

Contents (ppm)	Site		Reference Value (ppm)
	US	DS	
Zinc (Zn)	20	19	92-233
Iron (Fe)	32,916	65,153	30,020-43,858
Copper (Cu)	86	44	15-61
Nickel (Ni)	25	31	15-43

Chemical contents in the sediment were presented and compared to the reference value of chemicals in sediments (Table 3). Zinc (19 ppm and 20 ppm) was below reference value while Iron (Fe) content in downstream site (65,153 ppm) and Copper (Cu) in the upstream site (86 ppm) have values that exceeded the reference value. Moderate contents of Nickel (Ni) in the sediments were detected.

Figure 1. Graph on the number of individuals in upstream and downstream sites



Number of freshwater snail individuals in both upstream and downstream sites. The abundance of *Neritina pulligera* in the sites can be observed. It is shown that downstream sites have higher number of freshwater snail individuals compared to upstream sites (Figure 1).

**DISCUSSION**

A total of 201 individuals were collected from both upstream and downstream sites. There were 10 species from the class Gastropoda and all species belong to Taxa 3. According to Fajardo et al. (2015), Taxa 3 species are tolerant

to average and highly polluted water. The abundance of gastropods in Badiangon Spring implies that the waters are slightly polluted or polluted. Oloyode (2016) also stated in his study that the abundance of gastropods in the area without any bivalve indicates pollution for bivalves are sensitive to water quality compared to gastropods. Gastropods, on the other hand, are tolerant to polluted waters.

A total of 130 individuals were collected from the downstream sites and there were 71 individuals from the upstream sites. Higher number of gastropods was collected from downstream sites implying that the site is more polluted compared to the upstream.

Meanwhile, identifying the chemicals, specifically heavy metals, on sediments can help determine the toxicity of water (Hallare et al., 2009; Singare et al., 2011; Kumar et al., 2011). The sediments collected from the upstream and downstream sites were presented and compared to the recommended reference values in Table 3 as a basis for comparison in order to determine contamination risk on the water.

The upstream site contains 20 ppm, 32916 ppm, 86 ppm, and 25 ppm of Zn, Fe, Cu, and Ni respectively. Comparing to the recommended reference values Zn, Fe, and Ni did not exceed the standard values and exist in moderate values in contrast to the Cu contents. While on the downstream sites it contains Zn, Fe, Cu, and Ni with 19 ppm, 65, 153 ppm, 44 ppm, and 31 ppm respectively. It can be observe that Fe contents in the sediments exceeded the recommended reference value dissimilar to the values of Zn, Cu, and Ni. Kumar et al., (2011) opined that a high availability of such heavy metals means a high contamination risk for the water. High availability of Cu and Fe can cause harm to the inhabitants in the wet land.

The availability heavy metals have different contamination risk and the presence of gastropods implies present pollution of the stream. Pollution is caused by the activities of the residents and visitors of Badiangon spring, Gingoog City.

**CONCLUSION**

All the freshwater snails collected from Badiangon Spring are under the class Gastropoda which are highly tolerant to poor water quality. The value for the sites' biodiversity indices do not differ from each other. In addition, the heavy metal contents in the sediment, presents that the amount of Zn, Fe, and Ni in the upstream site does not exceed the recommended reference values dissimilar to the amount of Cu. While on the downstream site, only two (2) chemicals did not exceed the standard values; the Zn and Ni. It can be concluded that Badiangon spring has poor water quality due to the abundance of Gastropods and the high availability of Cu and Fe in the sediments.

Therefore, it is recommended that rehabilitation must take place in order to improve water quality and safety.

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# Self-esteem and Developmental Assessment in Reducing Human Inequality of Visually Disabled Adolescents in Manipur

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**Abstract-** Self-esteem is a major determinant of behaviour and it refers to the evaluation which a person makes. Self-esteem reflects a person's overall subjective emotional evaluation of his/her own worth. It is a judgement of oneself as well as an attitude towards self. The idea of self starts growing from the period of infancy and keeps on growing till and through adolescence and maturity. Adolescence being the critical period of development highlights a strong relationship between self-esteem and feeling of disablement which interactively produce significant effects on the personal and social adjustment and academic achievement for blind adolescents. As they are still tolerating the stigma of human inequality, the present paper tries to impart importance on the interaction pattern giving mental support and assessment for the development and self-perception of blind adolescents at school in the constructivist perspective. 'Self-esteem is the effective component of the self positive-negative, evaluation of the belief about self. Here, assessment is again critically an important step in the developmental progress of young adolescents who are blinds. Understanding a child's abilities and the nature of cognition, visual and other sensory impairment is fundamental knowledge of creating an education plan. The main objectives of the present study are i. To find out self-esteem level. ii. Relationship of self-esteem with age, sex and academic achievement. iii. To focus developmental assessment of the visually disabled adolescents. The sample size consists of 60 adolescents, 30 boys and 30 girls from the age groups of 12 to 19 years. The present study was conducted at Takyelpat, Imphal West, Manipur (Government Ideal Blind School and Home for the Blind). Questionnaire technique developed by Battle's Culture Free Self-esteem Inventory of Adolescent (1981), consisting of 3 areas – general, social, and personal self-esteem with interview schedule, observation of school record sheets, and mark achievements were adopted for data collection. Random Sampling Technique was used for the data collection. For developmental assessment - learning media assessment, functional vision assessment with the help of teachers were used. The result showed that majority of the adolescent reported intermediate self-esteem. Older groups had better self-esteem. There was significant relationship of self-esteem with academic achievement. Further, it can be concluded that developmental assessment proportionate to Higher self-esteem for the visually impaired students to cooperate, self-control and responsibility, thereby narrowing down the social inequality.

**Index Terms-** Self-esteem, Visually Disabled, Adolescents, Developmental Assessment and Manipur

## I. INTRODUCTION

Visually disabled are the margined group where they need special attention, care, love and affection from different angles like from parents, trained teachers, friends, society, community and different stakeholders. The visual disability can be defined as the loss of vision that is significant which cannot be corrected with the help of pills or any other methods. The classification is done by three levels – mild, moderate and severe.

The Centre for Disease Control and Prevention (CDCP) (Sept., 2013) says a visually impaired person's eyesight cannot be corrected to a normal level. It may be said that visual impairment is the functional limitation of the eye or eyes or the vision system.

Visual impairment or vision loss is a decrease ability to see to a degree that causes problems not fixable by usual means such as glassed or contact lenses. It is often defined as a best corrected visual equity of worse than either 20/40 or 20/60. Visual impairment may cause people difficulties with normal daily activities such as driving, reading, socializing and working.

These persons with poor sight are still in a position to continue his task with appropriate associated devices. A person suffering from visual disability, despite being in the society cannot achieve the visual social stimuli. Their disability blocks them from performing their life activities and prevents him in developing cognitive system that represents persons on view of him or pattern of traits by which he describes himself. This is a major determinant of behaviour. An individual with visual disability has feeling of helplessness and dependants on others. As they enter adolescent period they need to enhance self-esteem by making them thinking positive emotions, freedom of life, availability of energy, while being self motivated, increase risk taking ability with strong conviction and optimistic attitudes. Adolescence is the stage of most of the individual developmental changes and life challenges are associated (Zarette and Eccles 2006). It is the stage where one is struggling to find their own identity also with their social interactions and moral issues. The chief task of a teenager is to discover their identity separate from family and as an associate of their entire population. It is a kind of transitional stage where all

the psychological and bodily development occurs. In social relationship the teens much dealt with many of their community relations provides them with superior opportunity to develop and utilises their private and personal identity with additional exploring their self rule.

The idea of self starts growing from the period of infancy and keeps on growing till and through adolescence. Adolescence has been considered as a time when self-concept is increased in prominence. In this period, the physically challenged adolescents experience feeling of insecurity, isolation, rejection, and stigmatised on the part of parents and society and emotional conflicts which creates a lot of adjustment problems for their basic needs. The disability condition affects one's self-concept and self-esteem. The visually disabled adolescents find difficult to learn essential social skills and thus becoming victim of low self-confidence. Self-esteem is the evaluation a person makes and customarily maintains with regard to him or her. It is the way the individual feels about himself and judgement of worthiness that is expressed by the attitudes she or he holds towards the self. It is belief that those persons possessing high self-esteem helps to cope with life's difficulties and positively motivates individuals to work for the betterment of himself and those around him. High self-esteem leads to active role performance and low self-esteem leads to passive role performance. A self-esteem influence behaviour thinking and actions of individual, it is very important aspects of human life.

The social impact on visually disabled is one of the most important parts of actual problem. And again social support is one of the important focus points which makes them feel more effective and enhance them in all aspects of their adjustments in the society. How effective they themselves feel is an important part of development and helps to cope with life's difficulties and positively motivate them for betterment of life around him. But their disability blocks them from performing their activities successfully in life. So, this leads the proposed research questions for studying the self-esteem of visually disabled adolescents in Manipur and what needs to be focus for the developmental assessment at least to reduce the inequalities of the marginalised group in the society.

## II. LITERATURE REVIEWED:

While going through related literature, the researcher found few studies in the field of self-esteem taking different parameters and variables, highlighted opinions of the following observations.

Wood & Hem Pet (2003) reported that individual with high esteem have a clean intellect of what their private qualities are they think well of themselves, have appropriate goals, use feedback mechanism to enhancing self and they gain successfully with difficult situation.

Brown and Marshall (2001) added that people with low self-esteem have less understable self-conception, think poorly of them because they often go for unrealistic goals or shy away from goals overall tend to be negative about the future, remember their negatively pass experience.

Butter Worth (1992) reported that young children have fairly clear concepts of their personal qualities but many changes occur in middle and late adulthood which may influence the self-

conceptions that people hold thus reveals that self-esteem increases with increase of age.

## III. SIGNIFICANCE OF THE STUDY:

Self-esteem is the cognitive system that represents person's view of himself or pattern of traits by which a person describes himself. Self-esteem helps to cope with life's difficulties and positively motivates individual to work for betterment of himself and those around him. As self-esteem influence behaviour, thinking and actions of individual it is very aspects of human life. Self-esteem is a condition that promotes good performance especially in stress situations. It enables one to draw upon one's unique strength and confidence to cope with life's difficulties and to work for betterment for himself and of those around him. Since, high self-esteem is advantageous as it builds strong convictions and optimistic attitudes, makes person self-motivated, increase risk taking ability and improves performances in life. Being even in disability condition, blind adolescents needs to enhance self-esteem in higher condition, developmental assessment are required to cope up their life condition and situation at least to reduce the human inequalities in the society. So, the studies of self-esteem level of visually disabled adolescents are highly significant.

## IV. OBJECTIVES AND HYPOTHESES:

a) **Objectives:** The study aims:

1. To find out self-esteem level of the visually disabled adolescents.
2. To study relationship between self-esteem with age, sex and academic achievement.
3. To focus developmental assessment of the visually disabled adolescents.

b) **Hypotheses:** The present study seeks to verify the following hypotheses;

H0<sub>1</sub>: There exists low self-esteem of visually disabled adolescents

H0<sub>2</sub>: There is positive relationship between self-esteem with age, sex and academic achievement

H0<sub>3</sub>: There is significant relationship of developmental assessment and self-esteem of the visually disabled adolescents.

## V. RESEARCH METHODOLOGY:

**Research Method:** To achieve the above cited objective of the study, descriptive Research method was used.

**Population:** The population of the study is Imphal West District, Manipur.

**Sample:** The sample of the present study was limited to 60 visually disabled adolescents (i.e. 30 Boys and 30 Girls) of the age group of 12 to 19 years. The students were from the Govt. Ideal Blind School, Takyelpat, Imphal, Manipur. For the data collection, Random Purposive Sampling Technique was used.

**Tools:** The Tools used for the data collection were –

1. Self-esteem Inventory Questionnaire Technique prepared by Battle (Culture Free Self-esteem Inventory

1981), consisting of three areas – General, Social and Personal Self-esteem with interview schedule.

2. Observation of School Record Sheets of mark achievement
3. Developmental assessment method – learning media assessment and functional vision assessment.

1. Data Analysis and Interpretation:

The researcher classified and tabulated the data for presenting data systematically. The data was classified on basis of Sex, Age and on the basis of mark achievement and was analysed using descriptive method and inferential statistics like Mean, Standard Deviation, ‘t’-test and correlation.

**Table – 1**

Statistical differential indicating Mean, Standard Deviation and ‘t’-test value of

**Self-esteem levels of the Visually Disabled Adolescents**

Variables	No.	Mean	Standard Deviation	‘t’-test
Self-esteem High Achiever	23	4.6	4.34	0.19*

**Table – 2**

Statistical differential indicating Mean, Standard Deviation and ‘t’-test value of **Self-esteem levels of Younger and Older Visually Disabled Adolescents**

Variables	Number	Mean	SD	‘t’-test
Self-esteem of Younger Adolescents	27	5.4	2.51	0.28*
Self-esteem of Older Adolescents	33	6.6	3.58	

- Significant at 0.05 level of significance

**Interpretation:**

Table – 2 reveals that the mean score and standard deviation (Mean = 6.6, SD= 3.58) of the older visually disabled adolescents is higher than the (M= 5.4, SD= 2.51) younger visually disabled adolescents, when ‘t’ was computed out between these two extreme groups are highly significant result ‘t’ = 0.28 at 0.05 significant level. These results shows that we accept the

**Table – 3**

Statistical differential indicating Mean, Standard Deviation and ‘t’-test value of **Self-esteem and Sex of Visually Disabled Adolescents**

Variables	Number	Mean	SD	‘t’-test
Self-esteem of Visually Disabled Boys	34	6.8	3.42	0.21*
Self-esteem of Visually Disabled Girls	26	5.2	2.49	

- Significant at 0.05 level of significance

**Interpretation:**

From the above Table – 3, it can be concluded that the mean and SD (M=6.8, SD=3.42) of the visually disabled boys is higher score than the mean and SD (M=5.2, SD=2.49) of the visually

Self-esteem Low Achiever	37	7.4	5.03	
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- Significant at 0.05 level of significance

**Interpretation:**

The mean values and standard deviation of High achiever of visually disabled adolescents is 4.6 and 4.34 for the low achiever is 7.4 and 5.03 respectively, which can be classified as above average is self-esteem as suggested by interpretation taken from the manual. Thus, the above Table – 1, show that there is significant difference in self-esteem between the low and high achiever of the visually disabled adolescents. The obtained ‘t’ value (0.19) is significant at 0.05. This result indicates that the alternate hypothesis  $H_{01}$  that there may exist low self-esteem of visually disabled adolescents is accepted. The above difference is real and based on the data collected. It may be concluded that the visually disabled adolescents have low self-esteem.

The result concurs with the findings of Howell (1973), Kirk (1972), Podeditz (1971), Dr. Lakshmi Nair K and Dr. Anuradha S (2017) found that disabled children’s have negative self-esteem.

hypotheses  $H_{02}$  and conclude that there exist difference in self-esteem between younger and older adolescents that older group will be higher in self-esteem than the younger ones.

The results concurs with the results of Butter Worth (1992) that self-esteem recognition is increased and develops in infancy and changes in middle and late adulthood.

disabled girls, when ‘t’ was computed out between the two extreme groups is highly significant result ‘t’ = 0.21, which is significant at 0.05 level of significance. On this basis of the above result, we accept the hypotheses  $H_{03}$  that boys will have better self-esteem than the girls.

The result concurs with the findings of Hussain, Akbar (2006) exposed about the levels of self-concept among boys and girls. The result says that significant difference was found in case

blind students. Boys reported to have higher self-esteem than the girls.

**Table – 4**  
Statistical differential indicating Mean, Standard Deviation and Correlation value of **Self-esteem and Academic Achievement of Visually Disabled Adolescents**

Variables	Number	Mean	SD	Correlation
Adolescents with Rank	35	7	3.39	0.76
Adolescents without Rank	25	5	2.92	

**Interpretation:**

Based on the data collected the ‘r’ value of the high academic achievement and low academic achievement has been calculated to 0.76. The level of significance of ‘r’ value even at 0.01 and 0.05 level is significant that the relationship between self-esteem and high academic achievement is positive. The result shows that there exist relationship between self-esteem and

academic achievement. Higher academic achiever has better self-esteem than lower academic achiever.

The result concurs with the findings of Wood & Hem Pet (2003) that individual with high self-esteem have clean intelligent what their private qualities are they think well of themselves and they gain successfully with difficult situation.

**Table – 5**  
Statistical differential indicating Mean, Standard Deviation and ‘t’-test value of **Self-esteem and Developmental Assessment among the Visually Disabled Adolescents**

Variables	No.	Mean	Standard Deviation	Correlation
Developmental Assessment Achiever Adolescents	35	7	3.54	0.85
Developmental Assessment non- Achiever Adolescents	25	5	2.92	

**Interpretation:**

From the above Table – 5, it can be concluded that the ‘r’ value of the developmental assessment of high self-esteem achiever and developmental assessment of low self-esteem achiever has been calculated to 0.85. The level of significance of ‘r’ value at 0.01 and 0.05 is significant that the relationship between self-esteem and developmental assessment is positive. The result shows that there exist relationship between self-esteem and developmental assessment.

esteem than the non-achiever of developmental assessment.

**Findings:**

The findings of the present study can be highlighted in the following points:-

- a. Most of the visually disabled adolescents have lower self-esteem.
- b. There is significant difference between the visually disabled adolescent boys and girls in self-esteem. The result showed that the adolescent boys have better self-esteem than the girls do.
- c. There is significant difference in self-esteem between the younger group adolescents and older group adolescents. That the older group adolescents have better self-esteem than the younger ones.
- d. There is significant relationship of self-esteem and academic achievement of the visually disabled adolescents that the higher mark scoring adolescents have better self-esteem.
- e. There is relationship between the self-esteem and developmental assessment that those adolescents who got developmental assessment achiever have higher self-

VI. CONCLUSION

On the basis of the results, the following conclusions appear tenable that the study highlights the contributions from different angles like parents, trained teachers, administrators, educationists, different stakeholders and other concerns enhancing self-esteem and developmental assessment should be given for the disabled persons. Academic counsellors should devote wholeheartedly for the welfare of such marginalised section of the society. Further, state policies should be initialised for their wellbeing. Workshops, symposium, public awareness programmes, seminars, conferences, guidance programme activities at nearby community centres and educational institutions should be initiated at high school and college levels in order to equip them with the needed skills to develop self-esteem and to achieve higher academic achievements. These are some of the positive recommendations or outcome of the study which will enhance the inclusive and participative steps for betterment of the visually disabled adolescents.

Parents should adopt proper parenting styles that enhance motivation, encouragement, flexibility, fearlessness with adaptation of modern scientific ideas and new technological aids that can help and improve the disability condition.

The sense of ‘bodily’ self is reflected in the general attitude of trust and mistrust which stems a positive and negative sense of continuing self. So, all the concerns is needed to draw their

attention to help for such marginalised groups of people for their welfare and provisions for development.

Thus, thereby reduced the stigmatization and inequalities of such physically and challenged and visually disabled adolescents in the society.

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# Perceptions of teachers and Students on the Social Behaviour of Secondary School Students whose Parents Abuse Alcohol in Elgeyo-Marakwet County, Kenya

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## Abstract

Alcohol abuse is one of the social issues in today's society. Parents and social institutions like schools have the responsibility of socializing the young people but they have also fallen victims of alcohol abuse. The need to carry out this research arose from the fact that alcohol consumption, especially illicit alcohol, had affected the society as a whole, the family included. The study was carried out in Keiyo North, Elgeyo-Marakwet County. The objective of this paper was to establish the perceptions of teachers and students on parental alcohol abuse and the social behavior of the secondary school students whose parents abused alcohol. The study was based on the theory of Social Cognitive Learning by Albert Bandura. The theory argues that through observation and the use of cognitive processes people have the potential to learn certain behaviours from their environments. Concurrent triangulation mixed method research design involving qualitative and quantitative approaches was used. The target population of this study comprised of all the public secondary schools in Keiyo North sub-County. The sample comprised of 49 participants sampled from seven public schools. Stratified random sampling and purposive sampling were used to select the schools and participants respectively. The study utilized questionnaires and interviews to collect data. Quantitative data was analyzed using descriptive statistics while qualitative data was analyzed thematically. The findings showed that parental alcohol abuse was perceived as a contributor to the antisocial behaviour of the students in various ways such as students wanting to fight, aggression, isolation, poor grooming, taking of alcohol and involvement in pre-marital sex.

**Key words:** Social behaviour, parental alcohol abuse, perceptions, school

## 1. Introduction

The social and health problems caused by the abuse of illicit drugs not only affect the people who abuse them, but also the other individuals in their families and communities (WHO, 2012). As children develop, they are socialized by agents who include the family, school, peers, media and the religious organizations. The family being the premier socialiser where the child learns the first lessons of life has been affected by the abuse of alcohol which has consequently led to other social issues like HIV/AIDS. Simons Morton (2008) noted that the rapid development in early adolescence causes a lot of difficulty in parenting although positive parenting can greatly influence behavior with regard to substance abuse. Responsible parenting which can be jeopardized by alcohol abuse enables the children to obtain both technical and social skills needed in life (Sirera & Mwenje, 2014). Negative peer influence can be avoided through effective communication, parental monitoring, and involvement. Contrary to what was expected of them, some of the parents and teachers had fallen victims of alcoholism and had adversely affected the social development of their children and students respectively.

## 2. Literature Review

The family values and ethics have weakened with time making teenagers to deviate from the norms. Parental modelling of drinking has been linked with early initiation to drinking and increased later use (Ryan, Jorm & Lubman 2010). Research by Spear (2004) in the U.S confirms that children benefit when parents take an active role in their lives by talking to them about drugs and the effects, monitoring their friends and the nature of activities they engage in, understanding their problems and concerns, providing consistent discipline and rule and being involved directly in their learning and education, but alcohol has had diverse affects on the quality of parenting a child gets. Some of these parents in Australia were prone to violence hence the children regularly witnessed violence and aggression (CFCA, 2015). These finding therefore showed that parents play a great role in influencing the social behaviour of their children.

Research findings done in the U.S in 2012 showed that more than 10% of the children lived with a parent who abused alcohol (SAMHSA, 2012) and another done in 2008 revealed that 35.6% of students had taken six or more drinks of alcoholic beverages on at least one occasion. In addition, 70% of eleventh grade students had taken at least one drink of alcoholic beverages during their lifetime through the influence of friends and family members (Castillo, 2008). A two- wave longitudinal study conducted in Netherlands where data was collected using the questionnaire filled by 537 adolescents showed that alcohol availability at home was the only parenting factor predicting an increase in alcohol intake among the adolescents (Regina, Dike, Raymond & Vermulst, 2011), but this study sought to find out other social behaviours exhibited by these adolescents apart from alcohol intake.

Teens, whose parents engaged in risky behaviours which included drinking, smoking and not using safety belts while driving, were likely to engage in early and unsafe sexual behaviours as shown in a research done in the U.S. In the research 38% of boys and girls in grades 7-12 had had sexual intercourse (Wilder & Watt, 2002). Family alcohol abuse increases the chance of teens engaging in pre-marital sex due to alcohol making the families to be dysfunctional and hence weakening parenting (Kirby & Lepore, 2007). The findings showed that there was a correlation between parental alcohol abuse and premarital sex among the teenagers. Alcohol abuse has had a negative impact on the family in Kenya; in a study done in Kangemi where by majority (70.8%) initiated taking alcohol at the age between 11-20 years and 24.2% were influenced by the family (NACADA, 2011). Another study done among the students of Nairobi University, the results showed that 5.3% were also introduced to drinking by the parents; in fact 10.1% took alcohol at home. Though these were university students they passed through secondary school and its where they first tasted alcohol as the study confirms that the age of first drink was 16 years and above (Hassan, 2010).

A study conducted in Laikipia County on the parental behaviour disorder found out from the perceptions of their class teachers that the pupils who came from alcoholic backgrounds lacked concentration in class, were untidy and portrayed antisocial behaviours such as bullying, isolation and truancy. The study used quantitative approach where data was collected using questionnaires. Descriptive research design was used and the targeted was primary school pupils in class 6 & 7, head teachers and class teachers. (Kamau, 2017). The research in Elgeyo- Marakwet was different by the fact that it was targeting secondary school students and was using both qualitative and quantitative approaches. According to a study done by Sirera and Mwenje (2014) on the perceptions of parents on alcohol abuse and parental guidance of children in Butula Division, Busia County and Mathira division, Nyeri County, The result showed 67% and 46% of the parents in Butula and Mathira respectively daily abused alcohol hence rarely spent time with their children, 56% of these parents rarely got home before their children were asleep. Furthermore, 44% of them rarely communicated with their children, 56% rarely worked with them during the weekends and holidays and 20% were always violent to their families. The study was done in the rural setting and data was collected using questionnaires and focus group discussions from parents. It was therefore evident that parental alcohol abuse negatively affected the children.

Birech, Kabiru, Misaro & Kariuki, (2013) in a study conducted in Nandi showed that due to alcohol abuse within the family, the children who were affected did not do well in school and also had problems interacting with other children. Some ended up being violent and aggressive hence increasing their chances of being expelled or dropping out from school (Head, 2007). Alcohol abuse by parents therefore affects their children not only academically but also socially. A study conducted in Vihiga County showed that the drugs mostly abused by students in public secondary schools were alcohol, cigarettes, miraa and marijuana. The study established that one of the causes of drug abuse among students in public secondary schools was having parents or other family members who abused drugs and drugs being available. In the study, 45% of the students took drugs because a parent or a relative or someone they admired used drugs, 38% reported drugs being readily available such as having the drugs at home or parents dealing in drugs business (Chebukaka, 2014).

One of the factors that contributed to students' alcohol abuse in Mwimbi Division, Kenya was their backgrounds, of those whose homes consumed alcohol and 70.3% were more likely to consume alcohol than their counterparts. This could have been attributed to familiarity with alcohol by the students who grew up in alcoholic homes and surroundings. For such students, alcohol consumption was part of life and was conceptualized as any other drink like water, tea or soda (Munyua, Nyaga & Oundo, 2014). A study done in Kenya found out that more than 22.7% of the primary school children had taken alcohol, a figure that rose to 57.9% in secondary schools and to 68% among university students (Siringi, 2003).

The abuse of alcohol, in many cases led to the breakdown of families through divorce, separation or dissolution. Fights between husbands and wives became frequent leading to frequent use of violence by one of the spouse against the other. Family members exposed their children to violence and they rarely or never spent time together hence children lacked parental supervision. Children from these families also faced social isolation (Hutchinson, 2014). Therefore, children from homes where alcohol was abused were socialised to be violent. According to Simatwa, Odhong Juma, & Choka (2014), home and school were critical in regard to the abuse of drugs by the adolescents. Measures needed to be put in place against the access of drugs in immediate environments. According to Ndirangu (2001), parents were first teachers and counsellors long before the students joined formal schools and peer groups and many of the young people who took drugs came from families where members of the family took drugs. As much as advertisements expose adolescents to social models of drinking, research suggests that young people were likely to be influenced even more strongly by their peers, parents and other adults with whom they had a close relationship rather than by people they did not know and perhaps did not

care about (Martino, Kumar & Seymour, 2006). This shows that the home in comparison to the other agents of socialisation played a greater role in drug abuse of which alcohol is one of the drugs commonly abused.

A study carried out in Nakuru Sub-County found out that the behaviours of those students who abused substances include; carelessness and neglect of one's personal hygiene, general irresponsibility, high irritability, and hostility to close friends, dirty and tattered clothes and normally being in one clothe for many days. These behaviours, he noted presented many challenges to managers of schools especially boarding secondary schools (Nyaga, 2001). From the studies it was evident that the researchers were majorly interested with the abuse alcohol by students and how it affected them but this study sought to investigate if their drinking might have been as a result of alcohol abuse by their parents who were their adult socialisers.

### 3. Research Elaboration

#### Research design

The study adopted concurrent triangulation mixed method research design. In this design data collection is done in one phase. Qualitative and quantitative are collected and analysed separately yet concurrently (Creswell, 2013). This method provides well-validated and substantiated findings. This study was conducted in Keiyo North sub-county in Elgeyo-Marakwet County. The county has an area of approximately 557.40 square kilometres and currently the population is approximately 73,715 (IEBC, 2012). The county government had also raised concern due to the bars which are on the rise; their number was noted to be higher than the number of primary schools in the sub-county (Cheruiyot, 2014).

#### Target Population

This study targeted students whose parents abused alcohol, as the researcher was purposely targeting this group of students. Guidance and counselling teachers were also targeted to give their perception on parental alcohol abuse and students social behaviours. The deputy principals were also targeted because they are in charge of discipline in school. These participants were from all the 22 public secondary schools in Keiyo North Sub-County of Elgeyo-Marakwet County.

#### Sampling Techniques and Sample Size

According to Mugenda (2003) 30% of the target population is representative enough to allow for generalization. Seven schools were therefore selected for the study which represents 30% of the 22 public schools in Keiyo North Sub-County. Stratified random sampling was used to select a sample of 3 boarding schools and 4 mixed day schools. This was done by stratifying the schools into two, boarding schools and mixed day schools, the study then selected 3 boarding and 4 mixed day schools in proportion to the number of schools by use of simple random sampling. Boarding schools, in consideration of gender were further stratified into girls boarding, boys boarding and mixed boarding and one school from each strata was selected. All the forms were considered.

In each of the seven schools sampled, purposive sampling was used to select five willing students whose parents abused alcohol making a total of 35 sampled students for the study. This was done through the guidance of the class teachers since they had background information of students whose parents abused alcohol. It was also assumed that they would provide the required information. Purposive sampling was chosen because the study targeted students whose families' abuse alcohol. All the seven deputy principals and seven guidance and counselling teachers were selected purposively because their schools were participating. This made a sample of 35 students, 7 deputy principals and 7 guidance and counselling teachers resulting to a sample size of 49.

**Table 1. Sample Size**

Strata	Number of Schools	Schools Sampled	Number of Students per School	Number of Teachers per School
Boarding	8	3	15	6
Mixed day	14	4	20	8
<b>TOTAL</b>	<b>22</b>	<b>7</b>	<b>35</b>	<b>14</b>

*Source: Field study, 2016*

#### Data Collection Instruments

Two instruments were used given that one instrument is not sufficient to make valid and reliable conclusions. A questionnaire is a research instrument which consists of a series of questions used for gathering information from respondents. In this study questionnaires were used to collect data from the students and the guidance and counselling teachers. They contained both closed-ended and open-ended questions. The need for open-ended questions was to get more information. Each item in the questionnaire was developed to address objective and research questions of the study noted by Mugenda (2003) This was aimed at obtaining general information on the perceptions of teachers and students on the extent parental alcohol abuse, their perceptions on parental alcohol abuse and the social behaviour of the students, the challenges faced by schools and the measures that have been taken by these schools

to assist students. Interviews are oral questions that are used to obtain data. The study used structured form of interview where all the participants were asked similar questions. Interview schedules were used to obtain information from the deputy principals.

### **Piloting the Research Instruments**

Before carrying out the actual study, a pilot study was conducted in two schools, a boarding and a mixed day school in the neighbouring Keiyo South sub-county which has the same characteristics as Keiyo North sub-county. This was meant to establish whether the instruments are clear and to test if they generated relevant and adequate information needed for the study. The sample consisted of 10 affected students, 2 deputy principals and 2 guidance and counselling teachers. Piloting helped the researcher to reframe some of the questions that the students could not understand. One of the questions on the guidance and counselling questionnaire brought out different meanings hence it also had to be change.

### **Validity and Reliability of Research Instruments**

#### ***Validity***

Validity has to do with accuracy and to what degree. The research instruments which include the questionnaire and the interview schedule were designed and developed with ideas from the supervisors, other experts from the school of education, master of philosophy students and teachers from secondary schools. To develop content validity a review of the student and guidance and counselling teachers was conducted using Content Validity Index (CVI) by experts in the department. The expert rated 20 items (students questionnaire) and 22 items (guidance and counselling questionnaire) based on relevance, clarity, simplicity and ambiguity on the four points scale. Content validity index (CVI) for each item was determined. Of the 20 items in the students' questionnaire, those with CVI over 0.75 remained and the rest were discarded resulted to 15 item instruments. In addition of the 22 items in the guidance and counselling questionnaire 13 had a CVI over 0.75. This rigorous process helped the researcher ascertain whether the items in the research instrument would illicit relevant information for the study.

#### ***Reliability***

Reliability is when a researcher uses certain procedures to check for the accuracy of the research findings (Creswell, 2014). The researcher used the test re-test method and where the responses seemed to vary greatly, necessary adjustments were made. The instruments were administered to two different schools in Keiyo South sub-county. The researcher counter checked the responses together with those from respondents to ensure similarities in responses. After the administration of the test retest method, the researcher scored the responses. The researcher re-administered the instruments after two weeks to the same respondents and then scored the results. The researcher then calculated the coefficient of the two scores and established the reliability of the research instruments using Cronbach alpha. Since the coefficient of correlation obtained was 0.8 the research instruments were considered reliable for the study. This is acceptable as Cozby, (2003) puts that, for most measures the correlation should be at least 0.80. Qualitative data from open ended items in the questionnaire and interviews were organised and identification made on different components, patterns and themes were sought to enable explanation.

### **The Data Collection Process**

A research permit was obtained from National Council for Science and Technology Innovation (NACOSTI) and then the Ministry of Education of Elgeyo-Marakwet County. The researcher then notified the head teachers of the selected schools of the intention to conduct the study and on the intended dates. The researcher delivered and administered the questionnaires personally to the students and the guidance and counselling teachers of the various schools. The researcher carried out interviews for the deputy principals in selected schools by asking the structured questions and then recording down the responses.

#### **Data Analysis**

Quantitative data from the questionnaires were sorted out to check clarity. Tallying for closed-ended questions was done and analyzed using descriptive statistics which included frequencies and percentages. This data was presented using frequency tables, summary graphs and pie charts. Quantitative data run by the Statistical Package for the Social Sciences (SPSS). Qualitative data from the interview schedule for deputy head teachers and the open ended items in the questionnaire was analysed using content analysis procedures. The data was organised based on different components, patterns and themes to enable explanation. This involved the sorting of recorded data for completeness followed by coding according to the emerging themes. The researcher transcribed the emerging themes and gave the interpretations. Presentations were done in narrative form.

#### 4. Results

The table 2 below shows the perceptions of students on the social behaviour of students whose parents abuse alcohol

**Table 2: The Perceptions of Students on the Social Behaviour of Students’ whose Parents’ Abused Alcohol.**

Response	SD	D	N	A	SA
I sometimes spent little time with my parents or guardian when they are drunk	8	2	5	16	2
I sometimes spent little time with my friends due to my parents / guardians drinking.	6	4	7	13	3
I thought of engaging / engage in premarital sex	15	11	4	0	3
I found myself fighting / wanting to fight with others in case of a disagreement	11	4	0	15	3
I sometimes found myself violent	13	4	6	4	6
I sometimes thought of taking / take alcohol	20	10	0	0	3

*Source: Field Study, 2016*

Results in table 2 shows that majority of the students 16(48.9%) agreed and 2 (6.1%) strongly agreed that they spend little time with their parents or guardian when they were drunk while a few 8(24.2%) strongly disagreed and 2(6.1%) disagreed that they sometimes spend little time with their parents or guardian when they were drunk. It is worth noting that 5(15.2%) of the participants were undecided showing that there is likely hood that they spend or did not spend with their parents. The findings further revealed that majority of the participants did not spend with friends due to their parents/guardians drinking with the data showing 13(39.4%) and 3(9.1%) agreeing and strongly agreeing respectively. A few of the participant 6(18.2%) and 4(12.1%) showed that they sometimes spent time with their friends.

Responses from the interview agreed with this. One deputy principal indicated thus...

“Students whose parents abused alcohol had a poor interaction with other students, they also did not participate much in class and their consultation with teachers was very low, because they thought that they might be exposed, this is totally different with those students whose parents were seen as not engaged in drinking, as they seemed to interact more”.

Another deputy principal said that...

“During school functions such as academic days, annual general meetings and thanks giving days, students whose parents’ abused alcohol tended to withdraw themselves even wishing that their parents did not come so as to avoid embarrassments. When you see your mum drunk in such a public function chances are that as a student you would not wish to be associated with her.”

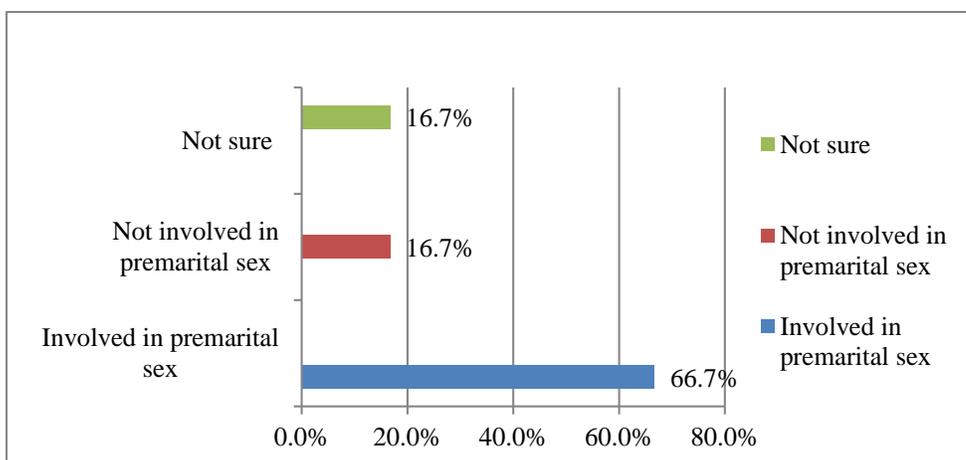
These findings are in agreement with the study by Sirera and Mwenje ( 2014) on the perceptions of parents on alcohol abuse and parental guidance of children in Butula Division, Busia County and Mathira division, Nyeri County, The result showed 67% and 46% of the parents in Butula and Mathira respectively daily abused alcohol hence rarely spent time with their children,56% of these parents rarely got home before their children were asleep. Furthermore, 44% of them rarely communicated with their children and 20% were always violent to their families. Though other studies have indicated advertisements being a social models of drinking to teenagers, research suggests that young people are likely to be influenced even more strongly by their peers, parents and other adults with whom they have a close relationship than by people they do not know and perhaps do not care about (Martino, Kumar, Seymour & Dolan, 2006)

The study further sought to find out if students thought of engaging/engage themselves in premarital sex as a result of their parents/guardian engagement in alcohol abuse. It was useful to point out that, very few students 3 thought of engaging in premarital sex while a majority of them 26 responded by saying that they could not engage in pre-marital sex because of their parents/guardian engagement in alcohol abuse. This though contradicts with the deputy principals who reported that most of the students engage in premarital sex. One deputy principal noted that “because of the vulgar language that their parents used some of the students tended to start thinking about premarital sex” Kirby & Lepore (2007) stated that family alcohol abuse increases the chances of teens engaging in pre-marital sex due to alcohol making the families to be dysfunctional and hence weakening parenting

Other participants said thus....

“When parents come home drunken most of them are not conscious of their action and words thereby engaging in sex without taking any precaution. Parents are bound to speak or utter sex related rhetoric when viewing content related to sex thus raising the curiosity of the children”

The guidance and counseling teachers were also in agreement with the Deputies suggesting that majority of the students were engaged in premarital sex as a result of their parents’ engaging in alcohol abuse. The findings are shown in figure 1.



Source: Field Study, 2016

Figure 1: Involvement in Premarital Sex

Findings in figure 1 shows that most of the students 4 (66.7%) were involved in premarital sex, 1 (16.7%) not involved while 1 (16.7%) of the Guidance and Counselling teachers were not sure if the students especially boys were involved in premarital sex or not. Some of the deputy principals had noted that sometimes when these students are taken home from school due to pregnancies, their parents were found to be too drunk for them to handle the situation. One of the deputy principal had this to say....

“A girl from our school was found to be pregnant and we had to take her home. On reaching their home they found her mother who was single, drunk. She was not even willing to receive them till they sought assistance from the extended family and the chief.”

These finding concur with Wilder & Watt (2002) research which concluded that teens whose parents engage in risky behaviours which include drinking, smoking and not using safety belts while driving, are likely to engage in early and unsafe sexual behaviours. In the research 38% of boys and girls in grades 7-12 have had sexual intercourse.

Another social behavior that was looked at was about participants finding fighting /wanting to fight with others in case of a disagreement. This was looked at from a point of view that most alcoholics tend to fight or be violent. Adolescents have unique social and emotional characteristics and undergo physical and cognitive changes that can affect their social and emotional development. Some of these characteristics and changes can increase the likelihood that youth will find themselves in dangerous and risky situations when using alcohol at a time when they are particularly vulnerable to negative outcomes from drinking. Understanding adolescents’ social and emotional development can provide greater insight into underage drinking, its dangers, and ways to prevent it. As adolescents struggle for independence and create a personal identity, relationships with their family and peers change. Peer groups are more important to youth than their families, and peers often provide some of the same functions that family did earlier.

Investigations conducted revealed that few students were willing to engage in violent behavior, 4 and 6 agreeing and strongly agreeing respectively, whilst majority of them 13 and 4 were strongly disagreeing and disagreeing respectively that they were not willing to engage in violent activities. As related to the study this implies that parental alcohol abuse may not be the sole factor that determines violent behavior among students but there may be other influence from outside alcohol. Child Family Community Australia, (2015) found out that some of these parents are prone to violence hence the children regularly witness violence and aggression.

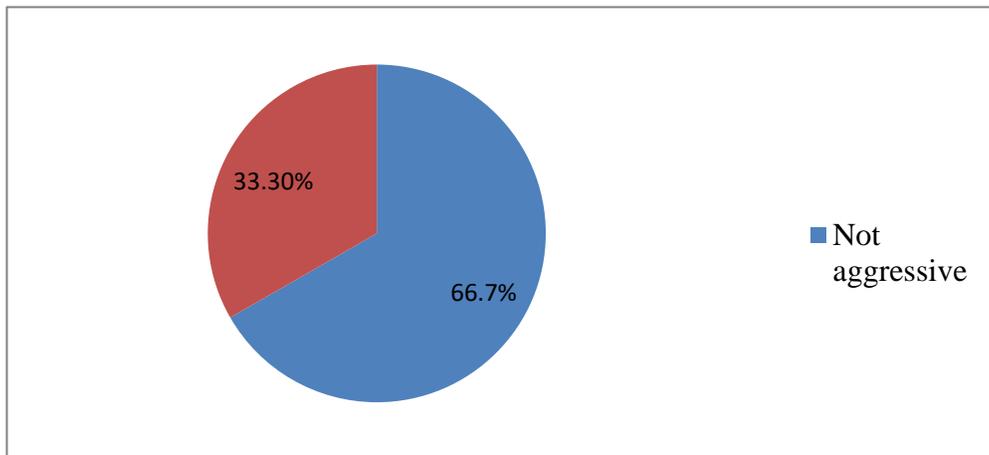
The study sought to look at whether the students took alcohol as a result of their parents/guardians engagement in alcohol alcohol. This was thought after taking into account the statistics revealed during the annual Kenya Secondary Schools Heads Association in 2004 that said 33.3% students took alcohol.

Given that the majority of the denied, this made the researcher concur with the responses of the guidance and counseling teachers who said that peer influence and technology had a great impact on whether students think about alcohol or not. One response read as follows,

“Most students were likely to think about experimenting on alcohol as a result of peer pressure, technologies like face book & WhatsApp and school work related pressure that can make students engage in drinking rather than seeing their parents drinking.”

Though the findings revealed that majority of the students sampled 30 did not think of alcohol it is still a concern that there are still a few 3 that thought of engaging in drinking, it is even more worrying as one of the participant interviewed indicated that some of the students who drunk sourced alcohol from their parent’s stock at home. It is important to also note that the national statistics in Kenya show that 57.9 %, of secondary students engage in drinking alcohol (Siringi, 2003). This is further supported by research findings in USA that stated that 70% of eleventh grade students have had at least one drink of alcoholic beverages during their lifetime through the influence of friends and family members (Castillo, 2008)

Teachers concerned with guidance and counseling highlighted student’s aggressiveness as another social behavior that emanates from parents/guardian alcohol abuse the results are shown in figure 4.6.



Source: Field Study, 2016

Figure 2: Student's Aggressiveness

Figure 2 shows that students of parents who abused alcohol were not aggressive as represented by a frequency of 4 (66.7%) while 2 (33.3%) responded to students being aggressive. This agrees with the response in Table 2 suggesting that majority of the students were not exhibiting violent behavior. The 33.3 % of the students who demonstrated having aggression stems from the verity that their parents drink and therefore become aggressive as concluded in the studies done by Schuckit (2005) that, alcohol affects mood in a variety of ways and can make people feel sad, happy or aggressive.

These findings on perceptions of parental alcohol abuse and students’ social behaviour concurs with the study conducted in Laikipia County on the parental behaviour disorder found out from the perceptions of their class teachers that the pupils who came from alcoholic backgrounds lacked concentration in class, were untidy and potrayed antisocial behaviours such as bullying, isolation and truacy (Kamau, 2017).

#### 4.1 Rating in terms of personal grooming

Looking at the personal grooming of students of parents who abused alcohol, deputy principals perceived that majority of the students whose parents abuse alcohol were poorly groomed. Only a few students were fairly groomed. Some of the emerging themes included the following

Participant's response...

"During inspection in the hostel it's normal to always find poorly groomed students who come from families whose parents and guardians abuse alcohol. Many at times these students lack personal items that they can use such as soaps, pads and body oil. It's suspected that as the parents engage in abuse they tend to procrastinate or forget all together their obligation"

Another participant responded thus...

"Many students from alcoholic family backgrounds are not given the proper supervisory role to monitor their cleanliness thus they come to school with that mentality"

Therefore, as reported by Nyaga (2001) people (parents/guardians) who drunk were careless and neglected personal hygiene and were always either in tattered clothes or being in one cloth for many days this therefore had an influence on their children.

Another social issue that was of much concern to both the guidance and counseling teachers and deputy principals was the issue of 'sponsors' and the girl child. A sponsor is either a man or woman who offer financial supports to the student in return of sexual favor. The study found out that most of these sponsors were Matatu conductors and drivers, motorbike owners referred to as 'boda boda' who offered them free rides to school. One of the guidance and counseling teacher indicated that some of the students have fallen victims of 'sponsors' because their alcoholic parents were not providing for them. In one of the schools the deputy Principal noted that one of the girls was afraid to go home because she had spent a man's money and she therefore was afraid of the consequences.

#### 5. Conclusion

Parental alcohol abuse was perceived as a contributor to the antisocial behaviour of the students in various ways such as students wanting to fight, aggression, isolation, poor grooming, taking of alcohol and involvement in pre-marital sex.

The responses showed that majority of the students whose parents abused alcohol 16 (46.5%) spent little time with their parents, 15 (45.5%) of the students fight or feel like fighting in case of a disagreement. It's important to point that though majority of the students felt like fighting 11(33.3%) of them were not violent. Further findings revealed that majority of the students 26 did not think of engaging in premarital sex. Personal grooming was wanting on students whose parents engaged in drinking. These students were also found breaking school rules in most occasions.

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# Impacts of crude oil exploration and production on environment and its implications on human health: South Sudan Review

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## Abstract

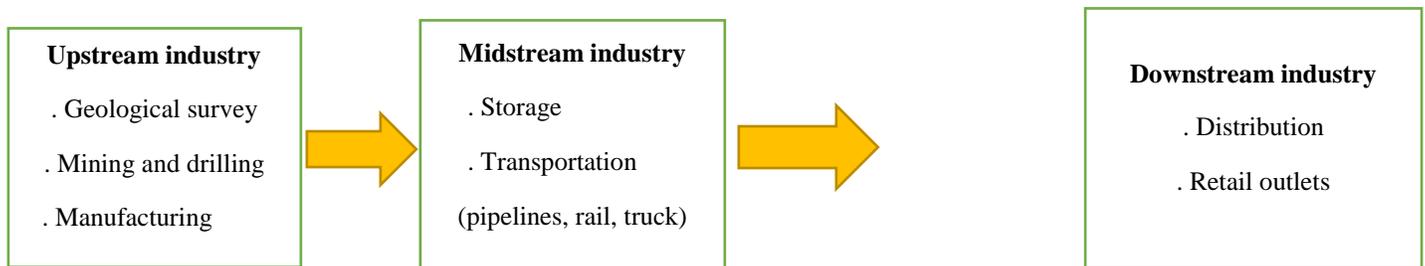
Crude oil contamination of the environment associated with exploration and production operations, is a common feature in oil producing nations around the world, especially in a developing country including South Sudan. Apart from this, the country has been suffered from civil war for long period of time which severely affected the oil production areas and oil facilities such as pipelines ware out hence causing oil linkages and spill, therefore it has resulted to significant contamination of the total environment (air,soil,water,biota) and negatively impacted human health. The contamination occurs during all crude oil production and exploration processes and negatively affect the environment which in turn reflect risks to human health through food chain such as apparition of heavy metals ;Lead, and Barium in hair of some of the South Sudanese people.This review examines some the environmental effects related to crude oil exploration and production in South Sudan and its implications to human health.It has further highlighted some recommendations that may help sustainable practices for the exploration and production of this resource which may yield in less negative impact for both environment and human health.

**Key words: Crude oil, Exploration, Environment, human health , implications**

## 1. Introduction

Oil is the lifeline of the South Sudan economy now and over the medium term.[1].According to the World Bank (2008) South Sudan is one of the newest significant oil producing countries in the World, and the third largest oil producer in Sub-Saharan Africa after Nigeria and Angola. As a result of oil exploitation, the structure of the Sudanese economy has shifted from being being predominantly reliant on agriculture to oil. It accounted for about half of the country's GDP, and most of the country's exports (about 97 %) and government's revenue (about 98 %) in the period 2008-2011[2]. Oil production of 360 thousand barrels per day in 2011 resulted in high export earnings, high government revenues and an income per capita level of a lower middle-income country. Natural resources especially hydrocarbons have become one of the most important resources of energy for mankind. However, the process of extraction of these natural resources is very complicated and most of the time the pollutant's products that accompany the process of oil exploration play a vital role to declare an inconsistency in the ecosystem[3]. This means an increase in the probability of environmental risk and as a result a widespread of hazardous material in the aquatic environment. An aquatic environment can be considered as one of the environments that are subjected more to the contamination by crude oil. This seems to be a big issue due to the spillage of some crude oil into the water. This spillage is due to the leakage which accompanies the process of oil exploration and transportation [4]. As a result, the aquatic environment becomes contaminated region. This situation is a big threat for the evolution of macrophyte, and for the life support balance of living organisms in that environment. Air pollution also bear a great concern with crude oil exploration and production and both mentioned reflect serious human health effects with high rate. Therefore, with world's

increasing dependency on the production of crude oil products, crude oil water contamination problem becomes the major factor that can alter the natural consistency of the outstanding life source in a particular environment [5]. Therefore, in order to decrease or remedied these effects, oil companies must adopt proper measure that are helpful to minimize the contamination rate to the normal wedge. This paper reviewed the impacts caused by crude oil exploration and production on environment (water, soil, aquatic plants and animals and its implications to human health. Oil is currently the backbone of South Sudan’s economy. Available data indicate that oil alone accounts for 98 per cent of the government budget and in the recent past, contributed between 60 and 80 per cent to GDP[6] [6]. In 2011, the petroleum sector accounted for 61.3 per cent of GDP, but that proportion declined to 7.4 per cent in 2012 and 14.7 per cent in 2013. The massive decrease in the share of petroleum in GDP in 2012 was due to the shutdown of oil production, which led to a decline in production in that year and a decline of about 47 per cent in GDP [6]. In June 2014, oil prices dipped from \$112 to \$30 per barrel. South Sudan currently produces 130,000 barrels of crude oil per day, down from 350,000 per day before the war [7] In the foreseeable future, oil will remain a strong driver of investments in the economy. However, it is not a renewable resource and already declining crude oil reserves point to an urgent need for government investment in other revenue earning sectors [8]. Crude oil exploration in South Sudan is carried out mainly in the central flood- plains of Jonglei, Lakes and Upper Nile, which are also endowed with rich terrestrial and aquatic natural resources. The oil blocks include part of Block 4, most of Block 5A, Block 5B.). The petroleum industry is traditionally divided into three sectors: upstream, midstream and downstream. In South Sudan, the upstream segment includes exploration activities, field development, and oil and gas production activities. The downstream sector, which became operational in 2012, comprises activities that refine the crude oil, and the marketing, sale and distribution of any ensuing products. The midstream sector links the upstream and downstream segments, and includes activities and facilities that enable processing, storage and transportation of products, such as pipelines and other facilities.



The Ministry of Petroleum oversees this sector in South Sudan. The state oil company is the Nile Petroleum Corporation (Nile pet), established in 2003 and incorporated in June 2009 under the New (South)Sudan Companies Act 2003 by the Ministry of Legal Affairs and Constitutional Development. It has joint ventures with the Nile Delta Petroleum Company Limited (Nile Delta), Diets Mann Nile, East pet Ltd and SIPET[9] . Crude petroleum is produced by joint ventures of state-owned companies from China, India, Malaysia and South Sudan. The government, through Nile pet, holds no less than an 8 per cent share in any of these petroleum joint ventures, [10].

Table 1. STRUCTURE OF THE OIL INDUSTRY IN SOUTH SUDAN, 2013

Commodity	Major operating companies and major equity owners	Location of main facility	Annual capacity [bpd]
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Petroleum crude	PETRODAR Operating Company (PDOC) China National Petroleum Corp (CNPC) 41% Petronas Carigali Overseas Shd.Bhd., 40%: Nile Petroleum Corp (Nile pet), 8%: Nile Petroleum Corp., 6%: Tri-Ocean Energy,5%	Blocks and 7 in Upper Nile	91500 First oil production was in 2001 and the average current production is 163 bpd
Petroleum crude	Greater Nile Petroleum Operating Co China National Petroleum Corp (CNPC) 41% Petronas Carigali Overseas Shd.Bhd., 30% ONGC Vides LTD 25 %: Nile Petroleum Corp (Nile pet),5%	Blocks,1,2, and 4 in Unit	32 200
Petroleum crude	White Nile Operating Company Co Petronas Carigali White Nile Petroleum Petronas Co. Petronas Carigali	Block 5A in Unit	4,400

Source:(Yager,2015)

Since April 2016, the petroleum sector regulator is the Ministry of Petroleum. The Ministry is guided by the Petroleum Act 2012 and the Mining Act 2012, as well as the Mineral Title Regulations 2015 and other bills that are currently being drafted to implement its mandate [11]. e. The Ministry is assisted in its duties by three institutions: The National Petroleum and Gas Commission, the National Petroleum and Gas Corporation, and the Petroleum Exploration and Production Authority. The National Petroleum and Gas Commission is the policy-making body for the petroleum sector. It is also in charge of petroleum resources management and coordinates all petroleum stakeholders at national and state levels, from the private sector and including non-governmental organizations. The National Petroleum and Gas Corporation is a commercial company limited by shares established by the government. It is to be the chief policy making and supervisory body in the upstream, midstream and own stream segments of the sector. The National Petroleum and Gas Corporation handles petroleum agreements for the government while the Ministry of Petroleum is responsible for the management of the petroleum sector. The Petroleum Exploration and Production Authority is to oversee day-to-day activities concerning petroleum operations and advise the Ministry.[12]

## 2.Impacts of Crude Oil and Natural Gas Production on the Environment

Environmental impacts that occur during production of crude oil and natural gas would mostly occur from long-term habitat change within the oil and gas field, production activities (including facility component maintenance or replacement), waste management (e.g produced water), noise (e.g from well operations, compressor or pump stations, flare stack, vehicle and equipment), the presence of workers and potential spills [13]. These activities could potentially impact on the resources as explained below:

### 2.1. Noise

The main sources of noise during the production of crude oil and natural gas would include compressor and pumping stations, producing wells (including occasional flaring), and vehicle traffic. Compressor stations produce noise levels between 64 and 86 dBA at the station to between 58 and 75 dBA at about 1 mile (1.6 kilometers) from the station [14]. The primary impacts from noise would be localized disturbance to wildlife, recreationists, and residents. Noise associated with cavitation is a major concern for landowners, livestock, and wildlife [15]

## **2.2. Soil**

Plants germinate, develop and grow in soil medium where water, air and nutrient resources supply plants for healthy growth for productive and profitable agriculture. Frequent crude-oil spillage on agricultural soils, and the consequent fouling effect on all forms of life, render the soil (especially the biologically active surface layer) toxic and unproductive. The oil reduces the soil's fertility such that most of the essential nutrients are no longer available for plant and crop utilization [16]. The enormity of toxicity by oil spillage on crop performance is exemplified in mangrove vegetation, which has been dying off in recent times [17]. Spilled crude-oil which is denser than water, reduces and restricts permeability: organic hydrocarbons which fill the soil pores expel water and air, thus depriving the plant roots the much-needed water and air [18]. Soil properties involved in soil-plant-water relationship are degradable and include texture, infiltration, hydraulic conductivity, moisture content and density, which affect root and leaf development and plant growth and yield [19, 20]. Overall, oil spillage affected crop yield and farm income, and by extension, the social and economic livelihoods of farming communities [20].

## **2.3. Air Quality**

The primary emission sources during the production of crude oil and natural gas would include compressor and pumping station operations, vehicle traffic, production well operations, separation of oil and gas phases, and on-site storage of crude oil. Emissions would include volatile organic compound (VOCs), nitrogen oxides, sulfur dioxide, carbon monoxide, benzene, toluene, ethylbenzene, xylenes, polycyclic aromatic hydrocarbons (PAHs), hydrogen sulfide, particulates, ozone, and methane [21]. Venting or flaring of natural gas (methane) may occur during oil production, well testing, oil and gas processing, cavitation, well leaks, and pipeline maintenance operations. Methane is a major greenhouse gas. Air pollution during oil and gas production may cause health effects and reduce visibility.

## **2.4. Wildlife ecosystem**

The adverse impacts to ecological resources during production of crude oil and natural gas could occur from: disturbance of wildlife from noise and human activity; exposure of biota to contaminants; and mortality of biota from colliding with above ground facilities or vehicles. The presence of production wells, ancillary facilities and access road reduces the habitat quality, disturbs the biota and thus affects ecological resources [22]. The presence of an oil or gas field could also interfere with migratory and other behaviors of some wildlife. Discharge of produced water inappropriately onto soil or into surface water bodies can result in salinity levels too high to sustain plant growth. Wildlife is always prone to contact with petroleum-based products and other contaminants in reserve pits and water management facilities [23]. They can become entrapped in the oil and drown, ingest toxic quantities of oil by preening (birds) or licking their fur (mammals); or succumb to cold stress if the oil damages the insulation provided by feathers or fur. In locations where naturally occurring radioactive material (NORM)-bearing produced water and solid wastes are generated, mismanagement of these wastes can result in radiological contamination of soils or surface water bodies [24]

## **2.5. Plants**

Seed germinations seem to be affected by oil at least in two ways. At high level of crude oil pollution, seed germination is prevented probably by oil soaking through the outer integument of the seeds. At low level of crude oil pollution, seed germination is retarded by the presence of oil [25]. The effect of crude oil on plant is one that is of great concern as it causes damage to different parts of the plant that are vital for its well-being and survival and hence obstructs development and growth.[26] showed that the leaves of plants affected by oil tended to dehydrate and show a general sign of chlorosis, indicating water deficiency. The reduction of leaf area may be due to dehydration. [27]The study agreed with the work of who found that reduction in photosynthetic rate resulted in the decreased rate of growth, which led to the reduction of leaf sizes.[28]observed that the volatile fraction of oil had a high wetting capacity and penetrating power and when in contact with seed, the oil would enter the seed coat and kill the embryo readily, which will in turn, cause reduction in percent germination.[25] found that the significant reduction in final germination percentage of all the species may be due to toxic effects of the crude oil on the seed and poor aeration of the soil. From various experiments, it has been elucidated that crude oil spillage would affect plants in the following ways: Inhibit the germination of plants [29]. Delay germination by inducing stress, which prolongs lag phase[30] [Inhibit the uptake of water and nutrients by the root of the plant, hence causing deficiency to other parts as the leaves.[31] Affects regeneration of stumps [32].Affects anatomical features of leaves[33].Causes cellular and stomatal abnormalities.[34]. Disruption of the plant water balance, which indirectly influences plant metabolism[35].Causes root stress, which reduces leaf growth via stomata conductance[36]. Causes chlorosis 'of leaves [37]. Enlargement of cells in various 'tissues due to oxygen starvation were cells coalesce forming large cells in tissues[38]

## 2.6. Impact on water quality

When oil is explored in water scarce areas the water resources become stressed. Off-shore oil exploration creates risks for the marine life while oil distribution and transportation will generate increasing risk for the ecology in case of leakages or accidents[39]. Accidents, leakages and spills are realities in oil drilling, shale gas exploration, pipeline transportation as well as in oil tanker transportation [40].A serious threat posed by oil-related pollution is the impact on both surface and underground waters. When oil spills occur or when there is an effluent discharge, it seeps into the ground and becomes mixed in the underground water system[41].It has been found that polluted underground water takes many years before it can be remedied. Yet this underground water moves into streams and wells which are the only sources of local water supply in the community which results in the rise of water-borne diseases. This has affected the traditional relationship of the people with water in the oil-bearing enclaves. There is a perceptible fear that rather than being the source of life, these water systems have become sources of misery, disease and death. Oil is always pumped together with water and they must be separated. There are big volumes of produced water stagnant in ponds with apparently inadequate treatment such as skimming which is less effective[42]. On another hand disposed drilled water may contain much quantity of salts and this become serious threat to the environment and aquatic ecosystem when salts concentration exceeds threshold levels. Petroleum pollutants in the African tropical region, consist of complex mixtures of both the aliphatic and aromatic hydrocarbons [43, 44]. The major pollutants in drinking water supplies fall into three general classes: petroleum hydrocarbons, halogenated hydrocarbons, and taste-and-odour compounds (which comprise of algae and bacteria). Petroleum hydrocarbons consist of the most ubiquitous pollutants and apart from polycyclic aromatic hydrocarbons (PAHs) [45] the most prevalent are the volatile organic compounds (VOCs): benzene, toluene, ethylbenzene, and xylenes (BTEX) [46, 47]. It is known that BTEX are often found in water supplies, but certainly not exclusively in groundwaters because of the widespread use of petroleum hydrocarbons and their relatively high-water solubility (130 – 1780 mg l<sup>-1</sup> at 20°C)[46]. According to Ite and Semple [48], polycyclic aromatic hydrocarbons (PAHs) containing from two to five fused aromatic rings are of serious concern because of their persistence in nature due to their lipophilic

character and electrochemical stability. It is known that PAHs are relatively recalcitrant in soils and some PAHs have been identified as carcinogens, mutagens, or teratogens.

The discharge of produced water causes serious environmental risks to both human and the natural environment and the use of technologies such as high efficient halophile oil-degrading microorganisms in biological treatment should be combine with membranes (SBR) biological treatment systems for effective management of produced water since the Dar blend (South Sudan) crude oil is acidic in nature and contain heavy metals[49], The pipelines are causing major problems from leaking leading to massive oil spills along the transportation line to the sea terminal at port Sudan requires proper maintenance and monitoring. Today, most oil producers re-inject produced water or reuse it for onshore wells (98%). However,91% of produced water from offshore wells is discharged into the ocean.[48]

## **2.7. Public health impact resulting from crude oil exploration and production**

The literature indicates that pollutants from the oil extractive industry are likely to have led to emerging health problems, including rising rates of female infertility, increases in the number of miscarriages, birth defects, and eye infections and even blindness and skin problems. Some interviewees mentioned in addition fatigue and stomach pains and an increased incidence of appendicitis [50, 51]. Noxious smells and smoke are also an issue, causing discomfort and distress to people living in or close to production oil fields [50]. Research shows that health workers in Melut and Koch indicate a positive correlation between these health issues and increased pollution from the oil industry [50]. A study in 2014 showed that 88.5 percent of the women in the oil producing areas had delivered babies with birth defects. Studies in the U.S. State of Colorado indicate a correlation with proximity to oil and gas fields; and the occurrence of congenital heart defects and neural tube defects in infants [52].The Mala oilfield shows signs of pipe leakage [53]. Oil spills from leaking pipelines, refineries or corroded or aging equipment and damage from fighting is common and has increased exposure to cancerous petrochemicals in the oil producing areas [54]. Emissions from gas flaring are also a significant environmental issue. During the mining process, gas that is produced along with the oil is flared or re-injected[55] . Although there is a law regulating against this, the emissions from gas flaring are the products of incomplete combustion. In oil field conditions, many particulates and other harmful gases are dispersed into the air. Some of these hazardous hydrocarbons include benzene, styrene, ethynyl benzene, ethynyl-methyl benzenes, toluene, xylenes, acenaphthylene, biphenyl and fluorine. Oil spill around Tharjat oil field, Unity, some of these are well known carcinogens, while others are thought to contribute to complications in foetuses[56] .The high lead and Barium concentrations in hair of the volunteers from Koch, Leer and Nyal indicate a serious exposure by this toxic metal detection of high lead concentrations in local well water samples, suggests that the contaminated water plays an essential role as a source of the lead hair results.

Apart from acidic precipitation and its negative impact, acid rain precursor gases (NO<sub>2</sub> and SO<sub>2</sub>) are part of six (6) common outdoor pollutants [57]. Inhalation of fine particulates that are fallouts from acid precursor gases have been linked to illness and premature death from heart and lung disorders such as asthma and bronchitis [58]. Nitrogen dioxide (NO<sub>2</sub>) poses a health threat itself as well as playing a major role in the formation of the photochemical pollutant ozone. Previous studies have shown that animals exposed to NO<sub>2</sub> have diminished resistance to both bacterial and viral infection [59] while children exposed to high indoor levels of NO<sub>2</sub> may become more susceptible to critical infections of the lower respiratory tract, bronchial tubes and lungs, and may develop bronchitis and chest cough with phlegm [60]. Sulphur dioxide (SO<sub>2</sub>) is a temporary irritant, though research have shown that increased levels of SO<sub>2</sub> in conjunction with particulate matter may trigger small, but measurable, temporary deficits in lung function[60] problems such as skin cancers and lesions may be linked to acid rain. Stomach ulcers could also occur, as consumption of acidic water can alter

the pH of the stomach and leach the mucous membrane of the intestinal walls, this is more so as south Sudanese depends heavily on rain water for drinking, cooking, laundry and other domestic uses.

**Table 2: Health effects of pollutants from oil and gas industry [61]**

Pollutant	Short- and Long-term health effects
benzene	May cause irritation of the skin, eyes and upper respiratory tract, and blisters on the skin. Longer term exposure may cause blood disorders, reproductive and developmental disorders and cancer.
Toluene	May cause nervous system effects, irritation of the skin, eyes, and respiratory tract, dizziness, headaches, difficulty with sleep, birth defects.
Ethylbenzene	Short-term exposure may cause throat and eye irritation, chest constriction, and dizziness. Long-term exposure may cause blood disorders.
Xylenes	Short-term exposure to high levels of mixed xylenes may cause irritation of the nose and throat, nausea, vomiting, gastric irritation, mild transient eye irritation, neurological effects. Long-term exposure to high levels of xylene may impact the nervous system.
n-Hexane	Short-term exposure to hexane can cause dizziness, giddiness, slight nausea, and a headache. Long-term exposure to hexane can cause numbness in extremities, muscular weakness, blurred vision, headaches, and fatigue.

### 3. Conclusion

The crude oil exploration and production result in more severe risks to both human and the natural environment. The Environment Bill 2014 Mining companies in some countries are required to follow environmental and rehabilitation codes, ensuring the area mined is returned to close to its original state. One of the guiding principles of the National Environment Bill 2014 is that the polluters shall be responsible for paying for the pollution that they cause, according to article 20 on the management of mineral resources[62]. Polluters will also pay a pollution tax to the Environment Fund (article 52), that will be used to finance environmental programmes at the local, state and national levels. The Environment Protection and Management Bill 2012 has provisions for Environmental Impact Assessments and Environmental Audits for projects in mining, all aimed at reducing environmental degradation and ensuring pollution control. The National Environment Policy 2012 also aims to control pollution and ensure protection of the environment and water bodies that may arise from mining activities [11]. For instance, it requires that riverbanks be protected from mining activities through the construction of embankments and to avoid sand harvesting too close to the banks and in vegetated areas. It also requires the restoration of landscapes after the conclusion of the various mineral extraction activities. Although South Sudan is endowed with abundant mineral resources and the potential for secondary and tertiary industries, the only modern industrial sector is the oil industry. The limitations to industrial development include the lack of geological exploration.

### 4. Recommendations

To remedy the oil pollution problem in South Sudan, a number of measures, both short terms and long terms, ought to be expeditiously undertaken before the situation spirals out of control. As short-term measures,

(1) The oil companies in conjunction with the government and the local communities who have been impacted by the oil pollution ought to urgently conduct environmental health awareness campaigns in the oil-rich areas to sensitize the local populations on the danger of oil contaminants in the environment. If this is properly done, the locals' exposure to environmental contaminants could be reduced, and the long term impacts of oil pollutants on the health of the people living in the oilfields could be drastically reduced.

(2) Construction of wastewater treatment plant for the produced oil wastewater, which is poorly managed, to undergo series of treatment (primary, secondary and advanced treatment processes) to meet discharge standards before released to the environment

(3) Air pollution control measures such as the use of air bag filters and electrostatic precipitators should be used to trap particulate gas matter from flaring process

(4) All the drilling chemicals that have been left decomposing in the environment need to be removed and destroyed.

(5) All the Produced Water (PW) ponds need to be fenced off so that the locals' livestock won't have access to them. In the long terms, there is a need for a complete Environmental and Social Audit (ESA) in all the South Sudan oilfields ostensibly to know the extent of environmental damage that has been caused by oil exploration dating back to the times when South Sudan and the Sudan were one country.

(6) Environmental and biological samplings need to be undertaken so that the extent of environment pollution and the exposure of the local populations to oil pollutants could be quantified regularly for proper monitoring.

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# Functional rehabilitation of edentulous mandible with cast removable partial denture: A Case report

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**Abstract-** The situation of multiple missing teeth always needs careful dealing and meticulous treatment planning. Successful treatment can be brought about with a combination of contemporary and conventional treatment planning. Implant-assisted prosthodontics has become a contemporary choice for the replacement of the natural teeth, but conventional methods of fabrication of the removable partial denture continues to be an essential prosthetic consideration in many oral reconstructions. In this case report the patient's esthetic and functional requirements were fulfilled with a cast partial denture.

**Index Terms-** removable partial denture: cast partial denture

## I. INTRODUCTION

Removable partial denture is that component of Prosthodontics, which denotes the branch of dentistry pertaining to the restoration and maintenance of oral functions, comfort, appearance, and health of the patient by the restoration of natural teeth and/or the replacement of missing teeth and craniofacial tissues with artificial substitutes. Even in countries with highly developed dental care systems these are still widely in use.<sup>1</sup>

In current practices for the management of partial tooth loss, various types of prostheses are considered and the prostheses which best meets the demands of the patient while being in harmony with the clinical condition is selected. All

types of prosthesis should meet the basic objectives of prosthodontic treatment, which includes: (1) the elimination of oral disease to the greatest extent possible; (2) the preservation of the health and relationships of the teeth and the health of oral and paraoral structures, which will enhance the removable partial denture design; and (3) the restoration of oral functions that are comfortable, esthetically pleasing, and do not interfere with the patient's speech<sup>2</sup>.

The removal partial denture has several advantages such as appearance, speech mastication, preventing the undesirable movement of the tooth, maintaining the health of the masticatory system and it also improves the distribution of the occlusal loads.

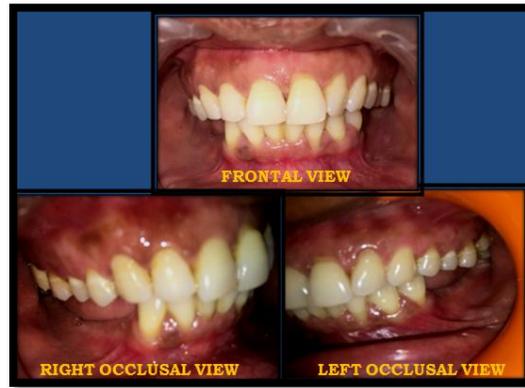
The desire to enhance chewing ability is the second most frequent reason given for seeking dental treatment, the first being esthetics.<sup>3</sup>

## II. CASE REPORT

A 37-year-old female reported with the chief complaint difficulty in mastication due to missing teeth. On clinical examination teeth present in mandibular arch were 31,32,33,34,38,41,42,43,48, in maxillary arch it was dental prosthesis wrt 17 with good periodontal condition the both the arches. The patient was partially edentulous wrt 35 36 37 44 45 46 47. In the radiographic evaluation, adequate bone support was found around all the teeth present.



**Pre-op intraoral pictures**



After the clinical examination the diagnostic casts were studied and different treatment plans, ranging from conventional removable partial dentures to implants were discussed to rehabilitate and restore function, mastication and speech. The option of implants was ruled out because of the economic reasons. The crown height and periodontal health of the abutments teeth being good enough for a removable partial denture. Treatment plan included root canal treatment of the posterior abutment teeth along with the metal crown with incorporated rest seat.

### Surveying of the primary cast

Definitive impressions were made with an addition silicone (reprosil soft putty/ regular set and reprosil LV, Dentsply, caul, Germany.) working casts were generated from diestone type IV (kalrock, kalabhai karson Pvt Ltd., Mumbai) for the fabrication of the metal crown irt to 38,48. The crowns have been waxed to full contour and milled in wax for guiding plane surface.

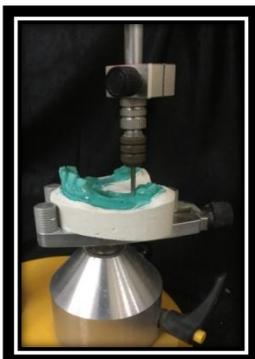


**Post root canal OPG.**

After the root canal procedure Tooth preparation was done 38,48 to receive the metal prosthesis with rest seat incorporation to evaluate the height of contour the surveying of the primary cast was done.



The mouth preparation were done in which the preparation of the rest seat on the mesial abutments were done and the final impression were made with the addition silicon material and the master cast was fabricated. The master cast was then duplicated for the wax pattern fabrication in investment material.





Impression technique: Dual stage  
Putty wash technique with  
elastomeric impression material



Surveying of the  
master cast



Metal framework



Metal framework  
trial



**Facebow transfer**



**Final prosthesis**

After the final check up, routine checkup were performed in every 3 months for 1 year for the health of the abutments. The final result satisfied the patient who produced a stable occlusion with good mastication and aesthetics.



### III. DISCUSSION:

There are several treatment options for rehabilitation of partial edentulism, including the use of conventional or implant retained fixed prosthesis. Newer technologies like CAD CAM, precision milled attachments, impression materials have played a vital role in improving the quality of RPD.<sup>4</sup>

Dr. Herman Chayes first reported the invention of attachment in the early 20th century. Removable partial denture with semiprecision or precision attachments for retention and support are also the available option for removable partial denture,<sup>5</sup> but these are most beneficial in the distal extension cases.

The stress on the abutment due to the difference in nature and behavior of the tissues supporting RPD is critical for long term success of prosthesis. The stress control on this abutment is achieved through dual impression technique, broad coverage and stable denture base, rigid design, splinting of dentition, proper selection of attachments and clasp design.

An appropriate attachment is to be selected for each individual case depending on many factors like periodontal condition, amount of space available, quality of bone support, location of abutment, angulation of the roots to occlusal plane and patient desire. Short clinical crowns prove to be the foremost contraindication to use of attachments in the construction of RPD'S.

The impact strength, compressive strength of the alloys with acrylic resins are better than the non metallic acrylic denture. Krall and others were investigate to state that the presence of removable partial denture is an important for nutritional intake and the replacement of missing teeth could help people maintain a healthy diet.

### IV. CONCLUSION:

The restoration of the partially edentulous conditions exhibits a challenging decision making in planning the treatment without compromising the patient's needs. The technique

followed in the treatment of this patient is a simple yet effective for providing an optimum treatment for an individual.

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# Effectiveness of Community Based Management of Borehole Facilities in Urban Areas: The Case of Budiriro High Density Suburb in Harare Zimbabwe; View from Human Rights Perspective

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**Abstract-** This study sought to assess the effectiveness of community based management of boreholes in urban areas using Budiriro high density suburb in Harare, Zimbabwe as a case study. The general objective was to find out the community's willingness to take ownership and capability to control or at least strongly influence the development of its water system. The study employed a mixed methods approach comprising three data collection methods namely survey questionnaire, key informant in-depth interviews and focus group discussions. The sample size was 120 research participants. The study revealed that community based management of boreholes, if introduced in Budiriro, can be very effective as the respondents expressed the community's willingness to pay, and that they had capacity and ability to manage the project, highlighting the community's experience of water related disease out-breaks that had claimed many lives in the suburb. The results of this study led to the conclusion that community based management of boreholes was the only effective way and option at Harare City Council's disposal to curb water shortages and ensure efficient water supply to the community by the community, hence it should be implemented.

**Index Terms-** community based management, water quality, disease outbreak, sanitation and hygiene

## I. INTRODUCTION

Zimbabwe, like any Sub-Saharan African country is struggling to meet the goal to reduce the number of people living without sustainable access to safe drinking water and basic sanitation (Harvey & Reed, 2004). According to the World Health Organisation (WHO) (2011) more than 12,000 deaths that occur in Zimbabwe per year are attributed to water, sanitation and hygiene (WASH) related diseases or injuries. Approximately, 40% of the total population lack access to safe water and basic sanitary facilities in the country in both rural and urban areas. The country has been facing enormous backlogs in the provision of water and sanitation services, especially in urban poor communities, which has resulted partly from the use of inappropriate service approaches, coupled with limited financial resources and rapid urbanisation and population growth (UNICEF, 2010, UNDP, 2011).

The City of Harare, like many other urban areas in Zimbabwe, is faced with serious water supply challenges (Chioreso, 2008). The current problems have been caused by rapid population growth after independence in 1980, inadequate rehabilitation and maintenance of water and wastewater treatment plants, expensive technologies and a poor institutional framework (Nhapi, 2009). This means that for Harare, the problem is two-fold, inadequate water quantity and poor water quality. Water quantity problems in Harare have been attributed to the inadequate pumping capacity at Morton Jaffrey Works and Prince Edward Water Treatment Works (Manzungu & Mabiza, 2004).

The quality of drinking water, on the other hand, has been seriously deteriorating (Nhapi et al, 2004), thereby exposing communities to waterborne diseases. Although the cholera pandemic was contained in 2009, water problems still persist as evidenced by the outbreak of typhoid and other isolated cholera cases (Manzungu, 2012).

According to UNDP (2009) the outbreak affected all ten provinces both urban and rural areas and was largely attributed to water shortages and malfunctioning sanitation systems. Burst sewer pipes underneath and above the ground started to mix with fresh water bodies, which according to UNICEF (2009), is what triggered the cholera outbreak in Chitungwiza town near Harare and Budiriro, a Harare high density suburb, which later became the epicenter of the pandemic.

A study by Zimbabwe's Ministry of Health and Child Care (2013) revealed that the Budiriro community in Harare, like other residents, experienced frequent water shortages for over 12 years due to water supply systems failure, leading to the use of alternative sources of water like deep and shallow wells at residential stands and along water streams in and around Budiriro, posing another health hazard to the community.

As an interim measure and as part of efforts to mitigate water borne and poor sanitation and hygiene related diseases, 28 boreholes fitted with a hand pumps, a facility originally meant only for rural areas, were drilled in Budiriro by UNICEF together with GAA and OXFAM. Of the 28 boreholes drilled, only 14 were functional as there was no service and repairs being done to those that were not functioning. The boreholes in question were constructed during an emergency period where the objective was to 'save lives', but three years after the cholera outbreak, the boreholes are still being used as the only safe alternative.

Early in 2012, and 2015 Budiriro high density suburb experienced yet another outbreak in the form of typhoid which was attributed to erratic water supply in high density areas, which compromised good hygiene practices (The Herald, 6 February, 2012 and 17 October 2015). There is extensive evidence according to UNICEF (2010) that newly delivered WASH services often perform effectively for a period, and then either fall into disrepair or otherwise fail to provide continuing benefits to their users. What makes the Budiriro situation even more frightening is that even though the interventions were in reaction to the cholera outbreak of 2008-9, the water and sanitation service delivery situation in the suburb has not improved since then (Manzungu, 2015).

The ownership of the boreholes was with the City of Harare who had failed to repair some broken down boreholes in the area, thereby exposing the community to diseases arising out of frequent shortages of safe and clean water due to frequent water supply systems failure in Harare (Nhapi, 2009). These problems often result from poor management of the council, which leads to erratic and dirty water supply (Manzungu, 2004). OECD (2003) pointed out that lack of an integrated framework for water facilities management and protection at national and local levels, as well as low level of public awareness are also contributing factors to disease outbreaks.

According to UNICEF (2003) some community organizations in rural and urban areas have been successful in generating the financial resources needed for the extension of services and in acting as providers of services through the operations and management of local utilities popularly known as Community Based Management (CBM). As a result Zimbabwe introduced the CBM concept in rural areas which became a successful initiative (UNICEF, 2003).

Community based management (CBM) means, as argued by Pandey and Okazali (2005), the communities are responsible and have authority and control over development of their water and sanitation facilities. Hence, this study aimed to find out the beliefs, attitude, ability and willingness of the Budiriro urban community to take ownership of the boreholes for sustainability and preservation of clean and safe drinking water for the communities that have become victims of infectious diseases like typhoid and cholera since year 2000.

Therefore this study assessed the effectiveness of community based management of WASH facilities given the failure of City of Harare to maintain the hard-to-find facility donated to save life in the community.

## II. REVIEW OF RELEVANT LITERATURE

The review of literature focused on the concept of community based management, willingness of the community to pay and take risks, the capacity to organise and make rational decisions and their willingness to take ownership and provide free labour coupled with their ability to work well in groups.

### 2.1 Community Based Approach

The concept of community based approach is not new or unique to the water and sanitation sector (McCommon, 1990). The approach has been, and is being implemented, in forestry management, fisheries and game parks. The rationale behind is

that what the communities themselves manage on their own, in their own way, using their own resources stand a greater chance of sustainability than an externally imposed approach. Community Based approaches to services is supported by several international declarations. The United Nations Decade Era (UN, Decade dossier, 1981) which recommended a shift towards sound financial practices, improved role and participation of communities and women, institutional reforms and environmental protection. The Dublin Conference Report (1992) stated that water development and management should be based on a participatory approach involving users, planners and policy makers at all levels and that water should be managed by the users and those close to it.

Community Based Management (CBM) is just a simple but attractive concept (IRC, 1993) and is about communities being involved and active in managing their own development. According to Narayan (1998). CBM is a people centred approach and is based on the fact that sustainable development and poverty elimination requires respect for human freedom and choice as well as understanding of the environment. This concept entails communities making decisions about their future and strengthening local ownership of local problems and solutions as well as designing actions to deal with identified challenges (McCommon et al., 1990).

CBM, unlike simple participation, firmly places control over the development and upkeep of the water system by the community itself (IWSD, 2005). But before that happens, communities have to be equipped and empowered to take on its changed role (from passive recipient to active manager) and at the same time the role of local authority, government and non-governmental agencies changes to development facilitator.

In Zimbabwe, like in many other African states, CBM has been accepted among policy makers, development practitioners, NGOs and the government as the route to sustainable WASH interventions.

### 2.2 Theoretical Framework

To understand complex facets of social interactions to a successful community managed project, Mayer's (1995) and Cleaver's (1996) theories are more relevant to this study as highlighted below.

#### 2.2.1 Civil Society and Social Capital Theory:

Civil society and social capital theories by Mayer (1995) and Edwards and Foley (1998) emphasize the relational aspects of community life. These theories hold that participation in informal and formal organisations builds trust in individuals and institutions and forms habits of interaction. Community based management or non-profit organisations facilitate trust and interaction by defining mutual obligations and member rights, by creating sets of specialised roles internal to the organisations, by establishing internal authority and accountability systems, by promoting norms and behavioural patterns regarded as useful to the group and inhibiting those regarded as detrimental. Organisations incorporate important accumulations of human experience and knowledge, which is social capital (Cernea, 1994).

#### 2.2.2 Organisational and Management Theory:

Another relevant theory to this study is organisational and management theory. The literature on organisational and management theory according to Mayer (1995), emphasizes the operational decisions and trade-offs that groups face when building their financial and political capacity. Mayer observed that decisions concerning the use of staff, choice of products and services, fundraising and marketing strategies, and even the selection of a board of directors can significantly impact the success or failure of an organisation. Decision making involves foregoing one option in favour of another. In short, organisational management decisions produce trade-offs that may be either beneficial or detrimental to the short-run or long-term viability of the organisation.

### 2.2.3 Responsibility theory

The community takes on the ownership of and attendant obligations of the system. They have the responsibility to plan and follow through their plans. Communities have had tendencies to associate water facilities with the service provider be it government, local authority or non-governmental organisations. As such, they see themselves as users only who are entitled to a service at any given time. With CBM, however, roles are reversed to that of facilitator (service provider) and owner (community) as stated by IWSD (2005).

### 2.2.4 Authority theory

The community has the legitimate right to make decisions regarding the system on behalf of the users (Deverill et al., 2002). The right extends to the choice of technology type, how and when they want a certain service. Communities are in a position to demonstrate a desire for and commitment to a new service and are prepared to make commitments over the lifetime of the service to receive it and to sustain it (Deverill et al., 2002).

### 2.2.5 Control theory

According to this theory the community is able to carry out and determine the outcome of its decisions. All decisions and actions pertaining to the facility are determined by the user community and not from the outside. This means that members of the community are prepared to face the consequences of their actions, either positive or negative. What is good about this theory is that the communities set targets, which they can achieve on their own and which will benefit them, using resources available to/among themselves. CBM implies the ability by the community to mobilise resources and to use them productively, equitably and sustainably in meeting the needs of that community (Thorpe, 2002).

## 2.3 Willingness of the Community

Barbara and Knuth (2004) argue that community based management (CBM) has progressed from the conceptual fringe to the dialogical heart of environmental management to water and sanitation. Community based management is receiving attention as a potential mechanism for increasing the efficacy, legitimacy, and sustainability of natural resources management (Basnet, 1992, Western & Wright 1994).

It is argued that literature on WASH facilities management has espoused alternatives to top-down practices. Such alternatives decentralize authority and enable communities most affected by

management decisions to have a greater say in those decisions (Christie, White & Buhat, 1994). As Renard and Cortesi (1994) note, unlike land resources, water resources are not easy to fence off and are often considered common property and available to all. They argue that protection and management of these resources is extremely difficult without the willingness, support and cooperation of the stakeholder's community. The management of water protected areas will fail without the support and involvement of the local community - a participant approach grounded in community based management (IIRR, 1998). Community management means that the communities are responsible, and have authority and control over development of their water and sanitation facilities (UNICEF, 2007). It is argued that community management goes beyond simple participation, it aims at empowering people and equipping them to own and manage own systems sustainably. In Budiriro, these initiative would have gone a long way to empower the local community.

## 2.4 Community's ability as a group.

Mayer (1995) observes that families in their formal way, have been the first agent of community capacity building since the beginning of recorded history. Mayer highlighted the resourcefulness of families in community management as follows:

- Commitment: Families help generate and preserve value systems (Gardner, 1991). Nature appears to assign to families the task of easing individuals into the larger community and of importing the rules and norms of behaviour. Families are designed to nurture, encourage, and support their members as their participation in the larger community increases.
- Resources: Families consume goods and services and they also produce them. They spend money and save it. Families accumulate material resources, and in doing so, demonstrate to their children necessary values and skills.
- Skills: In both subtle and overt ways, families learn, encourage learning and in essence, teach the principles of capacity building. They show their members the uses of information, material resources, and the values that underlie their acquisition and development. Families teach in varying degrees problem-solving, planning, organisational development, and management.

Emphasizing commitment, Gardner (1991) argues that a water project's success in reversing disease prevalence in the community depends on the commitment of the local stakeholders; a commitment gained and maintained through an ongoing community based management process.

## 2.5 Determinants of CBM Effectiveness

The effectiveness of Community Based Management depends on the responsibility of the community to take ownership of and attendant obligations to the project (Mayer, 1995). McIntosh (2003) concurs that the community has the responsibility to plan and follow through their plans. Mayer argues that the community has the authority and legitimate right to make decisions regarding the water project on behalf of the users; a position the City of Harare has failed to understand. A study by Mostert (2003), revealed that CBM also means that the community must be in control and is able to carry out and determine the outcome of its decisions. Community management,

if introduced in Budiriro, therefore implies enablement of the community to mobilise resources and to use them productively, equitably and sustainable in meeting the needs its needs. It is argued by Ndair (2005) that a true community management system must strengthen and broaden the local base of effective resource control.

De Vita and Fleming (2001) believed that, community management involves a long-term and changing partnership between communities and supporting agencies. In their Research paper, De Vita and Fleming argued that partnerships strengthen the capacity of each partner and enables combined resources to be used more effectively. According to their experience, as supported by Zanetell and Knuth (2002), a community’s stakeholders in the management of its water supply system may include government agencies, NGOs, the private sector and other communities. Accordingly, effective community based management of water and sanitation projects has the following aspects (WHO, 1995):

- Community decision making.
- Involvement of men, women, children of all classes in the community.
- Access to external support.
- Political support through policy.
- Willingness to pay for the services.
- Willingness to take a leading role.
- Ability to maintain and operate services.
- Community mobilisation of resources.
- Ability to prioritise needs.
- Ability to work well in groups.
- Willingness to be trained.
- Community having a common interest.
- Communities accommodating diverse interests.
- Conducive policy environment.

It is argued that effective community based management means a new role for support agencies as facilitators rather than providers, demanding new skills and offering greater opportunities (Boris, 2001). As Robison and Wilkinson (1995) assert in their agency theories, community management does not mean less work for agencies. It means a greater emphasis on the development of supporting and enabling skills and less on routine management and maintenance, more on monitoring and asset condition assessment (Misiunas, 2005).

### III. METHODOLOGY

The study utilized a mixed methods approach comprising three data collection methods, namely survey, key informant in-depth interviews and focus group discussions. The survey questionnaire was administered to a total of seventy households which use borehole water installed in their area of residence to explore the understanding of the community as regards community based management of boreholes and their willingness to take ownership of the boreholes. Systematic random sampling was used to select participants surrounding the installed boreholes. The approach provides an in-depth taping of the participants’ behaviour, attitudes knowledge of the CBM approach. In-depth interviews with 10 key informants from city of Harare and 3 local clinical officers who were purposively selected were held in order to gather information about how these institutions interact with the

community and their understanding of the essence of community based management of the existing boreholes in their area. Three focus group discussions with 37 local business people were held. The focus group discussions sought to understand business people’s experiences on the effects of water shortages and disease outbreaks and their views on community based management of boreholes.

## IV. FINDINGS

### 4.1 Total Boreholes surveyed

The researcher visited 28 boreholes that were drilled in Budiriro by various organisations and Harare City Council to provide the community with access to safe and clean water and save them from diseases. Of the 28 boreholes, 14 were broken-down and were not electrical but had hand-pumps. The study found out that the break-downs and non-repairs exposed the community to dirty and unsafe water as well as health risks. The borehole distribution is shown in table 1 below. One of the key informants stated: “As council, we have no funds to repair the boreholes and we expect the donating organisations to come to our rescue”. Other reasons advanced by key informants were lack of community awareness programmes on community based management of boreholes and their attitudes and perceptions on taking ownership.

**Table 1 distribution and status of boreholes**

<b>Residential Area</b>	<b>Borehole Working</b>	<b>Borehole/not working</b>	<b>Total per area</b>
Budiriro 1	3	3	6
Budiriro 2	3	2	5
Budiriro 3	2	2	4
Budiriro 4	2	2	4
Budiriro 5	4	5	9
<b>Total</b>	<b>14</b>	<b>14</b>	<b>28</b>

### 4.2 Causes of borehole breakdown

On causes of break-downs, the study found out that numerous factors contributed to the malfunctioning. Four focus group participants in Budiriro 4 and 5 remarked:

While we appreciate the Donations of boreholes by UNICEF, there was little attention given by council to the community water needs and the proper safe guards of donations like water facilities. We have identified the failure factors as: negligence, overuse, lack of spare parts and vandalism.

Three key informants at Budiriro 1 and 2 echoed the same sentiments:

People needs training on how to use boreholes, you cannot just give everyone access to its use without orientation as some have never used a pump in their lives. Children will take them as recreational facilities hence the high rate of break-downs.

#### 4.2.1 Negligence

There was no training offered to residents on the care and maintenance of the boreholes. Some young persons get excited by

pulling up and down the pump recklessly without due care resulting in the pumps dis-engaging from the pressure rigs.

#### 4.2.2 Overuse

Some of the participants thought that the main cause for breakdowns was overuse, especially, when only 50% of the drilled boreholes were still functional.

#### 4.2.3 Lack of spare parts

It was reported by 80% of the respondents that the borehole parts were not durable and were not meant to stretch far, while the rest 20% were not sure what was causing the breakdowns.

#### 4.2.4 Vandalism

Some unscrupulous elements in the high density suburbs move in and around wards looking for welding steel iron-bars from boreholes. They vandalise the borehole equipment to get the iron bars.

#### 4.3 Current Responsibility for Operation and Maintenance

On a rather disappointing note, contrary to the ownership results, when asked on who was responsible for borehole maintenance, 68% of the respondents indicated that it was the responsibility of the Council, while 20% were not sure. On the other hand, 6% indicated that it was the user community and another 6% indicate that it was NGOs, as shown in Figure 1. Some residents pointed out that borehole maintenance was the responsibility of those living around the borehole area, stating that with the distances they were travelling to fetch water, it was not possible to be involved in daily operation and maintenance issues relating to the boreholes. The majority of respondents (68%) further explained that it was the Council's responsibility because they are the ones who had first failed the residents.

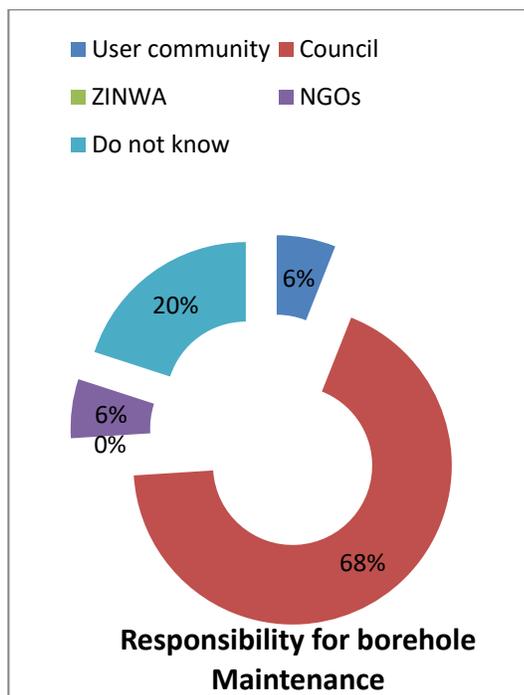


Figure 1: Responsibility for Borehole maintenance (n=70)

#### 4.4 Ownership and Maintenance of Borehole

The study established that all the boreholes were owned and maintained by the Harare City Council. On maintenance, ten participants in three focus group discussions concurred:

There were no repairs being done to the broken-down boreholes due to liquidity problems and poor management. Some boreholes needed very little attention but the council officials seemed to have no concern or attention to them. The impact of their state could not be underestimated and those who helped in financing them maybe discouraged to invest in future WASH facilities if no care is given to donated life-saving facilities.

Against the background of unreliable piped water, residents were finding it difficult to source water far away from their homes, a situation now resembling rural areas.

#### 4.5. Willingness to contribute towards Operation and Maintenance.

The respondents were of the opinion that council should reduce water bills or stop charging residents who were using borehole water. The research findings established that 88.3% of respondents strongly agreed that they were willing to take a leading role, 68.4% strongly agreed that the community was willing to pay for services and make contributions for maintenance, and 65.9% indicated that the community was willing to be trained as indicated in Table 3.

In-depth interviews with key informants (council officials and community leaders) was intended to get real issues about the council's perceptions on the introduction of CBM in Budiriro. The officials who were interviewed separately had almost similar perceptions about the residents' willingness and capacity to own and manage the boreholes.

One of the official said:

These people are not honest, they refused CBM at the earliest period of the problem and they accuse council for failure to supply adequate water yet they don't even know how expensive water treatment is and the scarcity of materials. Some are owing council a lot of money and they think they can run-away from paying their debts by adopting CBM. Council at the moment has no money to repair boreholes, let alone paying staff salaries.

The other council official said: "Those residents who want CBM of council boreholes should clear their debts first then approach council for the CBM, otherwise council is not ready to handover its boreholes to the community as they will be tempted to refuse paying council bills".

Table 2: Willingness to Ownership and Obligation  
n=70

	Questions	SA%	A%	U%	D%	SD%
1	Do you think the community is willing to take a leading role?	88.3	3.8	3.1	2.2	2.5
2	Do you think the community is	68.4	9.4	15.7	3.1	3.1

	willing to pay for services or make contribution for maintenance?					
3	Do you think the community is willing to be trained?	65.9	18.9	9.4	3.8	1.9

**Key; strongly agree (SA) Agree (A) Undecided (U) Disagree (D) Strongly Agree (SA)**

**4.6 Community capacity to contribute and making binding decisions**

On community capacity to contribute and making binding decisions on CBM of boreholes, the survey revealed that 88.3% of the respondents strongly agreed that they had the capacity to manage upon taking ownership and control of the borehole, 65% strongly agreed that the community could mobilize resources for the proper functioning of the boreholes, while 63.4% strongly agreed, to contribute towards maintaining and operating services of the boreholes, as shown in the Table 4.

Focus group discussions were intended to find out the willingness and preparedness of the local entrepreneurs to assist the community with resources as and when they are required as well as to take part in the programme as local residents experiencing the same fate. The discussions were quite fruitful and showed that the entrepreneurs were ready to go for it as there were no exceptions to the water challenges facing the Budiriro residents.

One group was bitter about what it termed corruption in council. The alleged:

A borehole in Budiriro 4, meant for the community, was taken over by a service station owner who has since removed the hand-pumps and covered the borehole with plastic and sand in a suspected bid to conceal it until everyone forgets about it, then

they will use it as theirs at their service station . What is council doing about it?

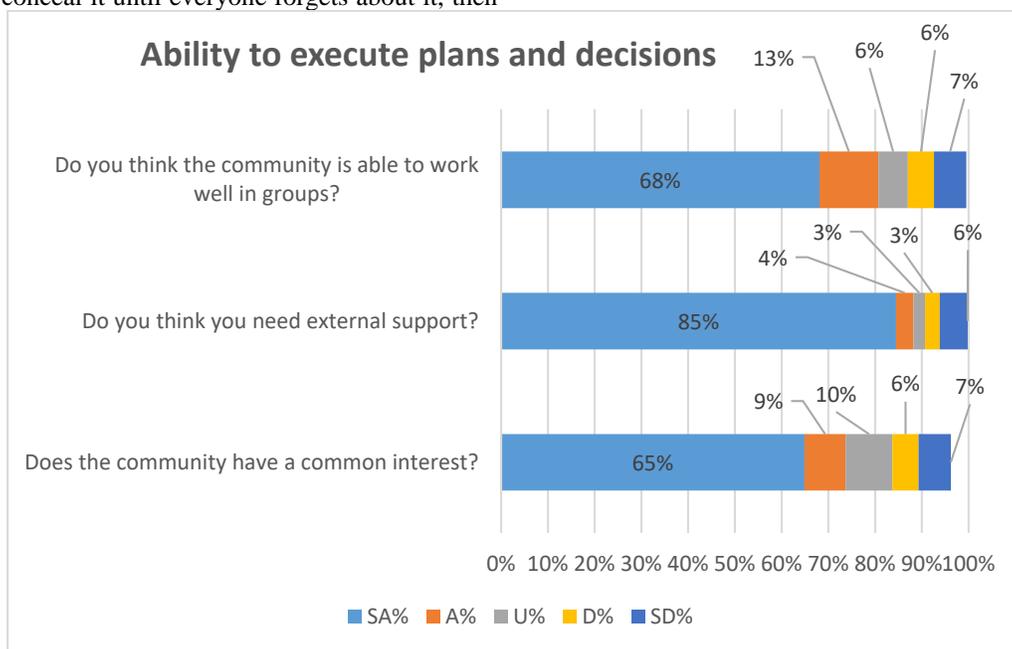
**Table 3: Capacity to Contribute and Decision Making n=70**

	Questions	SA%	A%	U%	D%	SD%
1	Do you think the community can take ownership and control of the borehole?	88.1	4.0	3.0	2.3	2.5
2	Do you think the community can mobilise resources?	65.0	9.4	9.4	6.0	6.6
3	Do you think the community can contribute towards maintaining and operating services of the borehole?	63.4	13.5	6.3	9.4	6.9

**Key: strongly Agree (SA), Agree (A), Undecided (U), Disagree (D), strongly Disagree (SD)**

**4.7 Ability to execute plans and decisions (n=70)**

The study revealed that 68% strongly agreed that they were able to work well in groups of CBM of boreholes, 85% strongly agreed that they needed external support from council, government and NGOs, while 65% asserted that the community had a common interest in borehole water project. Of those 7%, 6% and 7% disagreed with all the three statements as indicated in Figure 6 below.



**Figure 1: Ability to Execute Plans and Decisions**

## V. DISCUSSION

### 5.1 Towards a Framework for Integrated Community Based Management of Boreholes

The foregoing findings indicate that the high levels of enthusiasm and resourcefulness shown by residents imply that there were ready to take over the CBM of boreholes, if given a chance. In addition the community wanted council to conduct meetings about the project where they would be ready to tell council about their intentions and preparedness to roll-out the programme.

### 5.2 Knowledge and perceptions about the CBM

The findings suggest that the community had no knowledge of how the CBM works and the legality of the programme, particularly, ownership by the community. Upon explanation by the researcher the community became so excited and were ready to take charge of the boreholes. The community's perception of the CBM was that they would not pay council water bills even when they use council water sparingly against the background of inadequate water supply. Others were of the opinion that council borehole water would be paid for, thereby creating another bill. For this perception to be cleared, awareness meetings could help to enlighten the residents about the benefits of the programme, particularly, in eradication or minimising chances of disease outbreaks due to water shortages.

### 5.3 Attitudes and Beliefs

The interviews held exposed the community's growing desire to own water sources. Experience of frequent diseases outbreaks had taught the community to develop a positive attitude and find their own source of water to an extent that some have their own wells at their residential homes. The positive attitude about CBM would help to effectively implement the programme with certainty as the community was desperate for an alternative water supply considering council failure and poor administration in the water supply systems. The community belief was that council should own and maintain the water supply and no resident should pay for the borehole repairs as they were paying rates to council.

### 5.4 Willingness

The community's willingness to own the water project makes it easy to implement the programme. In any community project, willingness to be involved is key to its success. The findings suggest that CBM would be a better alternative to ensure constant supply of safe and clean water for their daily use.

### 5.5 Capacity

It is a fact that willingness and capacity are different variables. While one can be willing to undertake a project, capacity can be a limiting or driving factor. Studies by Mayer (1995) established that where there is willingness, capacity can be easy to mobilize. The findings suggest that the majority of the respondents have capacity to contribute and make decisions.

### 5.6 Ability

The CBM's success is also determined by the community's ability to execute its plans and decisions as this calls for commitment and discipline (WHO & UNICEF, 2010). There was

need to have a high sense of responsibility to be able to succeed. Ability is a key attribute to human success. Ability of the community to work as a group driven by common interest can also attract assistance from external. The study established that the community would be able to execute the project if it was given a chance to do so.

## VI. CONCLUSIONS

The study found out that the council has no financial capacity to maintain the boreholes for it had too many liabilities in its hands. Without the NGOs' assistance council would not afford the projects. Additionally, the neglect of donated water facilities discouraged would-be funders to intervene with funds when the need arose. The broken-down boreholes have been neglected for too long against the background of frequent disease outbreaks in Budiriro. The willingness, capacity and ability of the community to take ownership was real for they had experienced a lot of hardships due to water supply systems failure. Surrounding stakeholders and local entrepreneurs were ready to intervene with cash or kind in the event that council decides to handover to the community the boreholes as a community based managed project.

## VII. RECOMMENDATIONS

In view of the finding that the government has instituted community based management of water and sanitation programmes in rural areas at a time government could no longer afford to do everything for the community, this paper recommends that the Harare City Council should follow what was done by the government by handing over the donated boreholes to the community after educating them on their rights and dynamics of community based management. Such an arrangement could enable the council to save money and lives.

To ensure improvement in service delivery, there should be specific legislation for urban water management by the community, which clearly explain, all the processes involved and rights in the management of water by the community.

To ensure stakeholder involvement:

- There is need to run awareness and sensitization programmes.
- Water the council should ensure residents are involved at all stages in management.

Further studies can also be extended to community based management of solid waste and sanitation facilities.

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# Effects of Personality and Emotional Intelligence on the Performance of Senior High School Teachers through Motivation and Job Satisfaction

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## ABSTRACT

The purpose of the study was to analyze the effects of personality and emotional intelligence on the performance of private senior high school teachers in East Surabaya through motivation and job satisfaction. Results showed that personality had no effect on motivation, emotional intelligence had an effect on motivation, personality had no effect on job satisfaction, emotional intelligence had an effect on job satisfaction, personality had no effect on teacher performance, emotional intelligence had no effect on teacher performance and job satisfaction had an effect on teacher performance.

**Index Terms:** personality, emotional intelligence, teacher performance, motivation

## I. INTRODUCTION

Education is a conscious effort to make quality human resources useful for the state and nation. Human resources constitute an invaluable asset since the advancement of a nation lies in its resources. Quality resources will lead to an advancement for the country. Thus, education is required to improve human resources. Education is of paramount importance to create human resources capable of development towards advancements.

Personality represents an important factor for a teacher to adapt to where he or she is. The personality of an educator should be built continuously to adjust to the environment. This is manifested by the daily behavior, so that personality can provide an example for learners. According to McShane and Glinov (in Wahyuni, 2016), "personality is the relative stable pattern of behaviors and consistent internal states that explain a person's behavioral tendencies". According to Ulug *et al.* (2011), the behavior and approach of the teacher is directly accepted and copied by students, which puts great responsibilities on the teachers.

Emotional intelligence is one's ability to manage emotions effectively with regard to their environment. According to Robbins and Judge (2011: 147), emotional intelligence is the ability to detect and manage emotional cues and information. A teacher should be able to manage emotions since learners consist of various kinds of characters in order for teacher-learner harmony.

Motivation is an encouragement or enthusiasm for achieving a set goal. According to Mathis and Jackson (in Bangun, 2012: 312), motivation is one's desire to perform an action to achieve a goal. A teacher with a high motivation will seek to develop his or her professionalism for the benefit of their learners.

Job satisfaction is an assessment of the work being done. According to Badriyah (2015: 227), job satisfaction is among the highly important factors to obtain optimal results. Each person has a different level of job satisfaction depending on the work done. When someone is satisfied with their work, he or she will work optimally to get job satisfaction. A teacher should teach his or her students with happiness and a sense of love for his profession in order to achieve his or her goals.

Teachers' high performance is required to teach students; thus, teachers with a high motivation to educate their students are required. According to Bangun (2012: 211), performance is the outcome of a work achieved by someone on the basis of job requirements. Failure or success of learners lies in the teachers; thus, reliable and professional teachers in their respective fields are required.

In reality, there remains many learners acting violently to their fellow learners and even some of them have killed their teachers. Among the causes are dissatisfaction with the teachers, disrespect to the teachers, and the feeling of being treated unfairly. Responding to this phenomenon, the role of teachers should be improved since teachers set an example for their students; thus, teachers should have a good personality, capability and intelligence to better their students.

## II. THEORETICAL REVIEW

### Personality

Personality is a character possessed by each individual. Therefore, each individual has a different personality. Teacher personality is of paramount importance to teach students since whatever is done by the teacher will be followed by their students. In this era, teachers have an onerous duty of guiding their students to become better. According to Wahyuni (2016), personality is important and related to a person's behavior and will also build his loyalty to the company he works for when he is facing a dilemma of choice whether to stay at the company or looking for a new place to work. There are five dimensions of personality, known as the Big Five Dimensions, replicated by Norman (1963), Borgata (1964), Digman and Takemoto Chock (1981), and Norman (1963) in Keshavarzi and Amiri (2016): the factors were initially labeled as extraversion or surgency (talkative, assertive, energetic), agreeableness (good natured, cooperative, trustful), conscientiousness (orderly, responsible, dependable), emotional stability vs. neuroticism (calm, not neurotic, not easily upset), and culture (intellectual, polished, independent-minded).

### **Emotional Intelligence**

Emotional intelligence is the ability of an individual, in this case a teacher, to manage their emotions with regard to their students. A teacher is required to be patient in order for the learners to feel being paid attention and protected by their teachers. Students of private high school have different behaviors and characters, requiring patience to make them compliant with their teachers' instructions. According to Marya in Wahyuni (2013), emotional intelligence is an individual's ability to use his feelings optimally to face himself and the pressures from the surrounding environment.

According to Slovey (in Goleman, 1999: 58), some aspects that should be considered with regard to emotional intelligence are: 1) to recognize self-emotion, which is the self-awareness or the ability to recognize feelings as it occurs; 2) to manage emotions, which is the ability to handle emotions in order to reveal the feelings harmoniously so as to achieve balance within the individual; 3) to motivate oneself, which is the ability to organize emotions as a means to achieve goals; 4) to recognize others' emotions, which is the ability to empathize; 5) to foster a relationship, which is the ability to recognize each individual's emotions and control it.

### **Motivation**

Teacher motivation is crucial to achieve of teaching and learning process. According to Mustafa and Othman (2010), teachers also need to have high motivation as well as knowledge and expertise. Moreover, there is a parable stated that the higher teacher's motivation, the higher their work performance is. Motivation is the major factor so that what teachers need should be fulfilled. To date, teachers always accept what it is in terms of facilities, infrastructure, and salary, despite the fact that what they receive is far from enough. Therefore, teachers should be motivated to work in order to be enthusiastic to carry out their duties and seek to create new methods to make their learners capable of studying well. According to Robbins and Judge (2008: 205), motivation is the process that acts for the direction and persistence of effort toward attaining a goal. Thus, teacher motivation should be paid attention to make them enthusiastic to carry out their profession. According to Koesmono (2013), motivation factors can be viewed intrinsically and extrinsically. The intrinsic factors are everything that comes from inside an individual to meet his or her needs. It includes the desire to grow, the need for social relationships and the desire to excel. The extrinsic factors are everything that comes from outside an individual to meet his or her needs. It includes salary, rewards and social security.

### **Job Satisfaction**

Job satisfaction is highly important for a teacher. A teacher may feel satisfied with his or her job when his or her expectations are fulfilled. According Koesmono (2013), job satisfaction is a comparison between expectations and what has been achieved by someone. Thus, an individual is said to feel satisfied when their expectations are met or even exceeded. When expectations are met, there will be demotivation. In this case, demotivation should not occur in teachers since it will lead to decreased teacher performance. According to Hasibuan (2008: 202), job satisfaction is a pleasant emotional attitude. The following is the points to consider with regard to job satisfaction: 1) enjoying the job; 2) loving the job; 3) morale; 4) discipline; 5) work performance. A study conducted by Brahmasari and Suprayetno (2008) showed that motivation and organizational culture have a positive and significant effect on employee job satisfaction.

### **Teacher Performance**

Teacher performance is an activity performed by a teacher in the learning process. According to Koesmono (2004), performance is in essence the success of an employee in doing a job for a certain period of time based on the predetermined conditions. The variables directly or indirectly affecting performance are: personality, commitment, and behavior. According to Regulation of the Minister of State Apparatus Empowerment and Bureaucratic Reform No. 16 of 2009 on Teacher Functional Positions and Credit Codes, the components of teacher performance include: to develop science, to prepare lesson plans, to carry out learning activities, to guide students' extracurricular activities, to analyze the outcome of the learning process assessment, ability to compile syllabus, ability to assess and evaluate the learning outcomes of the subjects taught, scientific publication activities, ability to prepare the learning curriculum, timeliness to start learning activities, timeliness to come to school, ability to develop teaching materials, willingness to accept other tasks outside teaching, ability to guide novice teachers, and ability to create learning climate. There are 15 indicators of teacher performance that should be paid attention by teachers in performing their duties.

### **Hypotheses**

The hypotheses of the study are:

1. Personality has an effect on motivation of private high school teachers in East Surabaya.
2. Emotional intelligence has an effect on motivation of private high school teachers in East Surabaya.
3. Personality has an effect on satisfaction of private high school teachers in East Surabaya.
4. Emotional intelligence has an effect on job satisfaction of private high school teachers in East Surabaya.
5. Personality has an effect on performance of private high school teachers in East Surabaya.
6. Emotional intelligence has an effect on performance of private high school teachers in East Surabaya.
7. Motivation has an effect on job satisfaction of private high school teachers in East Surabaya.
8. Job satisfaction has an effect on performance of private high school teachers in East Surabaya.

### III. RESEARCH METHODOLOGY

#### Types of Research

The present study was quantitative, meaning that the approach was based on the use of numbers for statistical analysis.

#### Population and Samples

The population of the study was certified teachers of 12 private A-accredited high school in East Surabaya, they are Dr sutomo with 10 teachers, Petra 5 with 10 teachers, 17 Agustus with 10 teachers, GIKI 3 with 7 teachers, IPIEMS with 7 teachers, Luqman Al Hakim with 5 teachers, Maryam with 4 teachers, YPPI 1 with 15 teachers, ST Stanislaus with 12 teachers, Muhammadiyah 2 with 29 teachers, Kr YBPK with 5 teachers and ST Hendrikus with 4 teachers. The total are 118 teachers.

#### Sampling Technique

Samples were taken by using the cluster proportional random sampling technique. According to Sugiyono (2007: 218), the cluster proportional random sampling is sampling by region. The samples of the present study were certified teachers of private senior high schools in East Surabaya. Sampling was performed by using the Solvin formula (in Sanusi, 2014: 101) as follows:

$$n = \frac{N}{1 + Ne^2}$$

where:

n = sample size

N = population size

e = margin of error (in percent)

The population size of the study was 118.

Thus, the sample size of the study as calculated by the formula is:

$$n = \frac{118}{1 + 118 (0.05)^2} = \frac{118}{1 + 118 (0.0025)} = \frac{118}{1.295} = 91.11$$

The number of samples was 91; since the number was less than 100, data was processed by using SEM with Partial Least Square (PLS) regression analysis.

#### Data collection technique

Data were collected by distributing questionnaires to certified teachers of A-accredited senior high schools.

#### Operational Definition of Variables

Personality is a character possessed by each individual. According to Robbins and Judge (2008 : 132), there are five indicators that shape an individual's personality:

- a. Extraversion : I hang out with all my friends and teachers at school.
- b. Agreeableness : I run the teaching profession with confidence.
- c. Conscientiousness : I carry out my duties as a teacher with full responsibility.
- d. Emotional Stability: I can control my emotions when dealing with learners with a variety of characters.
- e. Culture : As a teacher I will continuously learn to increase knowledge.

Emotional intelligence of a teacher is an ability to manage emotions properly in dealing with learners. According to Slovey (in Goleman, 1999: 58), there are five indicators of emotional intelligence:

- a. To recognize emotions : I am able to control emotions.
- b. To manage emotions : I am able to manage emotions properly.
- c. To motivate myself : I am able to organize emotions to achieve goals.
- d. To recognize others' emotions : I am able to motivate myself to be enthusiastic in performing my duties as a teacher.

e. To foster a relationship : I am able to recognize emotions of each individual.

Work motivation is a teacher's impetus to carry out his or her profession passionately. According to Koesmono (2013), the indicators of motivation are as follows:

- a. Intrinsic factors : I want to be a high-performing teacher.
- b. Extrinsic factors : I obtain a salary that meets my wishes.

Job satisfaction is an individual's feelings of things related to his or her profession as a teacher. According to Hasibuan (2008: 202), there are several indicators:

- a. Enjoying the job : I enjoy my current profession.
- b. Loving the job : I love teaching profession.
- c. Morale : I will obey all the rules and norms as a teacher.
- d. Discipline : I will be disciplined in undertaking the teaching profession.
- e. Work performance: I will be a high-performing teacher.

### **Teacher Performance**

Teacher performance is an activity performed by a teacher in the learning process. According to Regulation of the Minister of State Apparatus Empowerment and Bureaucratic Reform No. 16 of 2009 on Teacher Functional Positions and Credit Codes, the components of teacher performance (in Wahyuni, 2014) include:

1. To develop science: The principal appeals to the teachers to develop science by taking a higher level study or attending seminars.
2. To prepare lesson plans: The principal appeals to the teachers to plan well.
3. To carry out learning activities: The principal appeals to the teachers to carry out the learning activities properly.
4. To guide students' extracurricular activities: The principal appeals to the teachers to guide the learners' extracurricular activities in addition to teaching them.
5. To analyze the outcome of the learning process assessment: The principal analyzes the learning process undertaken by teachers.
6. Ability to compile syllabus: The principal appeals to the teachers to arrange syllabus properly.
7. Ability to assess and evaluate the learning outcomes of the subjects taught: The principal evaluates teachers' learning outcomes.
8. Scientific publication activities: The principal appeals to the teachers to undertake scientific publication activities.
9. Ability to prepare the learning curriculum: The principal appeals to the teachers to develop the learning curriculum.
10. Timeliness to start learning activities: The principal appeals to the teachers to be timely in starting learning activities.
11. Timeliness to come to school: The principal appeals to the teachers to be on time to come to school.
12. Ability to develop teaching materials: The principal appeals to the teachers to develop teaching materials.
13. Willingness to accept other tasks outside teaching: The principal appeals to the teachers to be willing to accept outside tasks in addition to teaching.
14. Ability to guide novice teachers: The principal calls for senior teachers to coach novice teachers.
15. Ability to create learning climate: The principal calls for teachers to create a pleasant learning climate.

### **Research Instruments**

The research instrument of the present study was questionnaires distributed to private high school teachers in East Surabaya. The questionnaires consisted of a number of structured items representing the indicators of each of the research variables adopted from previous studies considered to have proven their reliability and validity. The items of the questionnaires were in the form of multiple choice questions, in which each item consisted of five alternative answers. The respondents' answers were scored in Likert-type scale of 1 to 5 according to Sarmanu (2003: 9) and Indriantoro and Supomo (2002: 104): strongly disagree was scored 1, Disagree was scored 2, Slightly agree was scored 3, Agree was scored 4, Strongly Agree was scored 5.

The items of the questionnaire were tested for validity and reliability. The tests were performed to determine whether the questionnaire has the ability to measure what it intends to measure.

### **Data analysis technique**

Data analysis is an activity to process data collected from the field or the library into a set of results, both in the form of new findings and validity of the hypothesis. The present study used the partial least squares (PLS) regression analysis and results of the outer and inner model testing.

### **Outer Model**

At this stage, each variable (personality, emotional intelligence, work motivation, job satisfaction and teachers performance) was tested for validity and reliability. The test for the outer model included:

1. Convergent validity test

Convergent validity is measured on the basis of the correlation among the item scores/component scores estimated using the PLS software. A reflexive measure is considered valid when it correlates more than 0.70 to the measured constructs.

According to Ghazali 2006: 78), in the early stages of the development of a measurement scale the loading factor of 0.5 to 0.6 is considered adequate and valid. The present study used a loading factor of 0.60.

2. Reliability test

The reliability of a construct can be determined by the reliability score and the Average Variance Extracted (AVE) value of the construct. A construct is considered to have high reliability when the score is 0.70 and AVE is above 0.50.

**Inner Model**

An inner model is used to determine the relationships among constructs, significance values and R-squared values of the research model.

**Research Description**

The object of the present study was all private senior high school teachers in East Surabaya. The number of respondents was 91, consisting of both male and female teachers. The data can be seen as follows:

**Respondents' Characteristics**

Respondents' characteristics consisted of gender, age and education. Respondents were certified private senior high school teachers of A-accredited schools. Teacher performance could be measured after being certified.

**Tabel 1 : Deskripsi Gender, Age, Education and duration of work for responden**

Gender	Mount	Percentage %
Female	60	66
Male	31	34
Age	Mount	Percentage (%)
20-30 years	20	37.03
31-40 years	15	27,78
41- 50 years	14	25.93
> 51 years	5	09.26
Education	Mount	Percentage (%)
Elementary school	-	-
Junior High School	-	-
Senior High	-	-
School/vocational school	-	-
Bachelor Degree(S1)	70	77
Postgraduate Degree (S2)	21	23
Postgraduate Degree (S3)	-	-
Duration of work	Amount	Precentage(%)
< 25 years	-	-
26 – 35 years	10	22
36 – 45 years	20	45
46 – 55 years	8	18
< 55 years	6	15

Table 1 shows that a total of 60 (66%) teachers was female and a total of 31 (34%) teachers was male. In terms of education, the majority (70% or 70) of teachers were undergraduate and 21 teachers were holders of postgraduate degree.

In terms of age, the majority (45% or 20) of respondents were aged 36 to 45 years, 22% or 10 respondents aged 26 to 35 years, 15% or 6 respondents aged >55 years, 18% or 8 respondents aged 46 to 55 years, and no respondent aged <25 years.

**IV. RESULTS AND DISCUSSION**

**Outer Model Test**

An outer model, often called an outer relation or a measurement model, specifies the relationship among the variables studied and their indicators. The following is the steps of an outer model test:

**a. Convergent Validity**

The convergent validity of a measurement model with reflexive indicators can be seen from the correlations between the item/indicator scores and the construct scores. However, in the scale development of a research, a loading factor of 0.50 to 0.60 is acceptable (Ghozali, 2006: 40). The correlations between the indicators and constructs are as follows:

Tabel 2 : *Convergent Validity*

	original sample estimate	mean of subsamples	Standard deviation	T-Statistic
Personality (X <sub>1</sub> )				
X <sub>1.1</sub>	0.739	0.750	0.088	8.368

	original sample estimate	mean of subsamples	Standard deviation	T-Statistic
X <sub>1.2</sub>	0.817	0.829	0.069	11.791
X <sub>1.3</sub>	0.764	0.781	0.085	8.992
X <sub>1.4</sub>	0.775	0.796	0.054	14.396
X <sub>1.5</sub>	0.834	0.820	0.080	10.366
Emotional Intelligence (X <sub>2</sub> )				
X <sub>2.1</sub>	0.708	0.770	0.093	7.631
X <sub>2.2</sub>	0.631	0.524	0.183	3.445
X <sub>2.3</sub>	0.692	0.754	0.098	7.034
X <sub>2.4</sub>	0.805	0.810	0.046	17.679
X <sub>2.5</sub>	0.830	0.858	0.040	20.736
Motivation (Y <sub>1</sub> )				
Y <sub>1.1</sub>	0.789	0.856	0.051	15.547
Y <sub>1.2</sub>	0.698	0.632	0.117	5.948
Job Satisfaction (Y <sub>2</sub> )				
Y <sub>2.1</sub>	0.796	0.845	0.038	21.096
Y <sub>2.2</sub>	0.784	0.819	0.095	8.291
Y <sub>2.3</sub>	0.890	0.910	0.019	47.780
Y <sub>2.4</sub>	0.789	0.846	0.049	16.259
Y <sub>2.5</sub>	0.712	0.765	0.066	10.825
Teacher Performance (Y <sub>3</sub> )				
Y <sub>3.1</sub>	0.831	0.882	0.036	23.391
Y <sub>3.10</sub>	0.640	0.721	0.054	11.822
Y <sub>3.11</sub>	0.521	0.640	0.088	5.915
Y <sub>3.12</sub>	0.631	0.704	0.058	10.799
Y <sub>3.13</sub>	0.546	0.669	0.082	6.676
Y <sub>3.14</sub>	0.622	0.696	0.072	8.629
Y <sub>3.15</sub>	0.555	0.664	0.082	6.737
Y <sub>3.16</sub>	0.656	0.727	0.085	7.752
Y <sub>3.17</sub>	0.745	0.816	0.060	12.402
Y <sub>3.18</sub>	0.746	0.763	0.044	16.870
Y <sub>3.19</sub>	0.744	0.792	0.051	14.499
Y <sub>3.20</sub>	0.747	0.776	0.069	10.764
Y <sub>3.21</sub>	0.772	0.834	0.046	16.635
Y <sub>3.22</sub>	0.723	0.779	0.057	12.613
Y <sub>3.23</sub>	0.738	0.821	0.061	12.198

As shown in Table 6, Personality (X<sub>1</sub>), as measured by the 5 indicators, Emotional Intelligence (X<sub>2</sub>), Motivation (Y<sub>1</sub>), Job Satisfaction (Y<sub>2</sub>) and Teacher Performance (Y<sub>3</sub>) indicate a convergent validity > 0.5; thus, it is considered valid.

**b. Discriminant Validity**

Discriminant validity describes the ability of each indicator to make a difference between its construct and other constructs. When an indicator belongs to another construct, it means that the indicator does not have a good discriminant validity. In the discriminant validity test, the first condition to be met is that the AVE value must be greater than 0.50, as shown in Table 7 below:

Tabel 3 : Nilai AVE

Average Variance Extracted (AVE)
----------------------------------

Personality (X <sub>1</sub> )	0.618
Emotional Intelligence (X <sub>2</sub> )	0.543
Motivation (Y <sub>1</sub> )	0.555
Job Satisfaction (Y <sub>2</sub> )	0.634
Teacher Performance (Y <sub>3</sub> )	0.572

As shown in Table 7, the AVE value in for the indicator that measure the construct can be considered as having a good discriminant validity. This means that all the construct variables are considered reliable.

The cross-loading output of the data processing is shown in the following table:

Tabel 4 : Cross Loadings

	Personality (X <sub>1</sub> )	Emotional Intelligence (X <sub>2</sub> )	Motivation (Y <sub>1</sub> )	Job Satisfaction (Y <sub>2</sub> )	Teacher Performance (Y <sub>3</sub> )
X <sub>1.1</sub>	0.739	0.368	0.397	0.380	0.323
X <sub>1.2</sub>	0.817	0.248	0.199	0.384	0.230
X <sub>1.3</sub>	0.764	0.292	0.221	0.280	0.247
X <sub>1.4</sub>	0.775	0.305	0.371	0.318	0.259
X <sub>1.5</sub>	0.834	0.393	0.571	0.508	0.306
X <sub>2.1</sub>	0.223	0.708	0.240	0.204	0.248
X <sub>2.2</sub>	0.234	0.631	0.310	0.184	0.228
X <sub>2.3</sub>	0.185	0.692	0.347	0.244	0.282
X <sub>2.4</sub>	0.113	0.805	0.738	0.537	0.324
X <sub>2.5</sub>	0.173	0.830	0.824	0.666	0.450
Y <sub>1.1</sub>	0.245	0.316	0.789	0.298	0.319
Y <sub>1.2</sub>	0.087	0.681	0.698	0.527	0.228
Y <sub>2.1</sub>	0.488	0.523	0.634	0.796	0.484
Y <sub>2.2</sub>	0.228	0.698	0.688	0.784	0.420
Y <sub>2.3</sub>	0.395	0.932	0.287	0.890	0.603
Y <sub>2.4</sub>	0.277	0.354	0.285	0.789	0.353
Y <sub>2.5</sub>	0.355	0.329	0.429	0.712	0.366
Y <sub>3.1</sub>	0.243	0.469	0.505	0.427	0.831
Y <sub>3.10</sub>	0.331	0.838	0.810	0.649	0.940
Y <sub>3.11</sub>	0.194	0.490	0.401	0.302	0.521
Y <sub>3.12</sub>	0.339	0.822	0.791	0.639	0.931
Y <sub>3.13</sub>	0.228	0.527	0.462	0.322	0.546
Y <sub>3.14</sub>	0.324	0.448	0.379	0.453	0.622
Y <sub>3.15</sub>	0.310	0.430	0.339	0.410	0.555
Y <sub>3.2</sub>	0.176	0.317	0.347	0.385	0.656
Y <sub>3.3</sub>	0.265	0.545	0.511	0.417	0.745
Y <sub>3.4</sub>	0.219	0.370	0.427	0.336	0.746
Y <sub>3.5</sub>	0.344	0.439	0.543	0.517	0.744
Y <sub>3.6</sub>	0.207	0.322	0.251	0.335	0.747
Y <sub>3.7</sub>	0.216	0.390	0.554	0.453	0.772
Y <sub>3.8</sub>	0.198	0.524	0.495	0.482	0.723
Y <sub>3.9</sub>	0.215	0.338	0.319	0.368	0.738

The cross-loading values in Table 4, show that the indicators of each construct variable have a convergent validity > 0.5, meaning that all the indicators used in the present study are valid.

**c. Composite Reliability**

The composite reliability test was performed under condition that when the composite reliability value is >0.60, it is interpreted as highly satisfying (Ghozali, 2006 : 98).

Tabel 5 : Composite Reliability

	Composite Reliability
Personality (X <sub>1</sub> )	0.890
Emotional Intelligence (X <sub>2</sub> )	0.854
Motivation (Y <sub>1</sub> )	0.713
Job Satisfaction (Y <sub>2</sub> )	0.896
Teacher Performance (Y <sub>3</sub> )	0.929

Table 5 shows that the composite reliability of all the variables are reliable so that each construct can be used as the research variable and for further analysis.

**Inner Model Test**

An inner model or structural model testing was performed to determine the relationships among constructs, the significance value and the R-squared of the research model. The structural model was evaluated by using the R-squared for the t-test of dependent constructs and the significance of the structural path coefficients, based on the PLS outputs, as shown by the following figure:

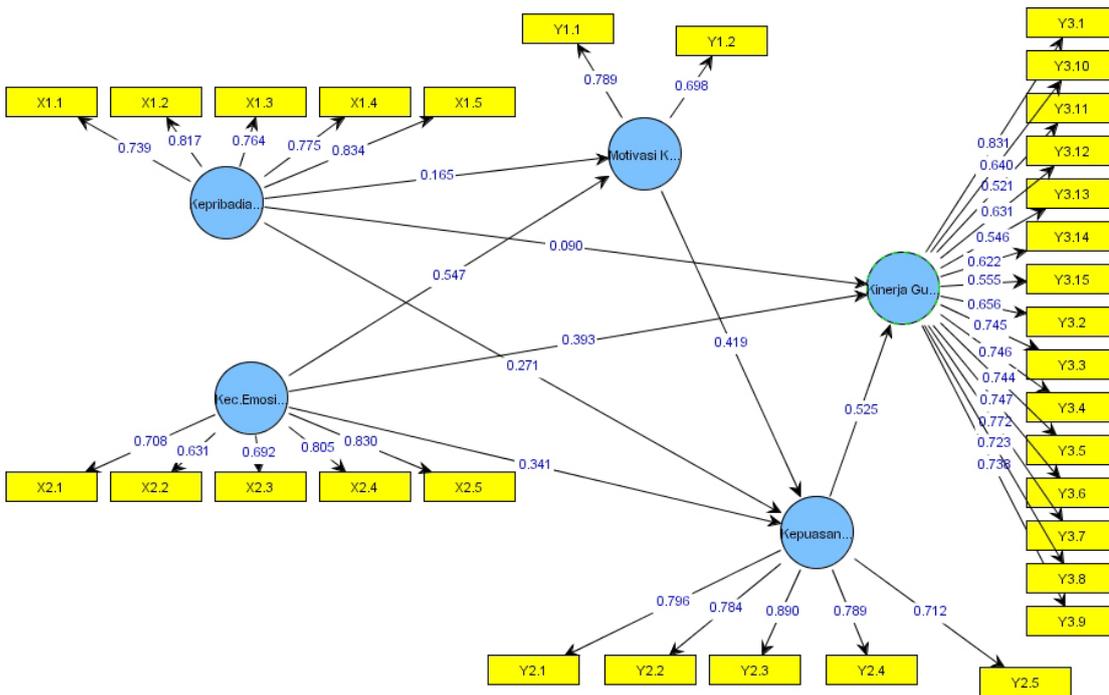


Figure 2 : PLS output

The inner weights as shown by Figure 2 above show that personality and emotional intelligence has an effect on work motivation, job satisfaction and teacher performance, as shown in the following structural equations.

**Structural Equations**

Work Motivation (Y<sub>1</sub>) = 0.165 Personality (X<sub>1</sub>) + 0.547 Emotional Intelligence (X<sub>2</sub>)

Job Satisfaction (Y<sub>2</sub>) = 0.341 Emotional Intelligence (X<sub>2</sub>) + 0.419 Motivation (Y<sub>1</sub>)

Teacher Performance (Y<sub>3</sub>) = 0.090 Personality (X<sub>1</sub>) + 0.393 Emotional Intelligence (X<sub>2</sub>) + 0.525 Job Satisfaction (Y<sub>2</sub>)

The model with PLS was started by looking at the R-squared for each latent dependent variable. Changes in the R-squared can be used to assess for the substantive effects of certain latent independent variables on the latent dependent variables. The endogenous latent variables in the structural model have the  $R^2$  of 0.67, indicating that the model was “good”; a  $R^2$  of 0.33 indicates that the model is “moderate” and a  $R^2$  of 0.19 indicates that the model is “weak” (Ghozali, 2006: 87). The PLS output is as described below:

Tabel 6 : Nilai R-Square

	R-square
Motivation (Y1)	0.387
Job Satisfaction (Y2)	0.550
Teacher Performance (Y3)	0.613

The variables Personality ( $X_1$ ) and Emotional Intelligence ( $X_2$ ) that had an effect on Motivation ( $Y_1$ ) had a  $R^2$  of 0.387, indicating that the model was “moderate”, and the variables Emotional Intelligence ( $X_2$ ) and Motivation ( $Y_1$ ) that had an effect on job satisfaction ( $Y_2$ ) had a  $R^2$  of 0.550, indicating that the model was “moderate”. Personality ( $X_1$ ), Emotional Intelligence ( $X_2$ ) and Job Satisfaction ( $Y_2$ ) that had an effect on teacher performance ( $Y_3$ ) had a  $R^2$  of 0.613, indicating that the model was “moderate”.

The structural model fit can be seen from the  $Q^2$  as follows:

$$\begin{aligned}
 Q^2 &= 1 - [(1 - R1) * (1 - R2) * (1 - R3)] \\
 &= 1 - [(1 - 0.387) * (1 - 0.550) * (1 - 0.613)] \\
 &= 1 - [(0.613) * (0.450) * (0.387)] \\
 &= 1 - [0.107] \\
 &= 0.893
 \end{aligned}$$

The  $Q^2$  shows that the model fits the study since it is above zero.

**Hypothesis Testing**

The hypotheses can be tested on the basis of the  $t$ -statistic in Table 11.

Table 7 : Correlations among constructs

No.		Original sample estimate	Mean of subsamples	Std. dev.	T-stats	Remark
1	Personality ( $X_1$ ) → Work Motivation ( $Y_1$ )	0.165	0.179	0.112	1.478	Not accepted
2	Emotional Intelligence ( $X_2$ ) → Work Motivation ( $Y_1$ )	0.547	0.619	0.125	4.365	Accepted
3	Personality ( $X_1$ ) → Job Satisfaction ( $Y_2$ )	0.271	0.230	0.192	1.408	Not accepted
4	Emotional Intelligence ( $X_2$ ) → Teacher Performance ( $Y_3$ )	0.393	0.272	0.197	2.084	Accepted
5	Personality ( $X_1$ ) → Teacher Performance ( $Y_3$ )	0.090	0.108	0.095	0.945	Not accepted
6	Emotional Intelligence ( $X_2$ ) → Teacher Performance ( $Y_3$ )	0.393	0.272	0.197	2.084	Accepted
7	Work Motivation ( $Y_1$ ) → Job Satisfaction ( $Y_2$ )	0.419	0.349	0.165	2.535	Accepted
8	Job Satisfaction ( $Y_2$ ) → Teacher Performance ( $Y_3$ )	0.525	0.588	0.155	3.388	Accepted

**DISCUSSION**

Table 11 shows that:

1. Personality ( $X_1$ ) has no effect on Motivation ( $Y_1$ ) since the T-statistics is 1.478, or smaller than 1.96; thus, hypothesis  $H_1$  is not accepted. Teacher personality is of paramount importance. In addition to undertaking their profession, a teacher should also serve their learners so that they feel noticed. However, in the present study, teacher personality was not taken into account, leading to the decreased motivation. This is because teachers are incapable of undertaking their profession properly, making many learners disrespectful of their teachers. In many cases, there were learners daring to fight their teachers when the latter seeking to enforce order in the classroom, dreaded teachers, teachers disrespecting their learners by talking bad about them in front of the class. Results of the present study are not consistent with those of Nyarko *et.al.* (2016) that the personality characteristics would significantly predict their motivation on academic achievement.
2. Emotional Intelligence ( $X_2$ ) has a significant positive effect on Motivation ( $Y_1$ ) since the T-statistics is 4.365, or greater than 1.96; thus, hypothesis  $H_2$  is accepted. A teacher should have a good emotional intelligence to manage his or her emotions in the face of the learners so that he or she will be enthusiastic to carry out his or her profession. Learners have different characters, representing the teacher's task to manage their emotions to guide their learners to learn properly and follow all the teacher's advices. Results of the present study are consistent with those of Asy'ari *et al.* (2014) that there was a significant positive relationship between emotional intelligence and learning motivation of the students of SMK Assa'adah Sampurna Bungah; the higher the emotional intelligence of the students, the higher the students' learning motivation would be. Results of the present study are inconsistent with those of Dewi *et al.* (2016) that emotional intelligence does not affect teacher performance through achievement motivation.
3. Personality ( $X_1$ ) has no effect on Job Satisfaction ( $Y_2$ ) since the T-statistic is 1.408, or smaller than 1.96; thus, hypothesis  $H_3$  is not accepted. A teacher's improper personality will lead to job dissatisfaction. Senior high school teachers had not have adequate personality, primarily in terms of internalizing their role as a teacher. This is proven by the fact that there are still teachers who are not discipline by skipping work during the teaching hours for a side job, ignoring their duties as a teacher. In fact, there are teachers failing to master their subject matters due to indolence to learn, making them lacking creativity and innovativeness. Results of the present study are inconsistent with those of Alsuwailam and Elnaga (2016) that personality traits have a significant effect on job performance.
4. Emotional Intelligence ( $X_2$ ) has a positive significant effect on job satisfaction ( $Y_2$ ) since the T-statistics is 1.997, or greater than 1.96; thus, hypothesis  $H_4$  is accepted. A teacher should be able to manage his or her emotions properly, especially in the face of learners in order to achieve the desired job satisfaction in which the learners follow all the teacher's directions. Being a teacher of senior high school requires a high level of patience to avoid misperception. Results of the present study are consistent with those of Anari, N. N (2012) that there is a positive and significant relationship between Emotional Intelligence and Job Satisfaction among primary school teachers. It means that higher the level of Emotional Intelligence the higher the job satisfaction is.
5. Personality ( $X_1$ ) has no effect on Teacher Performance ( $Y_3$ ) since the T-statistic is 0.945, or smaller than 1.96; thus, hypothesis  $H_6$  is accepted. This is because a teacher has not been able to appreciate his or her role as a teacher, despite the undergraduate diploma and certification. Many teachers ignores it since they feel that the salary they receive is not enough to support their family, even to take a higher level of education. As a result, many teachers are not wholeheartedly undertaking their profession. Even worse, the teaching profession serves as only a side job, rather than a demand or a call. Results of the present study do not support those of Angmalisang (2011) that personality has a significant effect on teacher performance.
6. Emotional Intelligence ( $X_2$ ) has a significant positive effect on Teacher Performance ( $Y_3$ ) since the T-statistics is 2.084, or greater than 1.96; thus, hypothesis  $H_7$  is accepted. Emotional intelligence is a necessity to a teacher in managing emotions in order to be cautious with regard to teaching the learners in a senior high school since they need a lot of attention. They are the generation of the nation whose character must be build to create human resources useful for the nation. Results of the present study are consistent with those of Naqvi *et al.* (2016) that there is relationship between emotional intelligence and performance of secondary school teachers. It means that increase in the level of emotional intelligence enhances the performance of secondary school teachers at secondary school level. According to Dewi *et al.* (2016), emotional intelligence has a positive and significant effect on teacher performance.
7. Motivation ( $Y_1$ ) has a significant positive effect on Job Satisfaction ( $Y_2$ ) since the T-statistics is 2.535, or greater than 1.96; thus, hypothesis  $H_5$  is accepted. Motivation is an impetus that leads a teacher to always be passionate in carrying out his or her profession. Being a teacher is a highly noble duty and often referred to as an unsung hero since a teacher is capable of creating future generations of character who later can lead this nation toward progress. Teachers would be satisfied and happy to see the learners who succeeded. Results of the present study are consistent with those of Arifin (2015) that work motivation has a positive and significant effect on teacher job satisfaction.
8. Job Satisfaction ( $Y_2$ ) has a significant positive effect on teacher performance ( $Y_3$ ) since the T-statistics is 3.388, or greater than 1.96; thus, hypothesis  $H_e$  is accepted. Teacher job satisfaction is crucial to improve their performance as reflected by the learning achievement achieved by the learners. According to Chamundeswari (2013), there is a significant difference in job satisfaction and performance of teachers. Furthermore, Arifin (2015) argues that job satisfaction has a positive and significant effect on performance, meaning that the higher the teacher job satisfaction the higher the teacher performance would be.

## CONCLUSION

In conclusion, personality has no effect on work motivation. A teacher who fails to make the learners enjoy the learning process in the classroom would always be bad-tempered in the course of the learning process.

Emotional intelligence has an effect on motivation. Results indicated that a teacher should be able to manage his or her emotions in order for the learners to follow his or her directions to become high-achievers.

Personality has no effect on job satisfaction. Results indicated that the personality of a teacher is supported by the individual's appreciating his or her role as a teacher. A teacher not appreciating the teaching profession would not be comfortable or unhappy to undertake his or her profession despite the certification.

Emotional intelligence has an effect on job satisfaction. Results indicated that emotional intelligence of a teacher in controlling emotions is needed to perform their duties as a teacher. Teachers are public figures whose attitudes and behaviors will be followed by his or her students.

Personality has no effect on teacher performance. Results indicated that teachers were not able to appreciate his or her teaching profession, despite the diploma and certification. The diploma and certification cannot guarantee that a teacher will have good behavior towards their teaching profession.

Emotional intelligence has an effect on teacher performance. Results indicated that managing emotions for a teacher is crucial to direct learners in the right direction. They are the next generation of the nation who will continue the struggle to bring Indonesia towards progress and eliminate inferiority to other countries.

Motivation has an effect on job satisfaction. Results indicated that giving motivation to learners in senior high schools is highly required since this may lead to passion for advancements and realization of ambitions.

Job satisfaction has an effect on teacher performance. Results showed that successful learners will make their teachers happy since the lessons given by teachers can be received well and applied to the community.

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# Service Quality and Customer Satisfaction in the Public Sector: The Case of the National Social Security Authority in Zimbabwe

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## ABSTRACT

The study sought to assess the satisfaction of pensioners with the National Social Security Authority's (NSSA) service in Harare. The study adopted the quantitative research design. Data were collected by means of a questionnaire from a sample of 169 randomly selected participants. Out of these 162 participants fully completed and returned the questionnaire, representing a response rate of 96%. Five constructs of the SERVQUAL model, namely; tangibles, reliability, responsiveness, assurance and empathy, provided the conceptual framework for the study. The data were captured and analysed using the Statistical Package for Social Sciences (SPSS) Version 22. Frequency analysis was conducted. Multiple linear regression analysis was conducted to determine the relationship between the various dimensions of service quality and customer satisfaction. The questionnaire had a Cronbach's alpha reliability coefficient of 0.906. The results of the study indicated that the overall satisfaction rate with service among NSSA pensioners was 62%. The major reason for dissatisfaction with service among pensioners was the slow processing of pension claims by NSSA. Tangibles, reliability and empathy had the strongest influence on customer satisfaction of R.66, followed by assurance and responsiveness with R.58 and R.48, respectively. The article argues that as regards service quality NSSA was doing well on tangibles, assurance and empathy, but was not doing quite well on reliability and responsiveness.

**Key words:** customer satisfaction, NSSA, service quality, SERVQUAL, social security

## I. INTRODUCTION

Public sector organisations, though not usually focused on competitive advantage and profitability, are not exempt from ensuring delivery of quality service and satisfying their customers. This study thus focused on customers' satisfaction with service at the National Social Security Authority (NSSA), a public sector organisation in Zimbabwe. NSSA is a statutory corporate body established by the government of Zimbabwe in terms of the NSSA Act Chapter 17:04 of 1989 to develop and administer social security schemes. The study was carried out against a background where the public in Zimbabwe is disillusioned with the quality of service in the public sector. For instance, Moyo (2013) aptly characterised public administration as dead for intents and purposes. Some of the poorly performing public organisations are, inclusive of the Zimbabwe Electricity Supply Authority, National Railways of Zimbabwe and Air Zimbabwe (Moyo, 2013). Yet public organisations, just like their private sector counterparts, are expected to provide quality service and to satisfy their customers who are basically the citizens (Zamil & Shammot, 2011). As Angelovah and Zekiri (2011) argue, in today's competitive environment delivering high quality service is the key to achieving sustainable competitive advantage and profitability. However, in the public sector profitability is usually not the central concern instead quality service and customer satisfaction are important. As Rashid (2008) points out, excellent quality of customer service is very important for government agencies even though they are not-for-profit. The National Social Security Authority (NSSA), a statutory corporate body mandated to administer social security schemes in Zimbabwe, is also expected to prioritize service quality and customer satisfaction. As an organization which administers mandatory contributory social security schemes, it is expected to show accountability to its stakeholders and to its beneficiaries, in particular, by delivering quality service.

## II. RESEARCH OBJECTIVES

Succinctly, the objectives of the study were to establish the state of the quality of NSSA's service to its pensioners, determine the level of pensioners' satisfaction with NSSA's service and establish the reasons for the state of satisfaction among NSSA

pensioners. In investigating customer satisfaction it was deemed crucial the state of service quality at NSSA since service quality is antecedent to customer satisfaction. Establish the level of customer satisfaction was deemed crucial as indicator of NSSA's performance as a public sector entity. Finally, identification of reasons for dissatisfaction with service, was crucial in identifying areas germane to service delivery requiring attention and improvement.

### III LITERATURE REVIEW

#### 3.1. Service quality

Gronroos, as cited in Karim & Chowdhury (2014), define service quality as the outcome of the comparison that consumers make between their expectations and perceptions. For Shahin (2006), service quality is the extent to which a service meets customers' needs or expectations. Similarly, Shahin & Janatyan (2011) assert that service quality can be characterized as the difference between customers' perception of service and their expectations. Karim & Chowdhury (2014) point out that a customer's expectation serves as a foundation for evaluating service quality because quality is high when performance exceeds expectation and quality is low when performance does not meet the customer's expectation. Shahin & Janatyan (2011), observe that the starting point in developing quality in services is analysis and measurement, hence the need for instruments for measuring service quality.

In the social security sector various quality initiatives have been instituted to improve customer satisfaction and guidelines have been developed to improve quality in the sector (Lee-Archer 2013). These efforts have culminated in the launch of the International Social Security Association (ISSA) Centre for Excellence at the 2013 World Forum, which sets service quality standards in social security organizations. (Lee-Archer, 2013). The service quality guidelines put people at the centre of the social security system. As Lee-Archer (2013) puts it, the traditional service model where the social security organisation was at the centre is being replaced by an ecosystem approach, which places people at the centre. In this set-up people can leverage the stakeholders in the ecosystem to participate fully in the social security system.

Lee-Archer (2013) notes that many social security organisations around the world are making significant investment in service quality to create an environment of trust and confidence to contribute to the overall health and stability of the social security system. The model appositely recognises the importance of service quality in social security provision. The need for quality service is made more compelling by the fact that contribution to social security schemes is compulsory so contributors naturally expect a good service from NSSA, compulsorily collects their contributions.

#### 3.2. Customer Satisfaction

According to Kotler and Armstrong, cited in Karim and Chowdhury (2014), customer satisfaction is a person's feelings of pleasure or disappointment resulting from the comparison of a product's perceived performance in reference to expectations. Similarly, Angelova and Zekiri (2011) define customer satisfaction as the outcome felt by those that have experienced a company's performance that has fulfilled their expectations. The two definitions clearly indicate the centrality of fulfilment of expectations by providers of goods or services as an element of customer satisfaction.

As Naik, Gantasala and Prabakar (2010) point out, satisfying customers is one of the main objectives of every organization since keeping current customers is more profitable than having to win new ones to replace those lost. Due to this realization, as McColl-Kennedy and Schneider (2000), cited in Naik, Gantasala & Prabakar (2010), observe, management and marketing theorists stress the importance of customer satisfaction for a business's success.

In studying customer satisfaction in the public sector and its impact on performance, Zamil and Shammot (2011) submit that customer satisfaction is critical for public sector organizations, contending that the customer needs services that satisfy him/her and equilibrate with his/her expectations. They further argue that if customer satisfaction is not achieved by public sector organizations, the customer will feel that his/her satisfaction is ignored and this causes more complaints (Zamil & Shammot, 2011). Similarly, Chakraarty *et al.* (1996), as cited in Karim & Chowdhury (2014), maintain that continuous systematic measurement of satisfaction level is necessary, since a satisfied customer is the real asset for an organization that ensures long-term profitability even in the era of great competition. This view dovetails with the International Social Security Association's submission, in reference to social security organisations, that when people are empowered to access the social security system in the way that best suits their needs, their level of satisfaction with the system and their level of trust in the system rises commensurately (Lee-Archer 2013). The current study was, thus, fittingly focused on customer satisfaction in a public sector organization, the National Social Security Authority, the overriding aim being an assessment of customer satisfaction with service quality.

### 3.3. Relationship between Service Quality and Customer Satisfaction

Karim & Chowdhury (2014) maintain that service quality and customer satisfaction have long been recognized as playing a crucial role for success and survival in today's competitive market. They further contend that service quality is antecedent to customer satisfaction. Saravanan & Rao (2007) maintain that customer satisfaction is based on the level of service quality delivered by the service providers. Likewise, Wilson *et al.* (2008), cited in Karim & Chowdhury (2014), contend that customer satisfaction and service quality have certain things in common. They, however, point out that satisfaction generally is a broader concept than service quality. Also, Zeithaml & Bitner, (2003), cited by Karim & Chowdhury (2014), posit that although other factors such as price and product quality can affect customer satisfaction, perceived service quality is a component of customer satisfaction. Daniel and Berinyuy (2010) also concur that there is some link between service quality and customer satisfaction, which highlights the importance of customer satisfaction when defining service quality. In this study service quality dimensions were, thus, employed to assess customer satisfaction. According to the SERVQUAL model, which was adopted for this study the dimensions are tangibles, reliability, responsiveness, assurance and empathy.

### 3.4 The SERVQUAL Model of Customer Satisfaction

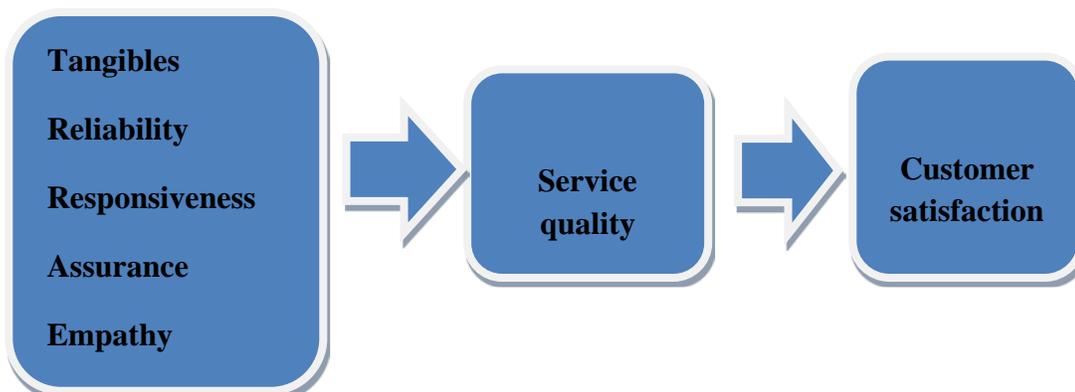
Gibson (2009) notes that SERVQUAL was developed by Parasuraman, Berry and Zeithaml in the 1980s. SERVQUAL is a multi-item scale developed to assess customer perceptions of service quality in service and retail businesses. The SERVQUAL model was originally made up of ten dimensions of service quality, namely, tangibles, reliability, responsiveness, communication, credibility, security, competence, courtesy, understanding the customer, and access (Daniel & Berinyuy, 2010). Later these dimensions were reduced to five because some dimensions were overlapping (Daniel & Berinyuy, 2010). The five dimensions are as follows:

- Tangibles - For example, physical facilities, equipment and staff appearance.
- Reliability - Ability to perform service dependably and accurately.
- Responsiveness - Willingness to help and respond to customer needs.
- Assurance - Ability of staff to inspire confidence and trust.
- Empathy - The extent to which caring individualized service is given.

As Shahin (2006) notes, the SERVQUAL approach, which was adopted in this study, is the most common method for measuring service quality. Shahin (2006) notes that SERVQUAL is a generic instrument with good reliability and validity and broad applicability. Its purpose is to serve as a diagnostic methodology for uncovering broad areas of a company's service quality shortfalls and strengths. As Shahin and Janatyan (2011, p.101) put it, SERVQUAL dimensions and items represent core evaluation criteria that transcend specific companies and industries, hence it has been used to measure service quality in a wide variety of service environments.

### 3.5. Conceptual Framework

The SERVQUAL model is the conceptual framework for this study and is represented diagrammatically in Figure 3. As part of the conceptual framework the five dimensions of quality identified by Parasuraman, Berry & Zeithaml in the 1980s under the SERVQUAL model were used to assess service quality and customer satisfaction. The dimensions are as follows: tangibles, reliability, responsiveness, assurance and empathy.



### **Figure 3: Conceptual Framework**

#### **IV. RESEARCH METHODOLOGY**

In this study the quantitative approach was used as it allows the collection and analysis of quantifiable data amenable to statistical analysis. Quantitative methods were also expected to enable the researcher to gather and analyse data from a large number of participants within a short space of time. This approach was thus envisaged to facilitate the collection of quantifiable data, which are easy to analyze and interpret objectively in line with the positivist paradigm (Flowers, 2009). The survey method was adopted for this study. The approach also dovetailed with the SERVQUAL model, which was adopted for this research study. SERVQUAL is a multi-item scale developed by Parasuraman, Berry and Zeithaml in the 1980s to assess customer perceptions of service quality (Gibson 2009).

##### **4.1. Sample Selection**

NSSA pays out pensions to about 140000 pensioners in Harare. However, the majority of these pensioners do not regularly visit the NSSA Harare office as their pensions are paid through banks. Pensioners who visit Harare office invariably will be either collecting or submitting pension claim forms or will be having queries. The NSSA Harare regional office on average attends to about a hundred such pensioners on a daily basis. Pensioners who visit this office were the target population in this study. In this study data collection was carried out over a period of 3 consecutive days. This gave the study an estimated target population of 300 hundred pensioners. Using the sample size table developed by Bartlett, Kotrlík, & Higgins (2001) it was determined that the appropriate samples size for a population of 300 pensioners, with a confidence interval of .50 for categorical data is 169. Random or probability sampling was employed in the selection of the sample for this study. This was meant to ensure representativeness of the sample, thereby making the results of the sample generalizable to the entire study population (Teddlie & Yu 2007).

##### **4.2. Data Collection Tool and Methods**

A questionnaire was used as the data collection tool. Most of the questions in the questionnaire were derived and adapted from tried and tested SERVQUAL customer satisfaction instrument. The five SERVQUAL constructs, namely, tangibles, reliability, responsiveness, assurance and empathy constituted the framework upon which the questions were hinged. The respondents were asked to use the Likert type rating scale to respond to the closed questions. However, a few open-ended questions were also included. This was meant to afford the respondents the latitude to give some explanation and justification for their assessment of service quality. Cronbach's Alpha was employed to test the reliability of the questionnaire. Cronbach's alpha reliability coefficient ranges between 0 and 1 and the closer the coefficient is to 1, the greater the internal consistency of the items in the research instrument (Gliem and Gliem, 2004). The questionnaire had a reliability coefficient of 0.906, which shows as that it was highly reliable, thereby enhancing the reliability of the research results.

##### **4.3. Analysis of Data**

Data were captured and analysed using the Statistical Package for Social Sciences (SPSS) Version 22. The analysis predominantly consisted of determination of frequencies of responses and multiple linear regression analysis.

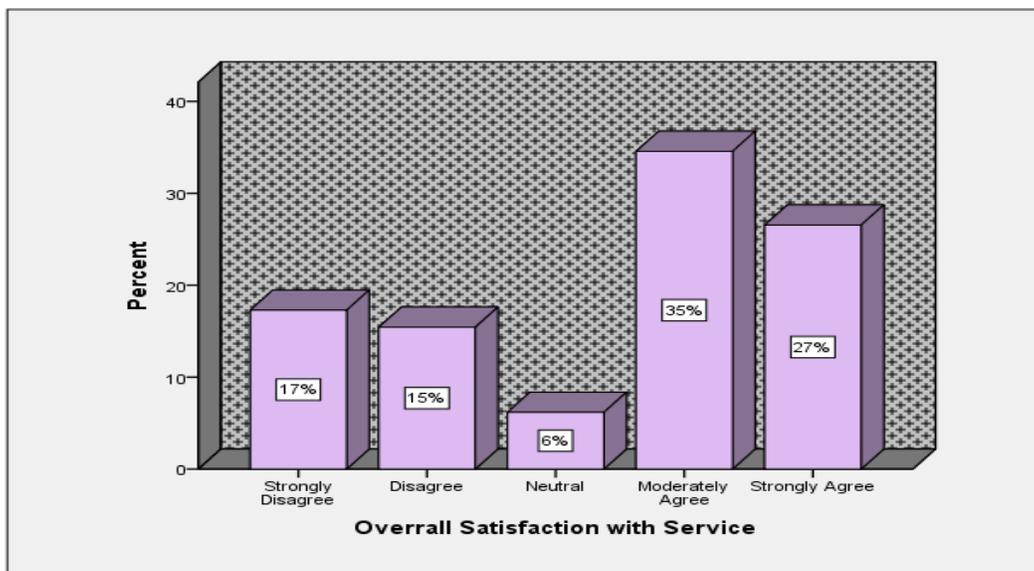
#### **V. RESULTS AND DISCUSSION**

##### **5.1 Response rate**

The questionnaire was administered on a sample of 169 participants. One hundred and sixty two (162) participants fully completed and returned the questionnaire, representing a response rate of 96%. Apparently, the high response rate was realised because the participants were requested to complete the questionnaire soon after receiving service from NSSA and to submit the questionnaire before leaving the NSSA premises. This yielded a high response rate, unlike a situation where participants are allowed to take questionnaires home and may end up forgetting complete and return.

##### **5.2 Satisfaction with Service at NSSA**

Figure 1 shows that a total of 62% of the participants were satisfied with NSSA's service. This finding addresses the research objective of determining the satisfaction level among NSSA pensioners in Harare. The level of customer satisfaction was moderately high, which could indicate that the service quality was reasonably good, since service quality is antecedent to customer satisfaction (Karim & Chowdhury, 2014). However, the fact that 38% of the participants did not indicate that they were satisfied with NSSA's service could suggest that there were shortcomings in the service delivery or that certain dimensions of service quality were not up to standard. It certainly indicates that the service quality needed improve in order to engender a higher level of customer satisfaction.



**Figure 1: Overall Satisfaction with NSSA’s Service**

**5.4 Reasons for Dissatisfaction with service**

Table 2 shows a variety of reasons for dissatisfaction with NSSA’s service. Seventeen percent of the respondents indicated that they were dissatisfied because of delays in the processing of pension claims, while 10% indicated that they were dissatisfied because of going through long and slow-moving queues. About 7% of the respondents, without elaborating, simply cited poor service as their reason for dissatisfaction. It is evident from these statistics that the major reason for dissatisfaction was delay in the processing of benefits.

**Table 1 : Reasons for Dissatisfaction**

Reasons For Dissatisfaction	Frequency	Percent
Staff at service counters seem not to have knowledge to answer questions	3	1.9
Poor service	11	6.8
Payment of inconsistent pensions amounts	2	1.2
Delays in processing claims	28	17.3
Long and slow-moving queue	16	9.9
Total	60	37.0
Not stated	102	63.0
<b>Total</b>	<b>162</b>	<b>100.0</b>

### 5.5 State of Service Quality at NSSA

#### 5.5.1 Tangibles

As shown in Table 3, the participants were generally satisfied with tangibles. The tangibles included signage, adequacy of parking space, clarity of directions to service counters, visual appearance of the service room, adequacy of ventilation and use of modern-looking equipment. Other tangibles included spaciousness of the service room, adequacy of seats in the service room, adequacy of service counters, cleanliness of the desk of the serving official and neatness of serving official. The participants predominantly indicated that NSSA was faring very well on tangibles. For instance, 88% of the respondents strongly agreed with the statement that the service room was visually appealing, while 6% moderately agreed with it and another 6% were neutral. Similarly, 73% of the participants strongly agreed with the assertion that ventilation in the service room was adequate, while 21% moderately agreed with it and 6% were neutral. Likewise, 84% of the participants strongly agreed with the assertion that the NSSA official who served them was neat in appearance, while 5% moderately agreed, 5% were neutral and 6% strongly disagreed with it. Evidently, NSSA was doing well on tangibles relating to buildings as regards customer satisfaction. This is presumably because over the years NSSA has invested in state-of-the-art buildings, which are visually appealing.

**Table 3: Tangibles**

TANGIBLES	Strongly disagree	Disagree	Neutral	Moderately agree	Strongly agree
Signage to the office is clear	2%	31%		37%	30%
Directions to service counters are clear	1%	9%		23%	66%
The service room is visually appealing			6%	6%	88%
The service room has adequate ventilation			6%	21%	73%
Equipment is modern-looking			11%	40%	49%
Service room sufficiently spacious		11%		45%	44%
Adequate service counters in the service room		24%		48%	28%
Desk of the serving official was clean	6%			12%	83%
The serving official was neat in appearance	6%		5%	5%	84%

A multiple linear regression analysis of responses to questions under tangibles was conducted. In this analysis R is called the correlation coefficient. In this model R=66%, as show in the model summary in Table 4, indicating a strong relationship between overall satisfaction with service and tangibles.

**Table 4: Model Summary for tangibles**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.662 <sup>a</sup>	.439	.390	1.139

As shown in Table 5, the multiple linear regression analysis showed that easiness to locate the service point, signage, adequacy of parking space negatively affected customer satisfaction as they had negative beta coefficients. Other variables with negative beta coefficients were clarity of directions to service counters, adequacy of ventilation, adequacy of counters, adequacy of stationery and cleanliness of the desk of the serving official. All these negatively affected overall customer satisfaction. This shows that for customer satisfaction to improve these tangible aspects should be improved.

**Table 5: Coefficients of tangibles**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	3.124	1.361		2.295	.023
It was easy to locate the service point	-.137	.092	-.127	-1.495	.137
Signposts to the Service points were clearly visible	.197	.104	.170	1.892	.060
There is enough parking space	-.048	.145	-.041	-.329	.742
Directions to the service counter are clear	.499	.153	.335	3.273	.001
The service room is visually appealing	1.143	.303	.396	3.769	.000
Ventilation is adequate	-.870	.309	-.344	-2.815	.006
Equipment is modern-looking	.202	.187	.094	1.080	.282
The room is sufficiently spacious	.091	.163	.057	.555	.580
There are adequate seats	.226	.154	.147	1.465	.145
There are adequate counters	-.589	.140	-.444	-4.193	.000
Stationery is adequate	-.434	.132	-.398	-3.280	.001
The desk is clean	-.502	.217	-.326	-2.318	.022
The Official was neat	.073	.207	.051	.354	.724

**7.5.2 Reliability**

As shown out in Table 6, the results indicate that service quality was low on the aspect of reliability. Ratings on reliability dimensions such as honouring promises, showing interest in solving customers' problems, doing things right the first time and maintaining error-free records were generally low. For instance, 33% of the respondents strongly disagreed with the assertion that NSSA officials do what they promise to do, while 17% disagreed with it. On the other hand, 22% were neutral, while 22% moderately agreed and 6% strongly agreed with it. These statistics show that NSSA was clearly lacking on the aspect of reliability, which is a facet of the SERVQUAL model of service quality and customer satisfaction (Shahin, 2006; Gibson, 2009; Shahin and Janatyan, 2011). This also shows that NSSA pensioners' satisfaction with this particular aspect of service quality could be lacking. Similarly, 39% of the respondents moderately agreed with the assertion that NSSA officials show sincere interest in solving customers' problems, while 26% strongly agreed with it. On the other hand, 17% strongly disagreed with it, while 6% disagreed with it and 12% were neutral. Forty five percent of the participants moderately agreed with the assertion that NSSA officials show sincere interest in solving customers' problems, while 10% strongly agreed with it. On the other hand, 22% disagreed, 6% strongly disagreed and 17% were neutral. Although the majority indicated that NSSA does things right the first time, the fact that a sizeable percentage indicated otherwise shows that NSSA was somewhat lacking on this aspect of reliability. Fifty four per cent of the respondents moderately agreed with the statement that NSSA maintains error-free records, while 6% strongly agreed with it. On the other hand, 23% were neutral, while 11% disagreed and 6% strongly disagreed. This indicates that NSSA's records were predominately viewed by the participants as moderately error-free. These results suggest that NSSA has a reasonably efficient records capturing and maintenance system. However, the fact that 40% of the participants did not affirm that NSSA maintained error-free records could indicate that the record system had some shortcomings, and therefore needed improvement.

**Table 6: Reliability**

<b>RELIABILITY</b>	<b>Strongly disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Moderately agree</b>	<b>Strongly agree</b>
NSSA Officials Do what they Promise to Do	33%	17%	22%	22%	6%
NSSA Officials Show Sincere Interest in Solving Problems	17%	6%	12%	39%	26%
Doing Things Right the First Time	6%	22%	17%	45%	10%
Maintaining Error-Free Records	6%	11%	23%	54%	6%

A multiple linear regression analysis of responses to questions under reliability was conducted. In this model R=66% as shown in the model summary in Table 7, indicating a strong relationship between overall satisfaction with service and reliability.

**Table 7: Model Summary of Reliability**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.657 <sup>a</sup>	.431	.417	1.113

Overall satisfaction with service depended by 43% on the independent variables included in the model as shown by the coefficient of determination R<sup>2</sup> of 44%. The analysis showed that failure to perform services right the first time negatively affected overall customer satisfaction as it had a negative beta coefficient of -.484. This shows that for customer satisfaction to improve, NSSA must improve on this aspect.

**Table 8: Coefficients on Reliability**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.484	.359		4.132	.000
NSSA staff perform according to promise	.453	.095	.406	4.771	.000
Staff show interest in solving problems	.580	.075	.549	7.732	.000
Staff perform services right the first time	-.484	.120	-.366	-4.041	.000
NSSA maintains error free records	.098	.109	.065	.901	.369

**5.5.3 Responsiveness**

Table 9 shows that service quality was generally poor in the area of responsiveness. For instance, 22% of the respondents moderately agreed that NSSA tells customers exactly when services will be performed, while 12% disagreed. Interestingly, 22% strongly disagreed, 22% disagreed and 22% were neutral. These statistics clearly show that NSSA’s service quality and customer satisfaction was poor in this regard as the majority of the respondents did not affirm that NSSA tells customers exactly when services would be performed. Thirty five per cent of the respondents strongly agreed with statement that NSSA offers prompt service to its customers, while 22% moderately agreed with it. On the other hand, 26% disagreed, 11% strongly disagreed and 6% were neutral. It is clear from these statistics that the majority of the respondents indicated that prompt service was offered by NSSA but a significant percentage of the respondents did not affirm this. This indicates that this is an area of service quality and customer satisfaction where NSSA was not doing quite well, since some of the respondents did not see NSSA’s service as prompt. Similarly, 38% of the respondents strongly agreed that NSSA employees were always willing to help customers. On the other hand, 12% were neutral while 11% strongly disagreed. This shows that NSSA was generally doing well on this aspect of service quality. With regard to answering to answering customers’ questions, 33% of the respondents strongly agreed, while 28% agreed that NSSA employees are never too busy to answer customers’ questions. Twenty three percent disagreed and 17% strongly disagreed. Although the majority of the respondents indicated that NSSA employees were never too busy to respond to customers’ questions, it is important to note that 40% of respondents did not affirm this. This could indicate that the NSSA’s employees were not always disposed to answering customers’ questions. This, therefore, shows that in terms of the SERVQUAL construct of responsiveness NSSA’s service quality was not quite good.

**Table 9: Responsiveness**

<b>RESPONSIVENESS</b>	<b>Strongly disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Moderately agree</b>	<b>Strongly agree</b>
Telling Customers Exactly when Services will be Performed	22%	22%	22%	22%	12%
Offering Prompt Service	11%	26%	6%	22%	35%
NSSA Employees are Always Willing to Help	11%		12%	39%	38%
NSSA Employees are Never too Busy to Respond to Customers’ Questions	17%	23%		28%	33%

Multiple linear regression analysis of responses to questions under responsiveness was conducted. In this model R=48% as shown in the model summary in Table 10, indicating a rather weak relationship between overall satisfaction with service and responsiveness. Overall satisfaction with service depended by 23% on the independent variables included in the model as shown by the coefficient of determination R<sup>2</sup> of 23%. The analysis thus showed that issues to do with responsiveness did not significantly affect overall customer satisfaction.

**Table 10: Model Summary on Responsiveness**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.479 <sup>a</sup>	.229	.209	1.296

**5.5.4 Assurance**

As shown in Table 11, the results generally show that NSSA was doing moderately well on the aspect of assurance. For instance, 40% of the respondents moderately agreed with the assertion that the behaviour of NSSA employees instils confidence in customers, while 27% strongly agreed with it. However, it is important to note that 33% of the respondents did not affirm the statement that the behaviour of NSSA employees instilled confidence in customers. This shows that NSSA was not doing very well in this regard. Thirty eight percent (38%) of the respondents strongly agreed with the statement that they felt safe in their transactions with NSSA, while 17% moderately agreed with it. The fact that the majority of the respondents were in agreement with the statement shows that on the aspect of assurance, which is one of the constructs of the SERVQUAL model (Shahin, 2006, p.6; Gibson, 2009, p.8; Shahin and Janatyan, 2011, p.101), service quality was reasonably good. However, the fact that 45% of the respondents did not affirm the statement that they felt safe in their transactions with NSSA shows that this aspect of assurance was to some extent lacking at NSSA. Thirty nine percent of the respondents strongly agreed and 39% moderately agreed with the assertion that NSSA employees were consistently courteous with customers. This shows that with regard to courteousness service quality was quite good. Also, 50% of the respondents strongly agreed with the statement that NSSA officials had enough knowledge to answer questions, while 27% moderately agreed with it. This indicates that on the aspect of knowledge NSSA was faring quite well. However, the fact that 23% of the respondents did not affirm that NSSA employees had enough knowledge to answer customers’ questions could indicate that some NSSA employees lacked the requisite knowledge to answer customers’ questions. According to the International Social Security Association’s service quality model for social security organisations, skilled employees are critical component of service quality (Lee-Archer, 2013. p.12). The model thus prescribes investment in the skills and capability of the staff delivering services as a way of improving service quality outcomes (Lee-Archer, 2013. p.12). The fact that some staff members at NSSA appeared not to have the requisite knowledge to answer customer’s questions could indicate that they needed to empowered with knowledge and skills necessary for the delivery of quality service.

**Table 11: Assurance**

<b>ASSURANCE</b>	<b>Strongly disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Moderately agree</b>	<b>Strongly agree</b>
The Behaviour of NSSA Employees Instils Confidence	5%	22%	6%	40%	27%
I Feel Safe in My Transactions with NSSA	17%	6%	23%	17%	38%
NSSA Employees are Consistently Courteous with Customers	11%	6%	6%	39%	39%
NSSA Employees Have Enough Knowledge to Answer Questions	11%		12%	27%	50%

Multiple linear regression analysis of responses to questions under assurance was conducted. In this model R=58% as shown in Table 12, indicating a strong relationship between overall satisfaction with service and assurance. It also showed that overall

satisfaction with service depended by 33% on the independent variables included in the model as shown by the coefficient of determination  $R^2$  of 33%.

**Table 12: Model Summary on Assurance**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.577 <sup>a</sup>	.333	.316	1.205

The analysis showed that failure to give clients a feeling of safety in transacting with them negatively affected overall customer satisfaction with service as it had a negative beta coefficient of -.288, as shown in Table 13. This shows that for customer satisfaction to improve, NSSA must improve on this aspect.

**Table 13: Coefficients on Assurance**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.946	.361		2.624	.010
Staff instil confidence in customers	.827	.120	.711	6.862	.000
I feel safe in my transactions with NSSA	-.288	.146	-.289	-1.975	.050
NSSA employees are courteous	.098	.209	.087	.470	.639
NSSA staff have enough knowledge	.025	.174	.022	.146	.884

### 5.5.5 Empathy

Table 14 shows that service quality was generally good on the aspect of empathy. Sixty per cent of the respondents strongly agreed that the official who served them greeted them well, while 23% moderately agreed. Similarly, seventy two per cent of the respondents strongly agreed and 11% moderately agreed that the NSSA officials who served them were friendly. Besides, 60% of the respondents strongly agreed and 39% moderately agreed that NSSA's business hours were convenient to customers. In addition, 40% of the respondents strongly agreed and 33% moderately agreed that they were given personal attention by NSSA staff. This bodes well as it indicates that with respect to empathy, service quality, and resultantly, customer satisfaction was good at NSSA. Also, 50% of the respondents strongly agreed with the statement that NSSA officials understood their specific needs, while 22% moderately agreed with it. This shows that service quality in this regard was quite good, since understanding customers' specific needs is an element of the empathy construct of the SERVQUAL model of service quality and customer satisfaction (Shahin, 2006; Gibson, 2009; Shahin and Janatyan, 2011). Furthermore, 46% of the respondents strongly agreed and 26% moderately agreed with the assertion that NSSA employees had the interests of customers at heart. These results, thus, show that with respect to empathy NSSA's service quality was quite good.

**Table 14: Empathy**

<b>EMPATHY</b>	<b>Strongly disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Moderately agree</b>	<b>Strongly agree</b>
The NSSA Official who Served me Greeted me Well	11%		6%	23%	60%
The Official Who Served Me was Friendly	6%	5%	6%	11%	72%
NSSA's Business Hours are Convenient to Customers		1%		39%	60%
NSSA Employees Give me Personal Attention	6%	6%	6%	33%	49%
NSSA Employees Understand my Specific Needs	6%	12%	4%	22%	55%
NSSA Employees Have Customer's Interests at Heart	10%	5%	13%	26%	46%

A multiple linear regression analysis of responses to questions under empathy was conducted. In this model R=66% as shown in Table 15, indicating a strong relationship between overall satisfaction with service and empathy. It also showed that overall satisfaction with service depended by 44% on the independent variables included in the model as shown by the coefficient of determination R<sup>2</sup> of 44%.

**Table 15: Model Summary on Empathy**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.662 <sup>a</sup>	.438	.416	1.113

The analysis showed that failure to greet customers well, lack of friendliness and inconvenient business hours negatively affected customer satisfaction as they all had negative beta coefficients, as shown in Table 19. This shows that for customer satisfaction to improve, NSSA must improve on greeting customers and friendliness and must ensure that its business hours are convenient to customers.

**5.5.6 Comparison of Dimensions of Service Quality using R**

The multiple regression analysis showed that the service quality dimensions that had the greatest impact on overall customer satisfaction were tangibles (R.66), reliability (R.66) and empathy (R.66), followed by assurance (R.58). The service quality dimension with the least impact on overall customer satisfaction was responsiveness (R.48). This implies that for NSSA to improve customer satisfaction it must concentrate on the service quality dimensions with the highest impact on overall customer satisfaction, namely, tangibles, reliability and empathy.

**5.6 The Appropriateness of SERVQUAL as a Model of Customer Satisfaction**

In a bid to test the appropriateness of SERVQUAL as a model for assessing customer satisfaction at NSSA, respondents were asked to state what they thought were the critical components of service quality and whether the absence of these components would affect customer satisfaction. Table 16 shows the components of service quality that were identified by the respondents. It is important to note that the components of service quality suggested by the respondents closely approximate to the five dimensions of the SERVQUAL model, namely, tangibles, reliability, responsiveness, assurance and empathy. For instance, service quality components such as good signage, clear directions to service points, sufficient service counters and adequate seats dovetail with the tangibles construct under the SERVQUAL model. Similarly, service quality components suggested by the respondents such as being truthful to customers, telling customers exactly when benefits would be paid, giving clear directions to customers and accurate diagnosis of customers' problems closely relate to the SERVQUAL dimension of reliability. Likewise, service quality components proposed by respondents such as being responsive, providing fast customer service and willingness to serve can be placed under the SERVQUAL construct of responsiveness, which is one of the facets of service quality and customer satisfaction. Other service quality components suggested by the respondents such as courteousness with customers and sufficient knowledge to answer customers' questions can be subsumed under the SERVQUAL construct of assurance, showing clear congruence between the components of service quality suggested by the respondents and those inherent in the SERVQUAL model. The sampled respondents also suggested other service quality components such as understanding customers' problems, listening to the views of customers, and

friendliness of staff. These are closely akin to those under the SERVQUAL dimension of empathy. This clearly proves that the SERVQUAL is applicable to the social security pensions sector in assessing service quality and customers satisfaction.

**Table 16: Components of Service Quality**

<b>Components</b>	<b>Frequency</b>	<b>Percent</b>
Good welcome or reception of customers	11	6.8
Adequate and clean toilets	2	1.2
Friendliness of staff	11	6.8
Willingness to serve	4	2.5
Sufficient service counters	7	4.3
Canteen for customers	2	1.2
Telling customers exactly when benefits will be paid	8	4.9
Being truthful to customers	7	4.3
Giving clear explanations to customers	9	5.6
Fast service	11	6.8
Increasing benefit levels	4	2.5
Listening to the views of customers	9	5.6
Open offices a in rural areas	8	4.9
Being directed to the right office	7	4.3
Teamwork by staff	3	1.9
Photocopying and certifying documents	8	4.9
Adequate seats	3	1.9
Clear directions to service points	3	1.9
Responsiveness	9	5.6
Accurate diagnosis of problems	3	1.9
Good signage	8	4.9
Adequate parking space	1	.6
Giving clear instructions to customers	1	.6
Being courteous to customers	13	8.0
Knowledge to answer customers' questions	3	1.9
Staff with people at heart	3	1.9
Understanding customers' problems	4	2.5
<b>Total</b>	<b>162</b>	<b>100.0</b>

## VI. CONCLUSIONS

The study established that customer satisfaction at the National Social Security Authority is rather low, 62%. Considering that NSSA runs compulsory pension schemes, to which employees and employers are compelled by the law to contribute, it is apparent that NSSA was operating below what is expected of it. The expectation is that NSSA would give pensioners value for their money by offering them quality service, which satisfies them. This expectation is in tandem with the International Social Security Association's service quality guidelines, which place emphasis on putting customers at the centre of the social security system from where they can leverage stakeholders in order to access social security benefits in the best way, which suits their needs.

It was evident from the analysed data that service quality on most of the five dimensions of the SERVQUAL model was generally good. NSSA fared relatively well on service quality on tangibles. This is presumably because it has over the years been investing heavily in infrastructure, especially in buildings. NSSA, thus, has nice building which are sufficiently equipped. However, apparently what is more critical is the delivery of service in a timely manner and the actual interaction between NSSA officials and customers. Clearly, this is where NSSA is lacking. Generally, the service quality at NSSA as measured by the dimensions of assurance and empathy was also quite good. Service quality with respect to reliability and responsiveness was not quite good as these dimensions tended to be affected by slow processing of benefits, inaccuracies in terms of informing customers about when services will be rendered and lack of prompt responses to customer needs.

The major reason for dissatisfaction with service at NSSA was slow processing of benefits, with the second major reason being long and slow moving queues in the service room.

It can be concluded from the findings of this study that SERVQUAL is apparently the appropriate model for assessing customer satisfaction in pension institutions like NSSA. The respondents' conception of service quality and customer satisfaction closely approximated that of the SERVQUAL model. It shows that from the perspective of the pensioners the constructs of the SERVQUAL model are generally appropriate for assessing customer satisfaction at NSSA. However, it is important to note that responsiveness, with R.48 had a minimal impact on customer satisfaction. This could indicate that it is not an important construct for measuring customer satisfaction at NSSA.

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# Analysis of phytoconstituents and antimicrobial properties of leaf extract of *Commelina benghalensis* L, against selected microbes.

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**Abstract:** The leaf extracts of *Commelina benghalensis* L were subjected to phytochemical and antimicrobial analysis. Chloroform extract showed the best results. Presence of tannin, flavonoid, phenol, carbohydrate and volatile oil were observed in the chloroform extract which showed the maximum activity against the pathogenic bacterial strains *Escherichia coli*, *Staphylococcus aureus*, *Salmonella typhi* and fungal strain *Candida albicans* with 7mm, 1mm, 3mm and 4mm of inhibition zone respectively compared to hexane and methanolic extract which showed the least activity. The dilution susceptibility test method was used to determine the Minimum Inhibition Concentration (MIC) of the chloroform extract. MIC value was determined as 22.5mg/ml. The present data provides the basis that leaf extract of *Commelina benghalensis* L can also be used for therapeutic purposes against common pathogenic microbes.

**Keywords:** Antimicrobial activity, *Commelina benghalensis* L, MIC, zone of inhibition.

**Introduction:** *Commelina benghalensis* L. is a medicinal plant and native in Southeast Asia. It is used in the Indian subcontinent as a folk medicine for the treatment of variety of ailments. It is also known as tropical spiderwort, is an herbaceous perennial and a troublesome weed, native to Africa and tropical Asia. They belong to this family Commelinaceae and genus *Commelina* (Santosh et al. 2013). Whole part of the plant is medicinally useful. Previous studies have shown that the leaves possess antioxidant, diuretic, antihypertensive, and anti inflammatory effects. It is also used for conjunctivitis, cataracts, night blindness, pain (headaches and toothaches), skin diseases (eczema, abscesses, acne, scabies, and warts), respiratory tract and mental disorders and insomnia. These beneficial effects have been attributed to the presence of primary and secondary metabolites such as polyphenols, amino acids, alkaloids and flavonoids. These phytochemicals have therapeutic importance). Literature search revealed not many reports on antibacterial activity of *C. benghalensis* L except a few ( Sumithra and Purushothaman 2017). Therefore, the present study was designed to investigate the antibacterial activity of leaf extract of *C. benghalensis* L. in order to examine the pharmacological basis of the use of the plant in folk medicine for the treatment of infectious diseases.

**Materials and Method:** The plant of *Commelina benghalensis* was collected from the Nursery near Gandhi Maidan Patna. The fresh leaves were cleaned and then were dried in hot air oven at 45°C. Dried leaves were ground to a coarse powder in a blender. To 200mg of coarse powder 500ml of each Hexane, Chloroform and Methanol were added and kept for 24 hours. The solvent from each extract was filtered for phytochemical and anti microbial screening.

**Preliminary screening of phytochemicals:** Freshly prepared extracts of the leaves were subjected to phytochemical analysis to find out the presence of the following phyto constituent like sterols, tannins, sugar, alkaloids, flavonoids, saponins, terpenoids and glycosides by standard methods (Jemilat et al. 2010)

**Test for Alkaloid:** Three ml of extracts were stirred with 3 ml of 1% HCl on steam bath. Mayer and Wagner's reagent was then added to the mixture. Brown red precipitate was taken as an evidence for the presence of alkaloid.

**Test for Tannin:** Two ml of extracts were stirred with 2 ml of FeCl<sub>3</sub> solution. Formation of green colour indicated the presence of tannin.

**Test for Saponin:** Five ml of extracts were shaken vigorously with 5 ml of distilled water in a test tube and warmed. The formation of stable foam was taken as an indication of the presence of saponin.

**Test for Flavonoid:** Two ml of extracts were treated with 2 ml of 10% lead acetate solution. Formation of a yellow precipitate was taken as a positive test for flavonoid.

**Test for Terpenoid:** Two ml of extracts were treated with 2 ml chloroform and evaporated to dryness. 2 ml of concentrated H<sub>2</sub>SO<sub>4</sub> was added. Development of a greyish colour indicated the presence of terpenoid.

**Test for Glycoside:** Two ml of extracts were treated with 2 ml of acetic acid. The solutions were cooled in ice. H<sub>2</sub>SO<sub>4</sub> was then added carefully. A colour change from violet to blue to green indicated the presence of glycoside.

**Test for Steroid:** Two ml of leaf extracts were dissolved in 2 ml of chloroform. 2 ml concentrated H<sub>2</sub>SO<sub>4</sub> was added in it. The upper layer turned red and H<sub>2</sub>SO<sub>4</sub> layer showed green colour. This indicated the presence of steroid.

**Test for Phenol:** Few drops of 5% ferric chloride were added to 2ml of extracts. Appearance of black colour indicated the presence of phenol.

**Antibmicrobial sensitivity assay by disc diffusion method:** Pure culture of pathogenic strains of *Staphylococcus aureus*, *Salmonella typhi*, *Escherichia coli* and *Candida albicans* were obtained from the Microbiology department, PMCH, Patna. Disc diffusion method was used to assess the antimicrobial effect of the leaf extract against the selected test microorganisms. Tests were performed in triplets against each selected strains of bacteria and fungus. Chloramphenicol and Fluconazole were used as control for bacterial and fungal strains respectively.

Baybei et al (2004), method was followed. Concentration of the sample ranging from 2.5, 5, 7.5, 10, 12.5, 15, 17.5, 20, 22.5 and 25mg/ml were used to measure the Minimum Inhibition Concentration (MIC) by dilution susceptibility test

**Results and Discussion:** The result of the investigation indicates the presence of five active phytochemicals in the Chloroform extract. Methanol extract contains three whereas the Hexane extract contained only two secondary metabolites as shown in Table 1. All the extracts showed variable degree of antimicrobial activity against selected test microorganisms. Chloroform extract was observed as most effective crude sample against the selected bacterial strain *E.coli*. Hexane extract was found to be more effective against the fungal strain *Candida albicans*. The results of the antimicrobial analysis indicate that chloroform extract had more inhibitory effect on *Escherichia coli* than *Staphylococcus aureus* which showed inhibition zone of 7mm and 1mm respectively. Methanol extract was ineffective against any test microorganism. The results are tabulated in Table 2. The Minimum Inhibition Concentration (MIC) value indicated that high concentration of extract was effective against the pathogenic microorganisms.

**Table 1. Phytochemical screening of leaf extracts of in different solvents**

Phytochemical tested	Different Leaf extract in different solvent		
	Chloroform	Hexane	Methanol
Tannin	+	-	+
Flavanoid	+	+	+
Saponin	-	-	-
Steroid	-	-	-
Terpinoid	-	-	-
Glycoside	-	-	-
Phenol	+	-	-

(Present +, absent -)

**Table 2. Antimicrobial screening of leaf extracts of *Commelina benghalensis L***

Test Microorganisms	Diameter of zone of inhibition(mm)			Control (+ve)
	Chloroform	Hexane	Methanol	
<b>Bacteria</b>				
<i>Staphylococcus aureus</i>	1	-	-	5
<i>Escherichia coli</i>	7	-	-	4
<i>Salmonella typhi</i>	3	4	-	10
<b>Fungi</b>				
<i>Candida albicans</i>	4	5	-	7

Chloramphenicol was used as standard antibacterial agent and Fluconazole was used as standard antifungal agent.

Extraction and phytochemical screening of bioactive agents from medicinal plants permits the demonstration of their physiological activities. The present study on leaf extract of *Commelina benghalensis L* shows the presence of tannins, flavonoids, carbohydrates and phenol. The results are similar to the earlier work of Sumithra and Purushothaman (2017) which also showed the presence of these phytochemicals.. According to Misra et al (2016) tannins and phenol compounds have been

found to inhibit bacterial and fungal growth and also capable of protecting certain plants against infection. The present study showed that Chloroform extract was most effective against the bacterial strains and it contained most of the phytochemicals. *Staphylococcus aureus* shows minimum inhibition zone and *E.coli* shows maximum inhibition( Kunle and Egharevba 2009). The Hexane extract showed the maximum inhibitory effect against the fungal strain. The isolation of volatile oils in *Commelina benghalensis L* confirmed the activity showed against the test organisms by this plant and also in part confirmed the report (Jarald *et al.*, 2009) of the oils isolated from same plant by distillation to exhibit great antibacterial activity.

### Conclusion:

The results of this study suggests that the leaves of *Commelina benghalensis L* are rich in phytochemicals which have intermediate antimicrobial activity against the pathogenic microbes *Staphylococcus aureus*, *Salmonella typhi* and *Escherichia.coli*. *Candida albicans* is markedly resistant to Lemongrass. The MIC of leaf extracts of *Commelina benghalensis L* reveals that a higher dose of the plant extract is required to bring about a significant activity in the body. Four active ingredients were identified in the plant leaf which include flavonoids, tannins, carbohydrates and volatile oils. Further studies can be made to identify the chemical nature of the antimicrobial properties present in the leaf extract of *Commelina benghalensis L*.

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# Thirst for Emancipation in Bharathi Mukherjee's *Jasmine*

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**Abstract-** Indian English Literature from the last two decades has gained immense recognition all over the world. Writers started to rediscover the literary heritage with fascinating richness and variety of folklore culture and literature. Women have empowered themselves to free their hands from men. To establish their identity many Indian women writers have been flourishing since independence. Even diasporic women writers have made their contribution to the rise of women empowerment through their writings. Bharathi Mukherjee is one of the pioneer writers who came to give her point of view about the influence of western culture in her novels. Though she is an immigrant her novels are incorporated with cultural dichotomy and women empowerment.

**Index Terms-** Diaspora, Empowerment, feminism.

## I. INTRODUCTION

Bharati Mukherjee being an expatriate and an immigrant, her writings largely reflect her personal experience as a woman. Bharati Mukherjee is caught between two cultures. She is an Indian born American novelist who has received considerable attention from all the audience in a short period. She has been widely acknowledged as the voice of expatriate-immigrant sensibility.

In her novel *Jasmine*, Mukherjee has indulged autobiographical elements and through the protagonists, she reflected herself in close projections. Being a Bengali-Indian woman, she found it difficult to limit herself in India, so she crossed boundaries and enabled herself as a pioneer of new experiences and literature. Anita Myles in her book *Feminism and the Post-Modern Women Novelists in English* quoted the words of Mukherjee given in an interview, "Fiction must be a metaphor. It is not a transcription of real life but it's a distillation and pitching at higher intensification of life. It's always a distortion" (108). From her statement the readers can get a clear idea that her novels have distillation and distortion form.

Jyoti was her real name and this name had banned her identity and kept her idle. Masterji, her school master was the first person to break her shell. The character Jyoti is presented as a young child. She is academically brilliant and good at English, but all that did not help her pursue her education. The following lines by Masterji to Jyoti's father implies the significance of girl's education: "It is important that modern ladies go for secondary-school education and find themselves positions. They are not shackling themselves to wifehood and maternity first chance. Surely you know, sir, that in our modern society many bright ladies are finding positions?" (*Jasmine* 50).

Masterji pleads with Jyoti's father to permit Jyoti to continue her education. Masterji feels that the society is transforming into a modern society. As the society changes, the recognition for women also change and their positions should change into educated women. Masterji is the first person to engrave the change in Jyoti's life. Through Jyoti's life he tries to create awareness about women's education. As a man he senses that these changes are palatable for a woman's life. No other woman in the village is as educated as Jyoti.

Jyoti is a unique girl in the village Hasnapur. She has the tendency to instill her individual growth in her society. As the story opens the astrologer foretells her widowhood and exile till the end of her life. She does not believe his words and feels nothingness. Jyoti's life transforms at each stage and she baptized as Jyoti, Jasmine, Jase and Jane at different stages of her life. Feminism bloomed in Jyoti's life when she was transformed from Jyoti to Jasmine. Her life flourished her liberty from the hands of male dominance through the help of Masterji and Prakash. As the title signifies, Jasmine is the seed for a new beginning of her life. The story progresses with her present life as Jane in Iowa who is pregnant and unmarried. She often flashes back to her life in India and the United States.

When her identity was Jyoti, her brothers were proud to have a brilliant sister who unlike other village girls. They had smuggled her to their examination and made her write their exams because she can write English well. Masterji has told already that she had written the best English compositions and also made her to translate manuals and instructions. Not only her brothers but also her neighbours liked her very much. They would keep her with them for she is good at numbers which proves useful for them in the market. She says, "The women liked having me with them because I could add fast in my head, and because I always caught the lime and chillies vendor when he cheated them" (*Jasmine* 47). She has all those talents to become a brave girl in her village but no one valued her uniqueness. Only after the appearance of Prakash she gained an identity of her own.

Prakash plays the role of a modern man of twenty-four years old who is an electronic student. He wants to go abroad in order to live an enlightened life in a foreign country. He marries Jyoti who is a sister to his friend. Jyoti was fourteen when he married. He is one of the best men in the village. He admits that women were not slaves anymore and they are worth enough to free themselves from hegemonic authority. Not only his thoughts show respect to woman but also, he proves it in his married life. He refuses dowry from Jyoti and takes her to Punjab to create a new beginning in her life. Her life with Prakash has been a drastic change where he truly cares her as a better half in his life. She says, "He wanted me to call him by his first name. 'Only in feudal societies is the woman

still as vassal,' he explained. 'Hasnapur is feudal.' In Hasnapur wives used only pronouns to address their husbands" (*Jasmine* 77). Prakash could not change the feudal society but he has initiated the progress from Jyoti. He treats her as his equal which is revealed from the above lines. The change he wants from Jyoti is reflected in the following lines:

He wanted to break down the Jyoti I'd been in Hasnapur and make me a new kind of city woman. To break off the past, he gave me a new name: Jasmine. He said, "You are small and sweet and heady, my Jasmine. You'll quicken the whole world with your perfumes. Jyoti, Jasmine: I shuttled between identities. (*Jasmine* 77)

He gives her a new name to cherish her liberty as a feminist. Jasmine's topsy turvy life starts after her change of name from Jyoti. Jasmine's character is well known for feministic approach. Not only her character but also the characters around her support her as a feminist. She lives her happy life as a woman of freedom with Prakash. He gives his manual to read and educates her. He teaches her modern values so that she can survive in United States to lead a peaceful life with him.

Unfortunately, her life becomes unhappy when Prakash dies due to a bomb blast. The death of Prakash pushes her to widowhood, "I wanted to scream, 'Feudalism! I am widow in the war of feudalisms'" (*Jasmine* 97). Her transformation did not continue after the death of Prakash. Jasmine, the woman of bravery and individuality was devastated and was made to sit in a corner as a widow. This painful state led to frustration and anguish. Her new life was created by Prakash and after much thought she decides to fulfill her husband's mission to open a store 'Vijh & Wife'. From that moment onwards, with the confidence instilled by Prakash she plans to go to America. "A village girl, going alone to America, without job, husband, or papers? I must be mad" (*Jasmine* 97). Her husband's vision had created perseverance in herself to travel abroad with no hope. She would face many obstacles through her travelling but she her determination changed the ideology that women are not only fit for household works but also eligible to imprint their individuality in the society.

As an Indian girl, no other woman is as challenging as Jasmine. When she leaves India she forges her document as she is an underaged woman. As a minor girl, she initiates her big step into an alien country. This shows that a woman can achieve anything in this world if they have perseverance and a will to face challenges. Rather than sitting idle at home, Jasmine leaps into the world of the unknown. This strong and courageous self evolved only with the confidence which she had imbibed from Prakash. He was the only man who had sown the seeds of feminism in Jasmine. As it was a seed Prakash had to nurture it by preaching the modern values and making Jasmine brave enough to fight for her rights. After the initial orientation, the seed took shape and emerged as a fine individual. By all the courage and perseverance, she manages to fulfill his dream by visiting his husband's favourite professor Dave Vadhera.

She travels to New York by ship where she gets to know about the captain of the ship, Half-Face. He is the person who had ruined her early life in the US. He drags her to a motel rips off her clothes and rapes her despite her protest that she is a Hindu widow. Jasmine steeped in Indian culture, tries to kill herself but something strikes at that time and she plans to kill her molester. She feels, "It was the murkiness of the mirror and a sudden sense

of mission that stopped me. What if my mission was not yet over? I didn't *feel* the passionate embrace of Lord Yama that could turn a kerosene flame into a lover's caress" (*Jasmine* 117-118). Losing her chastity on a foreign soil and from all those sufferings she tries to overcome her personal feelings in order to complete her mission. She kills him cruelly by slitting his body with a blade. He could not stop his bleeding as he was unable to find where the cut was. At that moment she transforms herself as Kali, the Goddess and devastates the man who had ruined her life on her first day in the U.S. According to Sengupta, Bharati Mukherjee uses to bring out the protagonist's feminist trait is that of Kali, the Goddess of Destruction. But since in Hindu Mythology Kali is an incarnation of Durga, the Goddess of Strength (shakti), is more relevant to the strength of a woman like Jasmine who has embarked on a perilous journey to the New World to fulfil her husband's dream (200).

She regains her strength and tries to live by leaving her life to fate. American life to Jasmine is unforgettable. For many days she wandered in the streets of America in starvation. All her thoughts of American life were broken until she meets Lillian Gordon. With her help she visits professorji and stays with him. Professorji lives with his parents and his wife Nirmala. America changes her and once again she goes back to her identity as Jyoti and she lives again as a widow. The liberty of a woman is concerned neither in India nor America. In India she proves her individuality whereas in American she leads the life of a traditional Indian girl who sits idle after the death of her husband. With the name of the country each person can understand the status of people in that country. For instance, people might think America might change their life style when compared to their native place. In reality the people in America still follow their life style which they had followed in their native country. Professorji, is an immigrant but the life style is still same as an Indian and Jasmine being a new makeover from Jyoti is pushed again to Jyoti in American not in India.

Jasmine moves away from Professorji's house and with the help of Kate, Lillian Gordon's daughter she gets the job as a caretaker in Taylor Hayes home. According to Monica Balyan Dahiya, she lived her life there as an American and her life changed back to Jasmine where she can complete the mission of Prakash's wish. Her changeover is totally American and takes care of Taylor and Wylie's adopted daughter Duff. After her meeting with Taylor and Wylie, Jasmine gets back her brave personality to handle her life forever. Within few months she returns the debt that she owes Professorji. She then takes up her study after all the hurdles she has faced before and after America. She is proud of her education:

With Columbia employment I was eligible for free tuition in Columbia extension courses, if I could convince them to overlook the fact that I was a sixth-grade dropout. There was nurse's training at Columbia-Presbyterian. There was English as a Second Language, but they told me my English was too good... There was nothing that seemed too exotic, nothing that did not seem essential to my future. (*Jasmine* 180)

The woman who lost her father at a young age, lost her husband in a bomb blast, pushed to widowhood at a young age, expatriate to America and raped by the Captain and then her murder of the Captain and her refugee life in Professorji's house and later Taylor's home, in all these situations she is the victim but everyone blames her as she is a girl. Being a girl child people think

that she has brought curse to the family and because of the curse her family has been destroyed. America has changed all the curses into boons. She has cherished her life with her intelligence.

Her destiny does not stop her to stay with Taylor. She runs to Iowa away from Taylor because she sees the murderer of her husband's death. There she meets Bud Ripplemeyer who works in a bank and paralysed. He was not paralysed before he meets Jasmine. He was shot by Harlon Kroener as he had some misunderstandings with Bud. In Iowa Jasmine is again transformed into Jane Ripplemeyer, pregnant with Bud's child. Bud wants to marry her officially but something stops her from doing so, for she thinks that she is not ready to accept his proposal. The reason could be that she is betraying Karin. Karin divorced Bud after Jasmine's arrival. This can be a part where she might object his marriage proposal or the love she still has for Taylor. Even though she is pregnant with Bud's child, her heart still aches for Taylor. As the story paves through the end she gets a message from Taylor, "Duff and I're heading your way. She still doesn't know and I'm hoping you'll help. She's quite a young lady and she remembers you perfectly. As do I. Wylie doesn't consider my trip insane. Stay put. Don't dare run away again" (*Jasmine* 209). On one side she feels wrong to leave Bud at his position on the other side she feels happy at the bottom of the heart for the arrival of Taylor. Taylor can be a portrayal of Prakash where both the characters support Jasmine to be an independent woman. Prakash gives the liberty to Jasmine as a gender of equal rights. She is able to take the right decision and she can enlighten her life. Taylor also grabs the attention of Jasmine and instills feminist traits in her.

Jasmine felt her femininity when she was with Prakash. After Prakash's death she felt the same comfort with Taylor. She ran away from Taylor in order to save Taylor not like Prakash who was killed because of her. She was not able to save him when she was with him but now atleast she could save Taylor to atone of Prakash's death so that her heart could rest at peace.

According to Sengupta, Bharati Mukherjee passes the final judgement through her mouthpiece, *Jasmine*. The readers are at once won over by her scintillating prose, her cadenced rhythm and above all by her powerful feminist convictions: "I am caught between the promise of America and old-world dutifulness." And as she, the eternal caregiver, walks away with Taylor and Duff, leaving Bud (whose child she is carrying but for whom she feels only pity and not love): "It isn't guilt that I feel it's relief. I realize I have already stopped thinking of myself as Jane. Adventure, risk, transformation: the frontier is pushing indoors through uncaulked windows. Watch me reposition the stars, I whisper to the astrologer who floats cross-legged above my kitchen stove" (*Jasmine* 240). This is the final affirmation of a true feminist (Sengupta, C. "Feminine Mystique in Bharati Mukherjee's *Jasmine*" 203).

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# A Study on Comparative Analysis of Non-Performing Assets in Selected Private Sector Bankst

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**Abstract-** Banking is the fastest growing economy in India. A major consequence faced by banks nowadays is Non – Performing Assets. A high level of NPA in banks will increase the credit values and affects the profit of banks. Thus, the banks will lose their investment for the long turn. The main objective of the study is to highlight the NPA trend growth of each banks and the Correlation Analysis of Net Profit and Net NPAs of each bank. The study is descriptive in nature and secondary data are collected and analyzed using Trend Ratio, Current Ratio, Assets on Equity Ratio and Pearson Correlation Co-efficient Analysis to examining NPAs, Net Profit and Assets quality of banks. The study is observed for the financial years from 2013-14 to 2017-18, Annual Reports of Selected Private Sector Banks such as Axis Bank, Federal Bank, IndusInd Bank. The trend analysis is used to understand the increasing profitability and bad loans structures in the banks and Correlation Analysis is used to compare the Net NPA and Net Profit. Through the study, it was concluded that IndusInd Bank is having positive growth in Net Profit as well as growth in NPAs which is not affecting the banking performance when comparing with other two banks.

**Index Terms-** NPA, Trend Ratio, Current Ratio, Correlation Co-efficient, Net Profit, Performance

## I. INTRODUCTION

### **N**1.1.Overview of the Study on-Performing Assets

Non-Performing Assets are meant by the uncovered funds which is lender by the banks to individuals or a companies. The amount which is lender to individual or companies have to be written by 90 days or recover within 90 days of the cash received. In case, the amount which is not recovered within 90 days it is termed as Non-Performing Assets (NPA). The NPAs are sources in credit risk and the cas to be received are mentioned as “out of order” account.

The Non-Performing Assets are variously classified by doubtful assets, substandard assets. The doubtful assets are to recovered within 12 months and the substandard assets are amount considered as the doubtful assets which are not received by the bank.

### **Why Private Sector banks?**

The role of private sector banks is increasing nowadays as many individuals and companies are interested in getting loans for

their needs. Private Sector Banks are considering as fastest provider in India Banking Sectors. While the public sector banks are facing major NPAs and it is easy to find a solution to NPA effects and their nature of affecting the banks’ performance. In Private Sector Banks, Axis Bank, Federal Bank, IndusInd Bank is selected for analysis as per the sales value in profit & loss account and goodwill among the customers.

## 1.2 Industry Profile

- ❖ The Indian banking system consists of 27 public sector banks, 21 private sector banks, 49 foreign banks, 56 regional rural banks, 1,562 urban cooperative banks and 94,384 rural cooperative banks, in addition to cooperative credit institutions.
- ❖ As of Q2 FY2019, total credit extended by commercial banks surged to ₹90,579.89 billion and deposits grew to ₹118,501.82 billion.
- ❖ Indian banks are increasingly focusing on adopting integrated approach to risk management. Banks have already embraced the international banking supervision accord of Basel II, and majority of the banks already meet capital requirements of Basel III, which has a deadline of March 31, 2019.
- ❖ Reserve Bank of India (RBI) has decided to set up Public Credit Registry (PCR) an extensive database of credit information which is accessible to all stakeholders. The Insolvency and Bankruptcy Code (Amendment) Ordinance, 2017 Bill has been passed and is expected to strengthen the banking sector.
- ❖ Deposits under Pradhan Mantri Jan Dhan Yojana (PMJDY) increased to ₹863.21 billion were deposited and 336.6 million accounts were opened in India. In May 2018, the Government of India provided ₹6 trillion loans to 120 million beneficiaries under Mudra scheme. In May 2018, the total number of subscribers was 11 million, under Atal Pension Yojna.
- ❖ Rising incomes are expected to enhance the need for banking services in rural areas and therefore drive the growth of the sector. As of September 2018, Department of Financial Services (DFS), Ministry of Finance and National Informatics Centre (NIC) launched Jan Dhan Darshak as a part of financial inclusion initiative. It is a mobile app to help people locate financial services in India.

❖ The digital payments revolution will trigger massive changes in the way credit is disbursed in India. Debit cards have radically replaced credit cards as the preferred payment mode in India, after demonetization. Debit cards

garnered a share of 87.14 per cent of the total card spending.

**List of Public Sector Banks and Private Sector Banks in India**

<b>Public Sector Banks</b>	<b>Private Sector Banks</b>
1. Allahabad Bank	1. Catholic Syrian Bank
2. Andhra Bank	2. City Union Bank
3. Bank of Baroda	3. Dhanlaxmi Bank
4. Bank of India	4. Federal Bank
5. Bank of Maharashtra	5. Jammu and Kashmir Bank
6. Canara Bank	6. Karnataka Bank
7. Central Bank of India	7. Karur Vysya Bank
8. Corporation Bank	8. Lakshmi Vilas Bank
9. Dena Bank	9. Nainital Bank
10. Indian Bank	10. Ratnakar Bank
11. Indian Overseas Bank	11. South Indian Bank
12. Oriental Bank of Commerce	12. Tamilnad Mercantile Bank
13. Punjab National Bank	13. Axis Bank
14. Punjab & Sind Bank	14. Development Credit Bank
15. State Bank of India	15. HDFC Bank
16. Syndicate Bank	16. ICICI Bank
17. UCO Bank	17. IndusInd Bank
18. Union Bank of India	18. Kotak Mahindra Bank
19. United Bank of India	19. Yes Bank
20. Vijaya Bank	20. IDFC
21. IDBI Bank Ltd	21. Bandhan Bank
22. Bharatiya Mahila Bank	

For the study, Three Banks from Private Sector is selected namely Axis Bank, Federal Bank and IndusInd Bank.

### 1.3 Company Profile

#### 1.3.1 Axis Bank



It is India's third largest private sector bank, which is offering the sources and funds to the business operations in various sectors of the industrial units and the public. The Bank has 59,600 employees with its 3,882 domestic branches and 12,660 ATMs across the country. The network of Axis Bank spreads across 2,211 cities and towns, enabling the Bank to reach out to a large cross-section of customers with an array of products and services.

#### Vision

To be the preferred financial solutions provider excelling in customer delivery through insight, empowered employees and smart use of technology.

#### Values

Company's Core Values,

- ❖ Customer Centricity
- ❖ Ethics
- ❖ Transparency
- ❖ Teamwork
- ❖ Ownership

#### Chief Executive Officer



**Amitabh Chaudhry**

**Industry Type** : Private Limited Bank

**Operating Profit** : ₹15,594 Crores

**Net Profit** : ₹ 276 Crores

**Gross NPA%** : 6.77%

**Net NPA%** : 3.40%

#### Corporate Social Responsibility

Amount of Corporate Social Responsibility expenses spent during the year - 126.50 crores

- ❖ Infrastructure Development
- ❖ Environmental
- ❖ Healthcare
- ❖ Education

#### 1.3.2 Federal Bank



The ancient development of federal bank is brought by the year 1931 and avil the first facility of banking resources for the people in pre-independence era. The founder and the visionary of federal bank, Late K.P Hormis is the main coin for the bank to be developed in this particular modern times of India. Federal Bank is originated from its ancient name as Nationwide Institutions. Now the bank is developed and placed its leg in 25 states and makes its best part of BSE and NSE stock prices.

#### Vision

- ❖ To be the 'Most Admired Bank' which is digitally enabled with a sharp focus on Micro, Medium and Middle market enterprises.

## Mission

- ❖ Achieve a consistent annual post-tax return of 18% per month.
- ❖ Develop in every employee a high degree of pride and loyalty in serving the bank.

## Chief Executive Officer



**Shyam Srinivasan**

**Industry Type** : Private Limited Bank

**Operating Profit** : ₹ 5,692 Crores

**Net Profit** : ₹ 2,297 Crores

**Gross NPA%** : 3%

**Net NPA%** : 1.69%

## Corporate Social Responsibility

The bank has spent 14.43 crores on various social and environment activities, in the areas follow as,

- ❖ Education and Skill
- ❖ Healthcare & Safety
- ❖ Rural Development
- ❖ Welfare & Poverty
- ❖
- ❖

## 1.3.3 IndusInd Bank

### IndusInd Bank

IndusInd Bank Limited is a Mumbai based Indian new generation bank, established in 1994. IndusInd Bank was inaugurated in April 1994 by then Union Finance Minister Manmohan Singh. IndusInd Bank is the first among the new-generation private banks in India. As on June 30, 2016, IndusInd Bank has 1,004 branches, and 1885 ATMs spread across 625 geographical locations of the country. Mumbai has the maximum number of bank branches followed by New Delhi and Chennai. The bank has also proposed to double the branches count to 1200 by March 2019.

## Vision

IndusInd Bank will be,

- ❖ A relevant business and banking partner to its clients.
- ❖ Customer Responsive, striving at all times to collaborate with clients in providing solutions for their banking needs.
- ❖ A forerunner in the marketplace in terms of profitability, productivity and efficiency.
- ❖ Engaged with all our stakeholders and will deliver sustainable and compliant returns.

## Mission

- ❖ They will consistently add value to all our stakeholders and emerge as India's most convenient Bank with Best-in-Banking financial parameters together with the doubling of loan book, clients and profits within the next 3 years.



## Chief Executive Officer



**Romesh Sobti**

**Type Of Industry** : Private Bank Limited

❖ To measure the effect of NPA in Selected Private Sector Banks Performance.

**Operating Profit** : ₹ 6,656 Crores

**Net Profit** : ₹ 3,606 Crores

**Gross NPA%** : 1.34%

**Net NPA%** : 0.54%

### Corporate Social Responsibility

The Bank has spent 20.47 crores on various social and environmental activities, in the areas follows as,

- ❖ Rural Development & Inclusiveness
- ❖ Environmental
- ❖ Sustainability
- ❖ Preventive
- ❖ Healthcare
- ❖ Education & Sports

### 1.4 Need for the Study

Banking is the fastest growing economy in India. A major consequence faced by banks now a days is Non – Performing Assets. A high level of NPA in banks will increase the credit values and affects the profit of banks. Thus, the banks will lose their investment for long turn. The article titled “Banks NPAs touch 12.2% by March 2019” is showing the current NPAs rising from 11.6% to 12.2% by March 2019. This shows that Banks and its sector are having more capitalization in investing money and affects the entire economy of the country. It is necessary to trim the NPAs to protect the country’s economy and to increase Bank’s efficiency.

### 1.5 Objectives of the Study

#### Primary Objective

- ❖ To Study on comparative analysis of Non – Performing Assets in Selected Private Sector Banks in India.

#### Secondary Objectives

- ❖ To study the trend of Gross NPA and Net NPA of Selected Private Sector Banks in India.

### 1.6 Scope of the Study

The scope of the study is to understand the comparative analysis of Non-Performing Assets based on secondary collected from Annual Reports of the Banks. The empirical research is used to analyse the data and variables. The Pearson Correlation Co-efficient tool is used to find the relationship between two variables and analyse the trend factors in GNPA and NNPA. The process of disbursement is used to evaluate the loans disbursement in various sectors and analysing the NPAs in the Geographical distributions.

### 1.7 Limitations of the Study

- ❖ The study is observed from the financial year FY2013-FY2014 to FY2017-FY2018.
- ❖ The data is only based on the secondary data set and focused only on the limited financial statement.
- ❖ The study is focused only on three banks such as Axis Bank, Federal Bank, IndusInd Bank only.

## II. LITERATURE REVIEW

### 2.1 Theoretical Concepts

Comparative analysis is used to compare two or more factors to find the positive relationship in each category of the financial statements or business reports of an individual or company based on its market share value, sales report, financial strategy and net operating revenue. The Bank performance is maintained by the Net Profit and Net Sales acquired through the financial years. In this case, Loans are marking up the important structures in creating the performance of banks as low or high in market structure. The loans paying to customer or an individual is to repay or recover by bank from the customer within 90 days and should be considered as interest amount collected on the basis of principal amount provided. When the loans provided to the customer or an individual is become non recoverable funds in future (after 90 days) is considered as Non-Performing Loans or Bad Loans. The Non-Performing Loans are playing major role in bank performance for creating the net profit and analyse the growth of the company for each year. The non-recovered funds are disbursed among various sectors and the NPAs in top five sectors is increasing each financial years. The study is Analytical in nature and analyse the secondary data using various tools like Trend Analysis and Pearson Correlation Co-efficient Ratio in each sectors. Trend Analysis is used to understand the growth of each year and used to analyse to collected data as positive and negative trend growth. Trend analysis can be allowed to each bank and promotes the future trending values in the Profit of Banks.



## 2.2 Review of Literature

1. **Kanika Goyal (2010), an article on “Empirical Study on Non-Performing Assets and Management of Indian Public Sector Banks”.** The analysis is based on trend ratio of GNPA, NNPA and Assets quality. The data is analyzed using Percentage analysis and statistical tools approaching tools like regression analysis, and coefficient approach on ANOVA test and Post Low-Key HSD Procedures.
2. **Bhawna Sethi (2013) had studied “The Comparative Analysis of NPAs in Punjab National Bank and State Bank of India”.** The methodology is based on conceptual framework, population and sample selection, collection of data, analysis of data. Tools use for the analysis is based on Mean, Standard Deviation, Standard Error, T-Test, ANOVA Test.
3. **Samir (June 2013) had studied a “Comparative Analysis of Non-Performing Assets of Selected Commercial Banks in India.** Its objective is to prevent or delays recycling of funds and erodes profit by way of provisions. The methodology is analytical in nature to understand the trend in Gross NPA and Net NPAs as percentage of total Assets respectively. This Paper is based on trend analysis of NPA and evaluates the financial health of banks.
4. **Krishna Murari (Aug 2014) had studied “Comparative Analysis of Non-Performing Assets of Indian Banks: A Study of Public and Private Sector Banks”.** The Data is analyzed using Percentage and ratio method of trend projection and one-way ANOVA. The main objective of banking reforms was to improve efficiency, productivity and profitability of banks.
5. **Ankur Bhushan (Dec. 2016) had studied “The comparative study on NPA in HDFC Bank and OBC Bank”** and screens in the nature of bank’s credit portfolio. The Objective on study is impact on NPA. The methodology is based on Auxiliary data and wellsprings of Data. The ratio analysis of NPA is based on limited resources of NPAs.
6. **Ayub Ahamed KS (Dec.2016) had studied a “Comparative Study of Non-Performing Assets in Private Sectors Banks and Public Sector Banks in India”.** The objectives are to study NPA trend in last 5 years of Private and private sector banks to measure and suggest the proper management of NPA in Banks.
7. **Nithin Gupta (2016) had studied on “Non-Performing Assets of Public and Private Sector Banks in India”.** The data is based on secondary data and analyzed using ratio analysis. The objective on sector wise distribution of NPAs in Public Sector Banks and Private Sector Banks. The ratio helps in finding out the decision on capital funds and the replacement opportunities in the Loans providing Sectors.
8. **Payel Roy (2016) had studied “The Analysis of Non-Performing Assets in Public Sector Banks of India”.** The banks advancing loans should be cautious enough to consider the backgrounds of loan receiver. The secondary data are used on study and analyzed using the secondary data to find the loans distributions and tools used like ANOVA, Regression Analysis for the secondary objectives of the study.
9. **Vivek Rajbahadur Singh (2016) had studied “The Non-Performing Assets of Commercial Banks and its recovery in India”.** The objectives are based on avoid future distractions in NPAs. The methodology based on secondary Data. Highlights the trend analysis and status in impacts in NPA. The NPAs are based on the commercial uses in the recovering process.
10. **Dr. Biswanath Sukul (Jan. 2017) had studied on “Non-Performing Assets: A comparative analysis of selected private sector banks”.** The objectives is to find the comparative analysis on NPA in HDFC Bank, Axis Bank, ICICI Bank. The methodology based on analytical nature and finding the trend ratio in NPAs. The Pearson Correlation Co-Efficient is used to explore the relationship between Net Profit and NPAs.
11. **Rajkumar Mittal (July 2017) had studied “The problem of raising Non-Performing Assets in Banking Sector in India: Comparative Analysis of Public Sector Banks and Private Sector Banks”.** The objectives are used to find the quantum of NPAs in Public Sector Banks and Private Sector Banks in India. The study is primarily analytical and descriptive based on secondary data collected from RBI Publications, Journals, Reports, and website annual report of the Public and Private Sector Banks. Compound Annual Growth is

calculated to identify the percentage increase in NPAs over the selected period.

### III. RESEARCH METHODOLOGY

#### 3.1 Research Design

Analytical Research Design is used for the study. The research is based on secondary data source available and collected from various external sources like annual reports, articles, journals and internet. The Secondary Data are analysed by using various statistical tools and find the solutions to understand the hypothesis in each concept of the values.

Analytical Research Design is mainly involves in facts, figures and variables which can be interpreted and results can be shown in graphs and diagrams for the future purpose of the institutions.

#### 3.2 Sources of Data

Data can be defined as the quantitative or qualitative values of a variable. Data is plural of datum which literally means to give or something given. Data is thought to be the lowest unit of information from which other measurements and analysis can be done. Data can be numbers, images, words, figures, facts or ideas. Data in itself cannot be understood and to get information from the data one must interpret it into meaningful information.

There are two types of Data one is Primary data which is fetched directly from the respondents, collected specially for the purpose of the study, and also is the original source and is first handed information. And the other type is Secondary Data are those data collected by someone else other than the user of those data, common sources of secondary data for social science include censuses information collected and published by the government of India departments, organisational records and data that was originally collected for other research purposes.

In this study the data is fetched from secondary sources for the study. Such as the published annual reports, journals, web portals of the Axis Bank, Federal Bank, IndusInd Bank is used for the study.

#### 3.3 Tools for Analysis

##### 3.3.1 Trend Analysis

A trend analysis is an aspect of technical analysis that tries to predict the future movement of a stock based on past data. Trend analysis is based on the idea that what has happened in the past gives traders an idea of what will happen in the future. There are three main types of trends: short-, intermediate- and long-term.

$$TREND ANALYSIS RATIO = \left( \frac{COMPARED VALUE}{BASE VALUE} \right) * 100$$

In Trend Analysis, base value is starts from 100.00% and have to calculated with Compared Value.

##### 3.3.2 Current Ratio

The current ratio is a liquidity ratio that measures a company's ability to pay short-term obligations or those due within one year. It tells investors and analysts how a company can

maximize the current assets on its balance sheet to satisfy its current debt and other payables.

$$CURRENT RATIO = \left( \frac{CURRENT ASSETS}{CURRENT LIABILITIES} \right)$$

A ratio under 1 indicates that the company's debts due in a year or less are greater than its assets.

##### 3.3.3 Return on Assets

Return on assets (ROA) is the measure of efficiency and the profitable a company is relative to its total assets. The Return on Assets will be used to the financial managers to account the next year.

$$RETURN ON ASSETS = \left( \frac{NET INCOME}{TOTAL ASSETS} \right) * 100$$

##### 3.3.4 Pearson Correlation Co-Efficient Ratio

Pearson Correlation Co-efficient is used to study the relationship between Net Profit and Net NPA to understand the positive growth among the three selected banks. Co-efficient Values are used to predict the present values and future value based on two variables. The variables are based on dependent in one condition and independent in another condition of the financial years.

$$r = \frac{N\sum xy - (\sum x)(\sum y)}{\sqrt{(N\sum x^2 - (\sum x)^2)(N\sum y^2 - (\sum y)^2)}}$$

N – Number of values

$\sum xy$  – Sum of two multiplied variables

$\sum x$  – Sum of total x variable

$\sum y$  – Sum of total y variable

$\sum x^2$  - Sum of total squared x variable

$\sum y^2$  - Sum of total squared y variable

Pearson Correlation Co-efficient is a statistical tool that calculates the strength of the relationship between the relative movements of the two variables. The range of values for the correlation coefficient bounded by 1.0 on an absolute value basis or between -1.0 to 1.0. If the correlation coefficient is greater than 1.0 or less than -1.0, the correlation measurement is incorrect. A correlation of -1.0 shows a perfect negative correlation, while a correlation of 1.0 shows a perfect positive correlation. A correlation of 0.0 shows zero or no relationship between the movement of the two variables.

### IV. ANALYSIS AND DISCUSSION

#### 4.1 Trend Analysis

##### 4.1.1 To Study the trend of Gross NPA and Net NPA

**Table 4.1.1 Bank wise GNPA**

Bank Name	2013-14 ₹ Crore	2014-15 ₹ Crore	2015-16 ₹ Crore	2016-17 ₹ Crore	2018-17 ₹ Crore
Axis Bank	3,146.41	4,110.19	6,087.51	21,280.48	34,248.64
IndusInd Bank	620.79	562.92	776.82	1,054.87	1,704.91
Federal Bank	1,087.41	1,057.73	1,667.77	1,727.05	2,975.62

**Interpretation**

- ❖ The value of GNPA is increasing continuously in each financial year and the GNPA is used to predict the Net Profit in future values.

**Table 4.1.2 Trend GNPA % (in Percentage)**

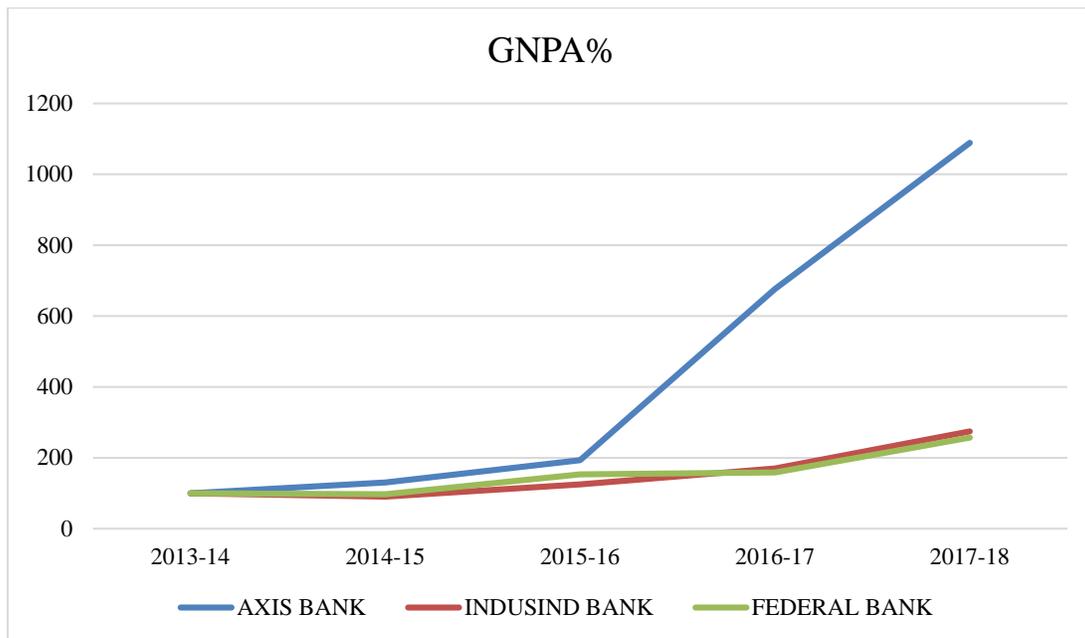
Bank Name	2013-14	2014-15	2015-16	2016-17	2017-18
Axis Bank	100	130.63	193.47	676.34	1088.49
IndusInd Bank	100	90.67	125.13	169.92	274.63
Federal Bank	100	97.27	153.37	158.82	257.08

Axis Bank	100	130.63	193.47	676.34	1088.49
IndusInd Bank	100	90.67	125.13	169.92	274.63
Federal Bank	100	97.27	153.37	158.82	257.08

**Interpretation**

- ❖ Trend Analysis of GNPA in IndusInd Bank and Federal Bank is showing that the banks are facing trouble on FY2014-FY2015 is decreased 10% form base year value and promoting the factors for decrease in Net Profit in IndusInd Bank and Federal Bank is decreased by 3% from base year.
- ❖ On 2015-16, GNPA values are increased by 25% and 40% in IndusInd Bank and Federal Bank respectively. It shows that the banks are facing higher Profitability and less risk return in credit wise transactions.
- ❖ In five years, Axis Bank is having more GNPA% of 1088.4% and shows the higher risk in crediting the future money. And comparing 2017-18 with base year, the ratio is trending towards 100% increase and having less profitability.

**Chart 4.1.1 Trend GNPA%**



**Interpretation**

- ❖ The base year trend analysis percentage is always 100.00%. If the percentage is decreased below 100.00%

it shows that the company is indeed in higher net profit of that particular year. If it is above 100.00%, then the company is positively growing in generating net profit.

**Table 4.1.3 Bank wise Net NPA**

Bank Name	2013-14 ₹ Crore	2014-15 ₹ Crore	2015-16 ₹ Crore	2016-17 ₹ Crore	2018-17 ₹ Crore
Axis Bank	1,024.62	1,316.71	2,522.14	8,626.60	16,592.00
IndusInd Bank	184.5	210.48	321.75	438.90	745.67
Federal Bank	321.56	373.27	950.01	941.20	1,551.96

**Interpretation**

- ❖ In Federal Bank, the FY2016-FY2017 is showing the Net NPA ₹941.20 Crores is decreased from the previous year FY2015-FY2016. It shows that the company is relaxed at the financial year and decreased their risk of returns to promotes more profitability.

**Table 4.1.4 Trend NNPA%**

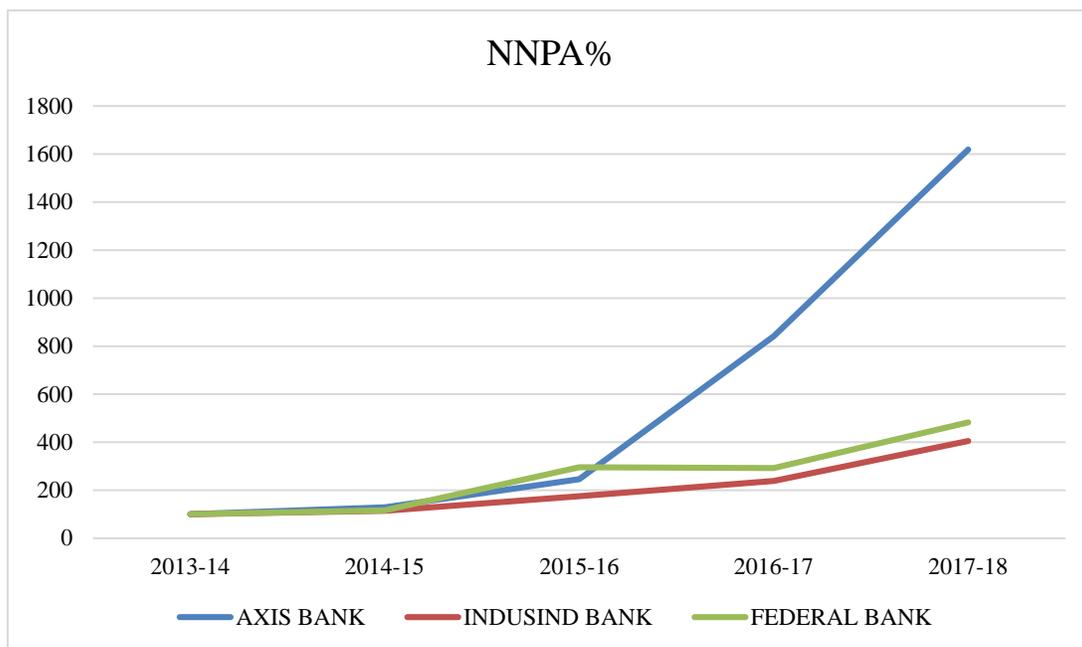
Bank	2013-14	2014-15	2015-16	2016-17	2017-18
Axis Bank	100	128.50	246.15	841.93	1619.33
IndusInd Bank	100	114.36	174.81	238.46	405.14
Federal Bank	100	116.08	295.43	292.69	482.63

Axis Bank	100	128.50	246.15	841.93	1619.33
IndusInd Bank	100	114.36	174.81	238.46	405.14
Federal Bank	100	116.08	295.43	292.69	482.63

**Interpretation**

- ❖ FY2016-FY2017 is analyzed as 3% decrease from FY2015-FY2016 and shows the value ₹9 crores approximately decreased from ₹950 crores and having more profitability in the current year.
- ❖ In FY2017-FY2018 shows that Axis Bank is having more Net NPA has highest value ₹16,592 Crores and with trend ratio of 1619.33% and shows the tremendous growth when compared to previous year and in higher risks factors.
- ❖ Among three banks, IndusInd Bank is rapidly growing in NNPA% by 14%, 60%, 60%, 200% from the base financial year. The 200% growth in NNPA ratio is shows the NPA values are dominating the current Net Profit Value of the Bank.

**Chart 4.1.2 Trend of NNPA%**



**Interpretation**

- ❖ On comparing three banks Trend Ratio of FY2017- FY2018 is shows that IndusInd Bank is having lesser ratio 405.1% and next to Federal Bank, 482.6% and Axis

Bank is placing more trend ratio value of 1619.3% and having more NPA values in five years.

**4.1.2 Current Ratio**

**Table 4.1.5 Current Ratio**

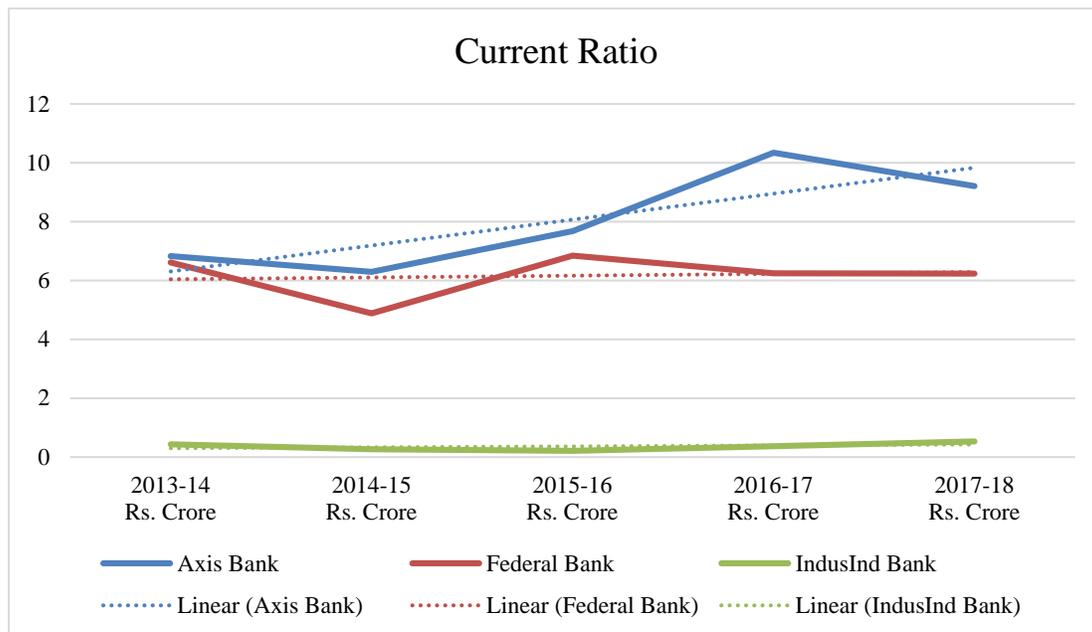
Bank Name	2013-14 ₹ Crore	2014-15 ₹ Crore	2015-16 ₹ Crore	2016-17 ₹ Crore	2017-18 ₹ Crore
Axis Bank	6.82	6.29	7.68	10.34	9.21
IndusInd Bank	0.43	0.26	0.21	0.36	0.53
Federal Bank	6.61	4.88	6.84	6.24	6.23

**Interpretation**

- ❖ In Five Financial years, IndusInd Bank is facing the major issues in distributing the current assets in each year and the bank is incapable in organizing the assets when to compared to other provisions. The ratio rate below 1 is considered for the major disturbance in the financial years.
- ❖ The negative balance in the current ratio is showing that IndusInd Bank have to prepared for less liability in all consecutive years.

- ❖ Axis Bank, shows the ratio of 10.34 in 2016-17 as a positive one and company is good in maintaining the assets and other provisions in all years Axis Bank is stable in current ratio as the company is strengthened in five financial years and the ratio rates are higher than 6.
- ❖ Federal Bank is also good in maintaining the current ratio of each five consecutive years. The ratio resembles on Axis Bank and Federal Bank is good for the organization and may provide the internal funds to the organization.

**Chart 4.1.3 Current Ratio**



**Interpretation**

- ❖ Linear Trend is used in the current ratio to describe the bank’s short-term obligations in meeting their needs in each consecutive financial year.
- ❖ Trend Line of Axis Bank is showing the continuous increase in associating the company assets and their short-term debt paying in year ended. Axis Bank is over the trend line in 2016-17 and their assets value is highly increased, and liabilities of that year is decreased and can

increase internal provisions for the next working capital 2017-18.

- ❖ Trend Line of IndusInd Bank is straight in organizing the assets and liabilities without any increased in the current ratio and the bank can do the moderate changes in the financial years.
- ❖ Federal Bank is also associating the same trend line in current ratio and the bank is stable in solvent among the assets and liabilities in each year.

**4.1.3 Return on Assets**

**Table 4.1.6 Return On Assets (ROA) %**

Bank Name	2013-14	2014-15	2015-16	2016-17	2017-18
Axis Bank	1.62	1.59	1.56	0.61	0.03
IndusInd Bank	1.61	1.64	1.63	1.6	1.62
Federal Bank	1.12	1.21	0.52	0.72	0.63

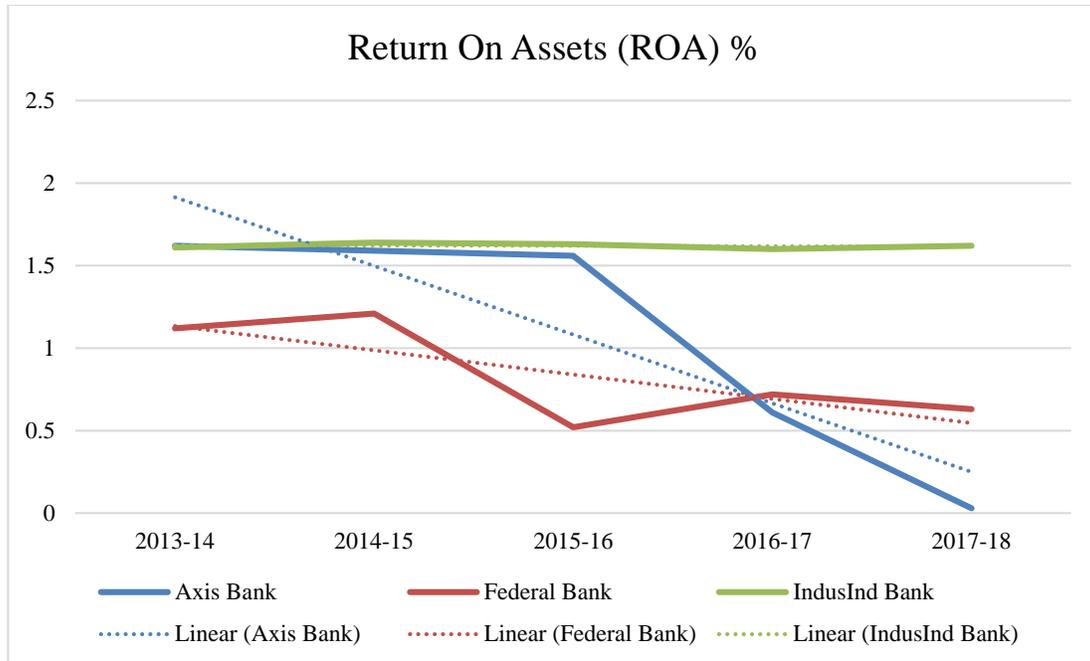
**Interpretation**

- ❖ ROA of Axis Bank is decreasing in all five years And IndusInd Bank is following the same ROA in all financial years. Axis Bank’s Performance is decreasing in each year and reaches 0.03% in 2017-18, shows that the bank is suitable for investor and shareholders to invest the shares.
- ❖ IndusInd Bank’s Performance is moderate and the percentage in each year is 1.6% and shows the bank is good in investing the shares and shareholders to promote new shares in the industry when

compared to Federal Bank and Axis Bank.

- ❖ In 2017-18, Axis Bank is performing the lowest ROA among banks as it holds 0.03% and next to Axis Bank, Federal Bank is having 0.63% and IndusInd Bank holds 1.62% and showing IndusInd Bank is having essential Net Income and have stable investors.
- ❖ In 2013-14, Axis Bank and IndusInd Bank is having the same percentage in ROA and showing the same investors and shareholders on that particular year. It makes the two banks become more competitive in the net profit and assets equality.

**Chart 4.1.4 Return On Assets (ROA) %**



**Interpretation**

- ❖ Trend Line of Axis Bank and Federal Bank is decreasing for the five financial years. Axis Bank is facing the major issue in ROA and doesn't maintains the shareholding partners and investor to promote the shares for the next consecutive years.
- ❖ Trend Line indicates that IndusInd Bank is good in understand the shareholding pattern in achieving the relations between investors in Profit and assets equality.

**4.2.1 To test the relationship between Net NPA and Net Profit of Axis Bank.**

**Negative Hypothesis:** There is negative relationship and indicates the company is decreasing in one variable of the selected variables for the values is below -1.

**Null Hypothesis:** The relationship between two variables are same and the co-efficient ratios are equal to understand the values are consistent when exactly 0.

**Positive Hypothesis:** There is positive relationship and indicates that the values is increasing in one dependent variable of the selected variable for the values is above +1.

**Table 4.2.1 Comparing Net NPA and Net Profit of Axis Bank**

Bank	Particulars	2013-14 ₹ Crores	2014-15 ₹ Crores	2015-16 ₹ Crores	2016-17 ₹ Crores	2017-18 ₹ Crores
Axis Bank	NET NPA	1,024.62	1,316.71	2,522.14	8,626.60	16,592.0
	NET PROFIT	6217.67	7357.82	8223.66	3,679.28	275.68

**Interpretation**

- ❖ Net profit of Axis Bank is continuously decreasing from financial year 2015-16 to 2017-18 and marked up with lowest Net Profit as ₹275.68 Crores and reflects more NPAs in the five years. This condition may bring heavy losses to the bank and may decrease net profit for future years also.
- ❖ Net NPA of Axis Bank is increasing for all five years and reaches the value of ₹16,592 Crores in 2017-18. The Net NPA of Axis Bank is stable in increase and bank have to take remedial measures on clearing those funds.

**Table 4.2.2 Pearson Correlation Co-efficient of Axis Bank**

Bank	Particulars	2013-14 ₹ Crores	2014-15 ₹ Crores	2015-16 ₹ Crores	2016-17 ₹ Crores	2017-18 ₹ Crores	Ratio
Axis Bank	NET NPA	1,024.6	1,316.7	2,522.1	8,626.6	16,592.0	-0.95
	NET PROFIT	6217.67	7357.82	8223.66	3,679.2	275.68	

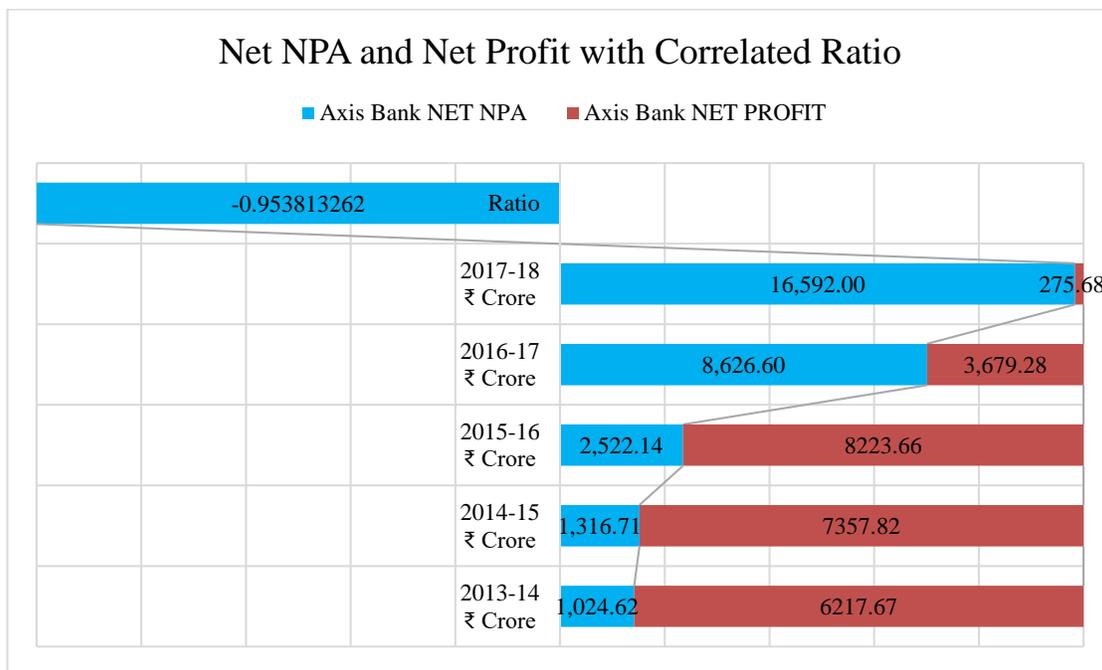
**Interpretation**

- ❖ As Axis Bank is facing major issues in Net NPA increasing for the five financial years, the bank’s correlated ratio is -0.95 and the ratio is negative in relationships and shows that Net NPA and Net Profit is not related as Net NPA is increasing constantly and Net Profit is less when compared with Net NPA.
- ❖ In financial years 2013-14, 2014-15, 2015-16 shows that Axis Bank is maintaining the Net Profit as it requires to

performing the Bank assets and other internal provisions while the Net Profit is also increasing in other side.

- ❖ In financial years, 2017-18 Axis Bank faces its dramatical change in Net Profit and Net NPA is increased by ₹ 8,626.6 Crores and the NPAs is peeked in that year and tends to increase by ₹ 16,592 Crores and Axis Bank is in unexpected issues to control and monitor the funds.

**Chart 4.2.1 Comparing Net NPA and Net Profit of Axis Bank**



**Interpretation**

- ❖ In 2017-18, Axis Bank Net NPA is increased drastically and making the bank to suffer in upcoming financial years. Increase in Net NPA is not good for the Bank as it decreases the profitability for the following years.
- ❖ The Ratio -0.95 is showing the negative relationship between Net NPA and Net Profit for all five financial years. The Line express the relations associated with the Net NPA and Net Profit of Axis Bank.

- ❖ The Negative Relationship existing in Axis Bank leads to decrease in stock investors, lesser profitability and can’t exists the following financial years to promote the budgets and the banking performance throughout the financial years.

**4.2.2 To test the relationship between Net NPA and Net Profit of IndusInd Bank**

**Negative Hypothesis:** There is negative relationship and indicates the company is decreasing in one variable of the selected variables for the values is below -1.

**Null Hypothesis:** The relationship between two variables are same and the co-efficient ratios are equal to understand the values are consistent when exactly 0.

**Positive Hypothesis:** There is positive relationship and indicates that the values is increasing in one dependent variable of the selected variable for the values is above +1.

**Table 4.2.3 Comparing Net NPA and Net Profit of IndusInd Bank**

Bank	Particulars	2013-14 ₹ Crore	2014-15 ₹ Crore	2015-16 ₹ Crore	2016-17 ₹ Crore	2017-18 ₹ Crore
IndusInd Bank	NET NPA	184.05	210.48	321.75	438.9	745.67
	NET PROFIT	1,408.02	1,793.72	2,286.45	2,867.89	2,978.89

**Interpretation**

- ❖ On interpreting IndusInd Bank Net NPA and Net Profit the bank is having Increasing factors for both the cases. Increased Net Profit and Increasing Net Profit is maintaining the Bank performance consistent and achieve their internal operations.
- ❖ While increase in Net Profit is a good sign for the Bank and can increase more shareholders and investors in their shares. On the same while, Net NPA is increasing in each year is also acting as a barrier for the bank’s growth in each year.
- ❖ The Net Profit which is earned by the bank is fully in depositing against the Bad Loans acquired by the Bank and it is highest NPA of ₹ 745.67 Crores and the Net Profit is ₹ 2,978.89 Crores which takes the bank to stable and constant in acquiring the good position in Banking Industry.

IndusInd Bank	NET NPA	184.05	210.48	321.75	438.9	745.67	0.88
	NET PROFIT	1,408.02	1,793.72	2,286.45	2,867.89	2,978.89	

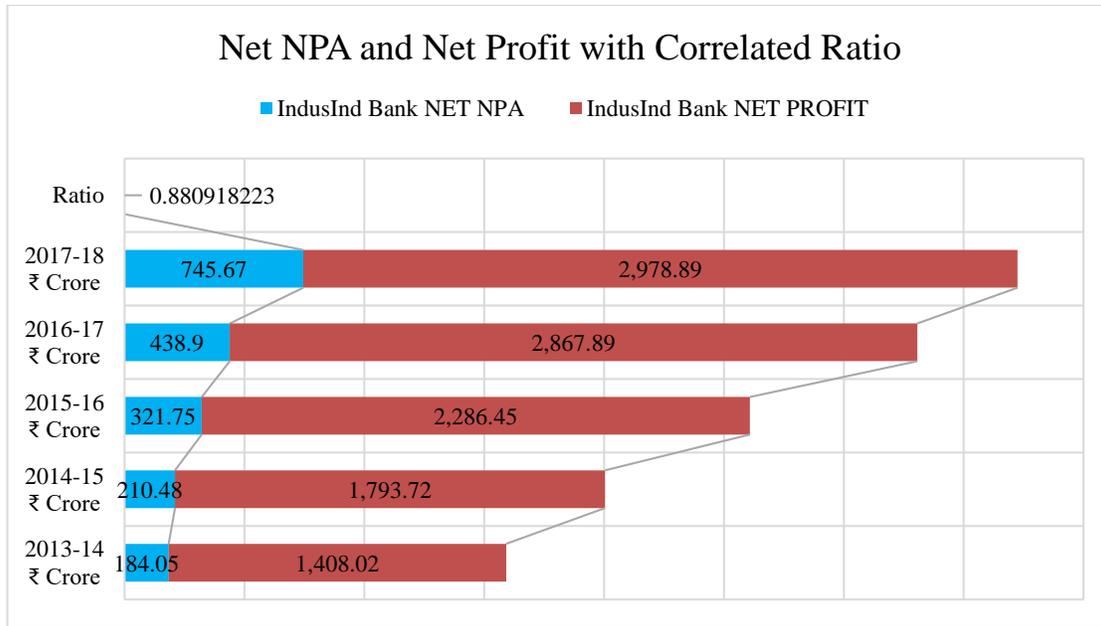
**Interpretation**

- ❖ The correlation ratio of IndusInd Bank is 0.88 and it shows the positive relationship between Net NPA and Net Profit for the all consecutive financial years. The Positive Relationship for the banks is reflecting the strong management and the organization of funds in each sector wise distribution of loans.
- ❖ IndusInd Bank performance is measured with its positive relationship among Net NPA and Net Profit. In this case, the Net NPA values is also increasing the factors and raising the bank to regulate the movement of NPAs among different sectors and their sources of funds.
- ❖ While considering the Net Profit of 2015-16 and 2016-17 is slightly increased and the bank is facing with higher NPA of ₹ 438.9 Crores which shows that the bank is lite unstable conditions but however the bank is organized by the essential funds on that particular year.

**Table 4.2.4 Pearson Correlation Co-Efficient of IndusInd Bank**

Bank	Particulars	2013-14 ₹ Crores	2014-15 ₹ Crores	2015-16 ₹ Crores	2016-17 ₹ Crores	2017-18 ₹ Crores	Ratio
IndusInd Bank	NET NPA	184.05	210.48	321.75	438.9	745.67	0.88
IndusInd Bank	NET PROFIT	1,408.02	1,793.72	2,286.45	2,867.89	2,978.89	

**Chart 4.2.2 Comparing Net NPA and Net Profit of IndusInd Bank**



**Interpretation**

- ❖ On interpreting the IndusInd Bank is facing more Net Profit when compared to Net NPAs and this is the major factor for IndusInd Bank is to maintain the greater management and the sources of funds among the industrial sectors.
- ❖ Positive relationship is acquired with 0.88 as Net NPA is lower when compared to Net Profit acquired by the banks each year.
- ❖ Higher Profitability shows that the bank is leading in acquiring new customers and other benefits in new customer avail facility for the branches in urban and rural areas. This Profitability can increase the goodwill among the investors and shareholders to place a god shares in the market place and can increase the sales of the bank.

**2.3 To test the relationship between Net NPA and Net Profit of Federal Bank**

**Negative Hypothesis:** There is negative relationship and indicates the company is decreasing in one variable of the selected variables for the values is below -1.

**Null Hypothesis:** The relationship between two variables are same and the co-efficient ratios are equal to understand the values are consistent when exactly 0.

**Positive Hypothesis:** There is positive relationship and indicates that the values is increasing in one dependent variable of the selected variable for the values is above +1.

**Table 4.2.5 Comparing Net NPA and Net Profit of Federal Bank**

Bank	Particulars	2013-14 ₹ Crore	2014-15 ₹ Crore	2015-16 ₹ Crore	2016-17 ₹ Crore	2017-18 ₹ Crore
Federal Bank	NET NPA	321.56	373.27	950.01	941.2	1551.96
	NET PROFIT	838.89	1,005.75	475.65	830.79	878.85

**Interpretation**

- ❖ Federal Bank is facing the major issues in the financial year 2017-18 as Net NPA value is higher than Net Profit Value and seeks the highest NPA of ₹ 1551.96 Crores which is higher in the five financial years and NPA is continuously increasing from the base year 2013-14.

- ❖ On interpreting the Net Profit of Federal Bank, the bank is facing again problem with constant increase and decrease in the profitability of banks. In financial year 2015-16 the bank is reached its lowest profit of ₹ 475.65 crores when compared with other financial years.

- ❖ In financial year 2015-16, the bank faces major issues by increased in NPA and decrease in Net Profit and makes the banks more unstable and the performance is again measured to be low in handling the bad loans to the vendors and borrowers.

	NET PROFIT	838.8	1,005.7	475.6	830.7
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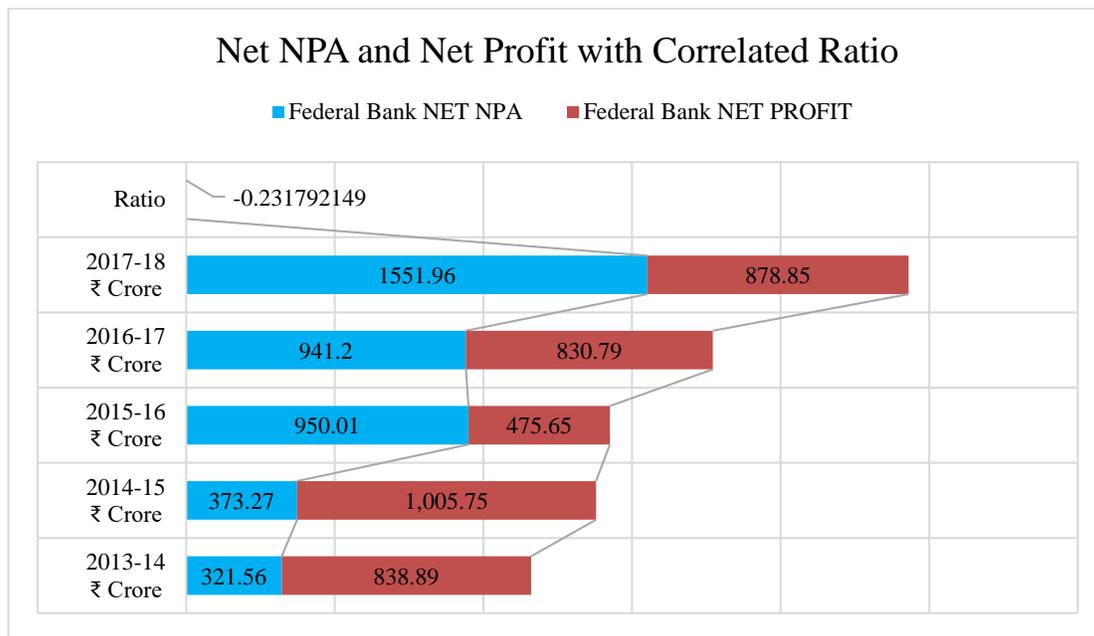
**Table 4.2.6 Pearson Correlation Co-efficient of Federal Bank**

Bank	Particular	2013-14 ₹ Crore	2014-15 ₹ Crore	2015-16 ₹ Crore	2016-17 ₹ Crore	2017-18 ₹ Crore
Federal Bank	NET NPA	321.5	373.27	950.0	941.2	1551.9

**Interpretation**

- ❖ Federal Bank's correlated ratio of Net NPA and Net Profit is -0.23, which reflects the bank is negative relationship in NPA and Profit. The negative relationship is unstable and the bank efficiency in providing the funds and money to other transfer is impossible in accessing the Bad loans. Net NPA and Net Profit is resembling the major part of a bank, in Federal Bank both factors are below in ratio to its lesser profitability and the bank is to take remedial measures in control the unorganized funds and loans to the borrowers. On interpreting Federal Bank is facing the decreasing values in both Net NPA and Net Profit. The Bank is weaker in assets and other provisions on looking the relationship is lower in each financial year.

**Chart 4.2.3 Comparing Net NPA and Net Profit of Federal Bank**



**Interpretation**

- ❖ On interpreting the Federal Bank with Net NPA and Net Profit for the correlation is taken with the negative relationship of -0.23 and lesser profitability in each sector for the bad loans.
- ❖ In financial year 2013-14 and 2014-15, the Bank is good in maintaining the profit and Net NPA with less credit wise exposures and more profitability in that financial years for the bank performance is good but

- the bank is aided in at the financial years 2016-17 and 2017-18 as Net NPA values are dominating Net Profit.
- ❖ Federal Bank is unstable and the operating expenses is also done in the lesser providence of the profit and the major issues are not maintain the organization to plan on next financial year structure to earn profit and to dominate the NPAs from borrowers and to increase shareholders.

**4.2.4 To measure the effect of NPA in Selected Private Sector Banks Performance**

**Table 4.2.7 Pearson Correlation Coefficient Ratio**

Bank Name	Correlation Coefficient Ratio
Axis Bank	-0.95
IndusInd Bank	0.88
Federal Bank	-0.23

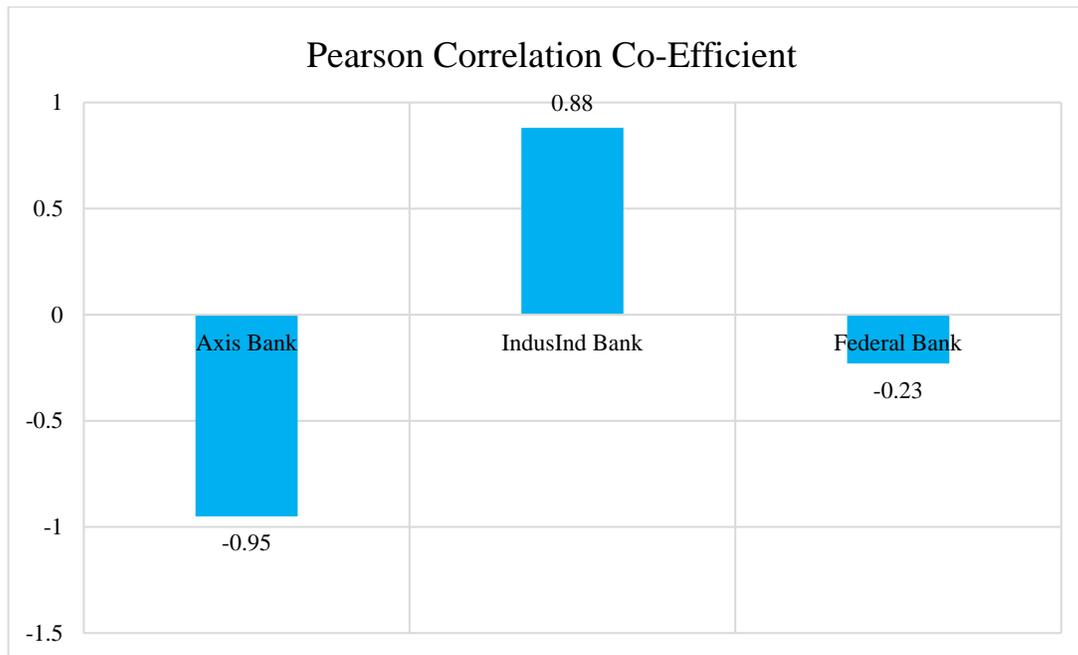
**Interpretation**

- ❖ Correlation ratio of IndusInd Bank is showing the positive relationship among the NPA and Profitability of bank. The Positive ratio finalize that IndusInd bank is more stable in acquiring profit and funds in each sectors of the loan distributions.
- ❖ Federal Bank is next to IndusInd Bank in correlation ratio, but it is negative relationship of -0.23 and bank have to be stable and to acquire more profit in associates

the funds in each sector and the funding positions of the bank.

- ❖ Axis Bank is the least negative ratio of -0.95 and facing the major issues in the profit and bank is in condition of loss in each year. The Bank have to take immediate measure in each sectoral sourcing funds and have to take decisions in expenditure to be followed in the organizational functions.

**Chart 4.2.4 Pearson Correlation Co-efficient Ratio**



**Interpretation**

- ❖ IndusInd Bank is getting Positive Ratio in Correlation Co-efficient and shows the consistent growth in generating net profit and maintain the NPAs values. Next to IndusInd Bank, Federal Bank and Axis Bank is getting negative values in NPA.
- ❖ IndusInd Bank is showing the positive Hypothesis as it shows the value above 0. The bank is ready to accept the

net profit and net gains in understanding the values and functions for increasing the net profits for next year.

- ❖ The Negative Hypothesis is again hit the Federal Bank by showing value of -0.23. The negative values indicate slight difference to make the positive hypothesis. The Bank has to work on Net Profit and to recover NPA to achieve again success in the future financial years.

## V. FINDINGS AND SOLUTIONS

### 5.1 Findings of the Study

- ❖ Non-Performing Assets (NPA) is the major causes of each bank and every financial institution. In selected private sector banks, Axis Bank, Federal Bank, IndusInd Bank is having their Net NPA values of ₹30,082.07 crores, ₹4138 crores, ₹1900.85 crores respectively.
- ❖ The total NPA of three banks is evaluated as ₹36,20.92 crores. The NPA of these three banks is occupying the major NPA values of the private sector banks as market sales and recovery of funds.
- ❖ The Net Profit and Net NPA is compared in correlation co-efficient ratio to find the comparison among the three selected banks. The ratio is provided with Null Hypothesis and Positive Hypothesis in the three banks.
- ❖ The expected positive results are changed, by Axis Bank is having the negative hypothesis of -0.9538%. These co-efficient ratio shows that Axis Bank is indeed of getting decreased Net Profit and it reflected as Net Profit of ₹275.68 Crores in 2017-18 with Net NPA of ₹16,592 crores which is doubled of Net Profit.
- ❖ IndusInd Bank is showing the consistent growth in all five years and the growth is indicating the positive hypothesis of 0.8502%. The bank receives the increasing Net Profit as it indicates in Annual Reports.
- ❖ This shows that the bank stable in organizing the funds to organizational sectors. In other hand the Net NPA is also increasing for the five years, ₹184.05 crores in 2013-14, ₹214.08 crores in 2014-15, ₹321.75 crores in 2015-16, ₹438.9 crores in 2016-17 and ₹745.67 in 2017-18. This increasing factor of Net NPA will decrease the increasing Net Profit of Banks and may leads to loss in future.
- ❖ Federal Bank is funded with Negative Hypothesis of -0.2317. The Net NPA and Net Profit of this bank is fluctuating in all consecutive five years. This shows that the bank is unstable and should be positioned in the upcoming financial years.

### 5.2 Suggestions

The management of NPAs is a very challenging task. It requires Preventive measures as well as Curative measures i.e. banks should not only take steps to reduce the present NPAs but also take precaution to avoid future NPAs. Preventive measures include,

- ❖ Inculcating ethics in borrowers regarding the importance of timely repayment of credit.
- ❖ Adherence of proper credit appraisal techniques.
- ❖ Proper evaluation of projects.
- ❖ Timely sanction and disbursement of credit.
- ❖ Proper credit monitoring to restrict any misuse and diversion of fund.
- ❖ assisting borrowers in developing entrepreneurial skill.
- ❖ Follow up of SLP (security, liquidity and profitability) principle

## VI. CONCLUSION

On concluding three private sector banks for the comparative is based on the sales report and their market values in the banking sectors. The Trend Analysis is used to analysed the GNPA and NNPA factors that are affecting the banking natures. The Correlation effect is compared between three banks and the hypothesis funded with IndusInd Bank is good in recovering the NPA and maintains their Net Profit and can move with the positive outgrowth for next financial years. NPA is the main artery vein of banking sector and other financial institutions to maintain the economy as a growing factors and to increase the country's profitability.

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# Historiographical Study on Vijayanagara Dynasty: An Empirical Observations

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## Introduction

This work elaborates study of Vijayanagara historiography and its importance from the beginning of human society, the man had to try to live a better life. The human life has transformed through various stages i.e. hunting-gathering to the globalization of the world in the present day. The economy, trade, and commerce had a crucial role to change the structure and thoughts of human society. In the part of developments, man has started barter system in the ancient period to control over the trade and commerce as well as monetary system continuing till today in terms of rupee coins and currency which were issuing by Government of India. The present study focuses on the historical resources during the Vijayanagara period. The VijayaNagara dynasty was founded in 1336 A.D. to protect the Indian culture. Though many dynasties were ruled in South India, there was a vacuum, which was filled by the Vijaya Nagara after Kakatiyas, and the Reddi Kingdoms. There were a disturbance and difficulties in Andhra during 13th Century A.D. after the downfall of powerful kingdoms the local chiefs and feudatories were tried to be independent but it was spoiled by the Muslim invasions. By this time the strong pillars of VijayaNagara founded to foil the enemy's strategy and made the unity among the local people. The political activities of VijayaNagara minted on their coins to prevent the enemies into its territory by showing the strength of the Army of Vijaya Nagara. The entire Paper focuses on the aim of the contributions of the sources of VijayaNagara period which will be understood through the primary and the secondary sources.

## The Primary Sources:

### a) Inscriptions:

Inscriptions are the most authentic sources to construct history. Inscriptions which stand for evidence of every event of the dynasty relates to the kings, chronology and also insight into the matters of political, social, cultural, economic and religious issues of a particular dynasty. For the study of VijayaNagara history we've to look into many records which explains inscriptions of VijayaNagara like South Indian inscriptions, epigraphic carnatica, Karnataka inscription, epigraphic Indica, Tirumala Tirupati Devasthanams epigraphical reports, archaeological survey, annual reports, archaeological survey- Memories, reports of Indian antiquity are the most prominent of primary sources of the VijayaNagara history. The copper plates

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of Shimoga, Nagalavaram, Krishnapadu, and Srisailam are the prominent sources of VijayaNagara. All these sources covered important events like accession, expedition, construction of movements and public works. These inscriptions provide us valuable information of VijayaNagara Dynasty.

**b) Numismatic Sources:**

The study of coins called Numismatics. The coins are a very important and authentic source to write the history. Coins are useful to understand the political, cultural, economic, and social aspects of the dynasty. “The introduction of coins is a land mark in the history of civilization and is a great achievement of the human race. (Circar D.C, 1968, P.2)”<sup>1</sup>. It indicates the value of coins issued by different kings and the importance of the money economy which reflects every life of mankind. There are many coins with different types and different symbols issued by the kings of VijayaNagara were discovered in any part of South India. The coins of Vijaya Nagara are the main source of this study, to prove its political and cultural history. The coins which preserved in the Museums of Andhra Pradesh, Tamil Nadu, and Karnataka are the most important of coins as a source of the study. The images on the coins of Pagoda, Varaha, Doddavaraha have the portrait of Siva Parvathi, Gandabherunda, Boar, Balakrishna, Vishnu, and Venkatesa are important coins which depict not only cultural significance of the Dynasty but also express the Historical, Political and Economic conditions of the Vijayanagara Empire.

**c) Chronicles and Commentaries:**

The chronicles of Paes and Nuniz (Narrates of Domingo Paes and chronicles of Fernao Nuniz) was written in Portuguese and translated by Robert Swell, brought as the Forgotten Empire - VijayaNagara. These chronicles are important to understand the condition of VijayaNagara. Domingo Paes visited VijayaNagara during the period of Krishnadevaraya and noted the report which he has really witnessed the things in the court of VijayaNagara. Nuniz who also visited VijayaNagara and carried out the traditional history of the Dynasty as well as local and current events which he was observed in the dynasty. These chronicles explained the great military expeditions (Digvijaya Yatras) and the political conditions of the Dynasty.

The Portuguese Commentaries focused on History of Vijayanagara in the period of Alfonso de Albuquerque, the Governor of Portuguese. The commentaries refer the expeditions of Albuquerque and also explain the relations of Krishna deva Raya with Adilshah and other neighbor dynasties. A commentary of Albuquerque was translated by Hakluyt society which gives us valuable information on social, economic and religious conditions of the Vijayanagara Empire.

The Persian traveler Muhammad Kasim Ferista have written Tarikhi- I – Ferishta which translated by Briggs. It is an important work which deals with the relations of the Deccan Rulers and the Vijaya Nagara Kings, and also explained major expeditions of both parties. The other Persian travelers Fuzuni Astarabadi had written the book Futuh-I-Adilshahi, which was translated by K.K. Basu, one of the important sources

of the study. Fuzuni who visited the court of Adilshahi of Bijapur explained the political history and the relations of Vijaya Nagara and Adilshahis of Bijapur.

The Arabic work Tohfut-ul-Mujahideen, written by Shaik Zeen Ud Deen, and translated by M.J.Rowlandson. It is focused on the relations of Portuguese and Muhammadan rulers. It was carried out by the author in the court of Adilshahi and it is useful to us to understand VijayaNagara and its contemporary's relations.

The Telugu chronicle Rayavachakamu by Stanapati Nayani Viswanatha Nayaka stands for Krishnadevaraya. This work deals with the events of Krishnadevaraya and traditional history. It will give us valuable information regarding Krishnaraya's relations, the coronation of Vira Narasimha, his relations with the feudatory chiefs, the Gajapatis etc. The author chronicle is Velugotivari Vamshavali. "This Chronicle commences with the reign of Kakatiya Kings. Gajapati and comes to a close with the advent of the British Government. It gives much valuable information about the history of Velugoti family. But its main importance is due to light it throws on the histories of the Kakatiyas, the Reddis, the Rayas (Vijaya Nagara), the Gajapatis and the Bahmanis Sultans with whom the chiefs of this family came into intimate contact (Nilakanta Sastri, K.A,& Venkata Ramanayya.N,1946,P.5)"<sup>2</sup>. By observing above statement we've understood that the importance of this chronicle to write not only Vijayanagara history but also the history of Andhradesa. It clearly describes the political, religious, cultural and socio-economic history of the Vijayanagara and its importance. It collaborates the work of different authors who have written in the style of Biruda-gadya and Eulogistic version. It is an important source for the study of Krishnadevaraya's political policy and his military expeditions.

### **Secondary Sources:**

K.A.Nilakanta sastry's Further sources of Vijayanagar History, focused on the Hindu Literary sources and advance knowledge of the subject. He deals with general literature, Chronicles and the Mackenzie Manuscripts. In the deep length of Vijaya Nagara History, he explained The Kamparaya Charita. The Saluvabhudya, The Raya Vachaka, The Krishnaraya Vijaya, The Vardhambika parinaya, The Achutaraya, and The Sahitya Ratnakara. He saw the forming of the Vijaya Nagara Dynasty as the literary revival in the southern region of India.

The drawback of the book is the author was started to counter the Muslim Chronicles and gave importance to the overall Hindu Literature. To study History all sources are important than the biased views of the authors. When writing history all the writer's views will take consideration for the constructing History. Here the author forgot the political identity and geographical works at the dynasty and didn't give priority to Numismatics which explains the culture of VijayaNagara.

N.VenkataRamanayya's *Studies in the History of the third dynasty of Vijayanagara*, views of the book is to narrate the principles events of VijayaNagara between 1529 and 1543. The second describes the system of Administration under which the empire of the Rayas was governed in the Sixteenth Century and the third deals with the religious and social conditions of the same period. In this book, the author focused only on the Administrative, social and religious conditions of the third dynasty of VijayaNagara. He didn't look into the economy and cultural identity of the dynasty. He looks on only conditions of the third dynasty but he neglected the after the third dynasty which was important to study of VijayaNagara History. I would like to fill this gap and try to explain all fourth dynasties conditions in Vijayanagara.

S.Thiruvenkatachari was translated Gangadevi's authentic work *The Madhura Vijayam or VirakamParaya Charitam* was discovered by accident amidst a heap of worn out Palm-leaf manuscripts as part of Sanskrit works and but for careful scrutiny of the head Pandit of the curator of Sanskrit Miss Trivandrum, it would have gone the way of many other works of the past which are not available to us. The central theme of the book is explaining the destruction of the Sambuvaraya Rule in Tondaimandalam and the destructions of the Madurai Sultanate. It is no doubt the story of Vijayanagara invasions of Tondaimandalam to send away the Muslim Sultanate. This is explained only on invasion but it was neglected by the translations to achieve the social, economic and cultural conditions of the VijayaNagara Dynasty.

William.J.Jackson presents *Vijayanagara visions-Religious experience and cultural creativity in a South Indian Empire* is a series of Vijaya Nagara vision and which explores some of the archetypal attractors of South Indian Culture in the lives of saints and sages and in the images and arts of spiritual creativity. It explores how such voices proved a traditional order, and renew a spiritual pathway in a world of contingencies, chaos, and uncertainty. The author focused on the theme of cultural and lives of the saints. He explained the meaning of the vision to explore the new thoughts and imaginations of the VijayaNagara Priests; he compared the Hindu Culture with China and Christian culture and believes. However, in the short comes of the book is he forgot the patronage of the sainthoods by different kings of Vijayanagara. He did not explain the historical view of Vijayanagara and also not look into the political, economic, social aspects of the Dynasty.

Robert Sewell's description on Vijayanagara was depicted in his book *A Forgotten Empire [Vijayanagara]*. The main aim of the book to explain the original writings of Nuniz and Domingopaes which was in Portuguese and translated in English. The author compared the Dynasty past and present condition and the writers give importance to the ruling of the important rulers. He succeeded to explain the tradition of VijayaNagara, Forts of Vijayanagara etc. However, in the book explanation regarding culture, economy and social issues in the dynasty are very less. He enlarged the political conquests of the Mohammedan Rulers and Counters of Vijaya Nagara rulers in South India.

The author interested to reconstruct the VijayaNagara History which was ignored by the writers in his words he says that “Making the dry bones live but meanwhile the Bones themselves must be collected an pieced together, and my duty is to try to construct at least the main portion of the skeleton (Sewell Robert, 1980, P.3)’’3. But the author did not fulfill the total gap to reconstruct VijayaNagara History.

Yazdani’s The Early history of the Deccan [parts vii-xi] explains the conditions in early times of Deccan. He concentrated to highlight the proportionate things of early Chalukyas, Satavahanas, Yadava’s, Kakatiyas of the Deccan region. He moreover described the literature, polity, architecture, and coins of these Dynasties. But the author did not give elaborate ideas of the rulers of the dynasty and social form of the Deccan region. He did not concede the Geographical differences of the region and in the period of study, he excluded VijayaNagara in this book. This is useful to historians to write history on Deccan but the book should cover more areas to construct an original history of Deccan.

Burton stein’s book peasant state and society in medieval South India examines the circumstances of peasants without lords who established and maintained great states enduring and complex local institutions and elaborate religious institutions. The author trying to explore the political system of South India which was wrongly interpreted by the writers of the past. He examined the present village its local context rural groups have been elaborated but constructions put upon the extent evidence. It assumed that the relationship existing between the social and cultural phenomena comprising medieval South Indian peasant society and other sectors of the social orders was obvious and unchanging. So it was proved by the authors and the social order still exiting today. He tried to explain the agrarian system and its relations with the state. But he did not concentrate on the total political structure of South India and cultural aspects in medieval South India.

The patronization of literature was gone on its peak during the Vijaya Nagara period. The Dravidian Languages was specially recognized by the Kings of Vijaya Nagara.

The poets Ashta Diggajas were patronized by Krishna Devaraya, who also great poet and scholar by the literature, the glory of Vijaya Nagara touched the sky. The political history of Vijaya Nagara was lit the flames of Indian culture which was forwarded to the Marathas. Nevertheless, the ending of the Vijaya Nagara period was panic; still, the fruits of Vijaya Nagara are surviving until today.

Rekha jain’s Ancient Indian coinage is systematic study of money economy from Janapada period to early medieval period deals with the gradual development of money in the form of coins from sixth century B.C. to the 12th Century A.D. The scientific study of ancient coinage of India started from 19th century A.D. onwards. Initially these coins were collected objects for the sake of pleasure but later on attempts were made to decipher their legends. The material regarding money economy in ancient India is scanty. the detailed explanation only come from the source of coins the sources of the book is ancient literary works,

inscriptions, coins and the account of the foreigners etc. is primary sources and catalogues, journals, commemorative volumes etc is secondary sources of the book. The author concentrated on money economy of the Janapada period to the Gupta period. the author didn't describes the study in scientific mode of coins and historical importance is less than the structure of the economic perspective of the said period.

Swami satyaprakash saraswathi and Rajendrasingh's book coinage in- ancient India, highlighted in a description of ancient Indian coins of different period, available in collections of museums. A documental reference to Indian coinage in ancient Indian literature, the covers Vedic Period, Brahmanic Period the periods of Panini and Kautilya and the laboratory work on the chemical and spectroscopic analyses and metallurgical study of Indian Coins as well as an account of the coinage in the ancient neighbouring countries has also been discussed.

A considerable revival of interest in the chemical analysis of ancient coins occurred in the second quarter of the 20th century A.D. Among the more extensive investigations on the Greek bronze coins and Chinese coins. An awaking interest of the composition of ancient Indian coins may be explored in the research scholar's analysis studies only, of course, there is a chance to explore the Indian coins in scientific manner due to the emission spectroscopy manner which applied in the 20th century. The author gives the importance only on the scientific methods but not explained historical background and of the said period.

D.C.Sircar's 'studies in the geography of ancient and medieval India' is contained dissertations on numerous problems relating to India's historical geography of the ancient and medieval period. the author cited important geographical texts. He highlighted to correct the geographical names of the Indian sites in the past. He explained the various Emperors who influenced the early Indian conceptions regarding the earth, the addition number of geographical names, identical names of different locations, cartography and elephant forests. He gave the major sources of historical geography to find the localities in present period. But he did not explain the entire medieval dynasties who ruled in India in medieval period.

Paul herrmann's the great age of Discoveries explains the route map to the world and geographical discoveries. And also emphasis the causes to invent the sea routs to India by the Vascoda Gama, other important routes to the world. He gives the Sketches of maps the linkage of routes in the world which shows the civilization of different countries. This book helps us to understand geographical regions of the world which shakes the world's history from the civilization period to modern period. He explains the relations of navigators with the local Kingdom Authorities and focus on light to development of trade and commerce. Historical geography which depends on each other on the economy and political strategies of the various regions in India as well as in the World History.

B.G.Tamaskar's contributions to historical geography of India is highlighted in the concepts of the ancient Indians on the rising and setting of the sun, directions, the spherodicity of the earth and its support

less ness in space, the southward and northward march of the sun attract the equator, the duration of light of the sun and darkness around the north pole for six months, the spread of the ocean around the land twice as large. There is hardly any direct allusion to the spherodicity of the earth in the Upanishads although their author seems to have some vague concept about its Spherical form. The author have seen the geography in the historical texts of Upanishads, Jatakatales, Geographic basis of Kautilya Geo-politics, the concept of Boundaries of India through ages. He critically analyzed the vegetation and forests of Indian part. The Puranic names of the regions, rivers were discussed. But he did not cover the historical sources than geographical explanations.

O.P.Bharadwaj's studies in the historical geography of ancient India explains topography i.e. place names of tribes, rivers, hills, routes, etc. It is general work of geographical dictionary of ancient and medieval India and historical basis of literature of various dynasties. Geographical and linguistics considerations and traces the evaluation of tribal and geographical names through the ages leading in the process in some important conclusions deserving of notice by research scholars in the reconstruction of Indian past. Historical geography reveals its mysteries through more knowledge of the history of the region selected for the study and close acquaintance with the original sources and their medium from the earliest times to almost the present day, access to all branches of Indian Literature familiarity with the philosophical principles of linguistics change, and geographical acquaintance with the region and up to date information on epigraphically and archaeological discoveries needed.

K.Satyanarayana's A Study of the history and culture of the Andhras (from Stone Age to feudalism) vol-1 produce Historical background and cultures of the Andhras. The author mainly concentrated on the lives of the Andhras from the ancient age to medieval feudalism. He mainly focused on the tribes of Andhras i.e. Chenchus, Koyas, Reddis of Bison Hills, Svaras, Khonds and Raj Ghonds. He explained the pre-history of Andhras and directly deals with the Satavahanas but in the gap he did not fulfill the History of the Andhras. He used to say about the social life of the people and not concentrated the political views of the study. He gave only some importance to the political life of the people. He raised the questions of the people existence as the feudal lords, warriors and warlords Devadasis etc. in the society. He tries to explain the rise and Growth of Feudalism and relation between state and peasants, the life of tax collectors etc. The author did not much concentration on the major dynasties who ruled in Andhra Desa. He did not give the historical background of the Andhra Desa after Satavahana in extensive manner.

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Satish Chandra's Essays on medieval Indian history is the study which explores the relations of the state and society. The author explained the medieval economy, the political process of the state up to the end of the Mughal Empire. He concentrated the importance of the taxes like Jizyah and the religious policies of Mughals etc. He highlighted the cultural history and relations of the state, the Raja Putana Policy, the Deccan policy of the Mughals, and the author considered the Bhakti Movement which played vital role in Indian cultural system in economic point of view he focused the money economy, rise of Zamindari systems and importance of cultivation and agriculture etc. He developed the view on village society in Northern India and Marathi Polity and society. He critically examines relations of the Marathas, Jats, Sikhs and the Afghans etc. In Historical point of view, the author did not give much priority to South India and Southern dynasties which played a major role in Indian history especially in Medieval Indian History. He focused only North Indian History and society but did not cover the overall history of India.

H.C.Verma's Medieval routes to India was focused on the Historical routes in the North West Region of Medieval India. The study covers the medieval Khursans, Turkistan, Iran, Afghanistan, part of Russia. Pakistan and India up to Delhi, this study is evidence to development of the economy, military activities in India. The trade activities at one point, the other the establishment of military stations at different places are better to understand of their mercantile and logistic importance of better ascertained. The routing system in medieval India is neither judged in this work by modern standards nor condemned for want of modern technology involved in the preparation of roads. The 18th century A.D. saw the emergence

of a vast Arabian Empire which gave enough space to their adventurous, travelers and merchants to trade and trade in. this resulted in a growth of interest in the study of Geographical science among the Arab Scholars. The Arab Geographical literature composed in the 9th century A.D. drew heavily on the Greek tradition. The author gives good information about the historical geography of medieval India but he did not concentrate on the Southern part of Medieval India.

S.A.Rahman's *The beautiful India-Andhra Pradesh* focuses the History of Andhra Pradesh. It gives the history of different rulers and dynasties who ruled Andhra. He focused the Satavahana, Sakas, Ikshavakas, Eastern Chalukyas, and Kakatiya's contribution to the Andhra. The geographical structure they covered peninsular part of the ancient and stable Deccan block. Though the number of geological formation occur in this region, it is chiefly composed of a genetic complex of pre-Cambrian region. The exposure of the gneisses interspersed with granitic intrusion presents a surface monotony throughout Northern area except on the outskirts where the Archaean basement is overlain by the rock of younger series. The author focuses the natural vegetation, drainage system of the Andhra and he highlighted the ancient Andhra History in Aitereya Brahmana and indicates the Andhra originally Aryan race, but many scholars and archaeological evidence denied this statement and proved the Andhra is originally Dravidians.

M.Naga Bhushana Sarma's *History and culture of the Andhra* explores the cultural history of Andhra. The territory now known as Andhra Pradesh and its surroundings areas occupied a vital position in interesting major cultural currents, thus paving the way for Indian nationhood. For long it stood as a melting pot for diverse, cultural trends not only from within south India but also from the north mainly due to its geographical central position. They focused on the geographical history and relations of the other languages, religions from ancient to the modern period, different dynasties of Andhra and the position of people in socially, politically, economically and culturally etc. they also examined the folklores, tribes, and formation of the tribal density activities etc. The inscription and the Ethnographic study should be extended and it will be good work for the Andhra History if they cover the overall inscriptions and Numismatics.

P.Hymavathi's *Vijayanagara-the life and times of Tuluva Vira Narasimha* focuses the Vijayanagar life and activities during the period of Tuluva Vira Narasimha Raya. The author explores the wide-ranging of Administration, Military Forces, Social, Cultural, Economic aspects under Tuluva Vira Narasimha Raya. Based on Epigraphy, Literary works, Muslim and European sources used to write this book. The author highlighted the origins of Tuluvas through the literary and Puranic style, he linked the origins of Tuluvas with the Moon (Chandra Kumara). She also highlighted that "the Vira Narasimha Raya who was first proclaimed himself as 'Raya' ". The author explained the society and culture of Vijayanagara under Vira Narasimha Raya. But she did not completely focus the origin of Vijayanagara and did not give much importance to the Krishna Devaraya.

Kesavan veluthat's 'the early medieval in south India' focus is to present an alternative history of the deep south and re-examines the problems and patterns in the History of Tamilakam, in general, an early medieval Kerala and Karnataka in particular. The author looks into the previous researches on south India to Distinct from the proceedings of early Historical information and explains the structures characterizing early medieval India. He used the sources in epigraphic and literary sources and drawn from the regional languages and inscriptions. He explained the theories of historiography and the history of Tamil Nadu, Kerala, and Karnataka. He explains the cultural history, customs, and constructions of different temples and worship of different deities in three regions. He also explains the social life and economic activities of the people and the rulers of different dynasties. But the author didn't explain the major dynasties in Andhra for historical ground though it is under South India.

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# Cultural importance of the Vijaya Nagara Coins

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## Introduction

This work elaborates study of VijayaNagara coins and its cultural importance. Coins played a vital role in Indian history through the ages. From the beginning of the human society man had trying to live a better life. The human life has transformed through various stages i.e. hunting gathering to globalization of the world in present day. The economy, trade and commerce had a crucial role to change the structure and thoughts of human society. In the part of developments man was started barter system in ancient period to control over the trade and commerce as well as monetary system continuing till today in terms of rupee coins and currency which were issuing by Government of India. Coins played an important role not only in economy and trade but also in expression of cultural history, political and social life of the people. The coins were started to survive from 7th century B.C. onwards. Most of the Kings gave importance to coins to focus the property and prestige of their dynasty and it will reflect the culture, polity, economy, trade, commerce and position of particular dynasty. The present study focuses the coinage and currency system during VijayaNagara period. The VijayaNagara dynasty was founded in 1336 A.D. to protect the Indian culture. Though many dynasties were ruled in South India, there was vacuum, which was filled by the Vijaya Nagara after Kakatiyas, and the Reddi Kingdoms. There was a disturbance and difficulties in Andradesa during 13th Century A.D. after the downfall of powerful kingdoms the local chiefs and feudatories were tried to be independent but it was spoiled by the Muslim invasions. By this time the strong pillars of Vijaya Nagara founded to foil the enemy's strategy and made the unity among the local people. The political activities of VijayaNagara minted on their coins to prevent the enemies into its territory by showing the strength of Army of Vijaya Nagara. They also minted the coins to focus the culture of VijayaNagara by portrait the deities and Kings and their names and period. The title itself gives us the theme of the study and it was focused on above mentioned points which were explained. The entire Paper focuses with the aim of cultural importance of VijayaNagara period which will be understand through the primary and the secondary sources.

## Types of Vijayanagara Coins:

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It is very interesting to note that the rulers of Vijaya Nagara was founded the dynasty to spread the Indian culture and protect its by unity among the people of the Indigenous, the fourth dynasties have played a vital role to serve the society in a better way. “The first dynasty was the Sangamma dynasty under which the empire was started and under which they struggled to fame. The second the Saluva dynasty was merely a transitory dynasty for two decades, where new and fresh blood was introduced in to the administration of the empire. The third dynasty was the Taluva dynasty, under which Vijaya Nagara rose to the biggest of its fame and glory, and under the last or the Aravidu Dynasty, the empire after the great battle Tallikota in 1565 A.D, held its own, till it came to a close finally in the 17th century A.D(Ramesan.N, 1979, P.35)”<sup>1</sup>. Coins played a vital role in human life since ancient period. of course, there was barter system which exchanging goods to buy the products or commodities, and it were in types of kind, animals and different production of goods. The coins introduced in 7th century B C by Lydians and followed by China and India, brought the changes in monetary system of human history. What is coin? “The coin which small stamped metal discs of standard sizes used as tokens of money in commercial transactions. (Mitchell James, 1978.P.176)”<sup>2</sup>.

The Use of cost-metal pieces as medium of exchange is very ancient and probably developed out of the use in commerce of ordinary ingots of bronze and other metals that possessed and intrinsic value. Until the development of bills of exchange in medieval Europe and paper currency in medieval china, metal coins were the only such medium. Despite their diminished use in most commercial transactions, coins are still indispensable to civilized economics. In fact, their importance is growing due to the wide spread use of coins-operated machines. The making coins called as coinage and the study of coins called as numismatics.

“The coinage of the Vijaya Nagara Empire was based on ‘hun’ or ‘pagoda’ a gold coin. This continued to be coined by the principalities of southern India and the Qutubshahi kingdom of Golconda even after the designation of the Vijaya Nagara Empire (Chanderi Japan Ray & Habib Irfan, 1984, P.360)”<sup>3</sup>.

“In South India tree seed called Kalanju and Manjadi known in Telugu as Gurunginga was the basis of the metric system of coins originally as time went on, metallic pieces cut to the weight of these seeds were used. In Maharashtra and Konkan the heavy Gadhyana weighed 72 grains. In Tamilnadu, the Kalanju of 20 Manjadi was equal in theory to the same weight. Between these two areas, the light Gadhyana which was used in Andhra and Karnataka areas of the same weight as the coin of the name i.e. 50 to 52 grains. These coins were bearing the same name as the weight as for example the Gadhyam, the Dharana etc. according to Abdur Razack who was in Vijaya Nagara in the period of Devaraya II issued the currency with the small denominations follows as:

S. No	Particulars	Illustration
I	Gold	Varaha, Pratapa = ½ Varaha

		Fanam = 1/10 of Pratapa i.e. 1/20 of Varaha
II	Silver	Tara = 1/6 of Fanam or 1/20 of Varaha
III	Copper	1/3 of Tara i.e. 1/360 of a Varaha (Ramesan.N, 1927, PP.38-39)" 4.

The major denomination of Coins classified according to their metals i.e. Gold, Silver and Copper, the currency of Vijaya Nagara appeared to be different denominations based on the study of inscriptional and literary sources. The following symbols or types predominantly by the rulers of Vijaya Nagara to daily transaction of money as well as to show the sovereignty of the kingdom, political and cultural importance as well as to prosper the economy with trade and commerce etc.

S. No	Particulars	Illustration
I	Sangama Dynasty	(a) Hanuman and Garuda (b) Vrishabha (Bull) with sword (c) Elephant, Elephant & king (d) Umamaheswara, Lakshminarayana, Saraswathi and Brahma, and Lakshminarasimha.
II	Saluva Dynasty	No coins have been found.
III	Tuluva Dynasty	(a) Lion (b) Venkateswara (c) Umamaheswara (d) Vrishibha (Bull) (e) Garuda (f) Balakrishna (g) Lakshminarayana (h) Gandaberunda
IV	Aravaidu Dynasty	a) Srirama (b) Garuda (c) Sanka and chakra (d) The Vraha (e) Elephant (f) Bull in the coconut form (g) Hanuman (h) Venkatesha wils or without consorts (i) Venkatesa (Gandikota)

It is very interesting to note that we've seen this coins of types or symbols of all three dynasty of Vijaya Nagara, but we could not find any coins of this second dynasty i.e. Saluva dynasty of Vijaya Nagara because their rule was short period 1486-1505 A.D and the dynast was in facing with reverts and war of

succession which leads to the bad circumstances of the dynasty and their dynasty was ended with miserable situations.

### **Cultural Importance of Vijayanagara Coins:**

**Definition of Culture:** Culture means way of life especially the general customs and believes as a particular group of people at a particular time. Human culture has been changed time to time and region to region. Anthropologists and other social scientists define human culture as learned behavior acquired by individuals as members as social group. The concept of culture was first explicitly defined in 1874 by the British anthropologist Edward B. Taylor “He used the term refer to that complex whole which includes knowledge belief, art, morals, law, custom and any other capabilities and habits acquired by man as a member of society. Since, other anthropologists have admired numerous refinements and variations on this definition, but all have agreed that culture is learned behaviourally contrast to genetically endowed behaviour. The emergence of language was giant slip that made possible the remarkable complexity of human culture. Through language, human is able to use symbols, that is they are able to bestow and communicate meaning through sounds and the arrangements of sound in to words and sentences. Human cultures vary widely over the eargs from the primitive to the present civilized society. In spite of the cultural diversity around the world, in all societies’ certainly universal culture reflect basic responses to the need of human beings as social animals i.e. hunting, gathering, agriculture and industrialized labour etc. (Vexicon Universal Encyclopaedia, 1984, PP.384-385)”<sup>5</sup>. Vijaya Nagara rulers were because prominent in Indian History because of their cultural policy which unifying the people in regions of south. We have been discussed in the previous chapters about the establishment of the Vijaya Nagara Kingdom and they circumstance in region as the south which was attacked by the Muslim invaders of North India. We know that the foundation of the pillar of Vijaya Nagara is to defend its indigenouse culture from the foreigners who was tried to loot the vast resources of India and also, they moved towards to South India especially in Andhradesa, Tamilnadu, Kerala and Karnataka regions. Culture have been referring in the customs of civilization which reflects the life of the people in various aspects like political, economic, social religious ideas as well as art and architecture. Here we will look in to the religious and political ideas of Vijaya Nagara, which were played a predominant role in Indian Society, to set up a greater dynasty in south India and it was proved by the religious and other images of symbols on the coins of Vijaya Nagara. The Vijaya Nagara Empire was established on the pillars of culture which was based on identity and power. Many historians and researchers have been argued that Vijaya Nagara founded to protect the Hindu culture. But here understand by this research, that the Vijaya Nagara was founded the protection of Indigenouse culture but not religious culture. Though many coins of Vijaya Nagara expressed the identity through the images of Hindu gods, we came to know that the inner meaning of the images to promote the Justification of the power which always fought between evil and good things in the society. Coins of Vijaya Nagara depicted the images of Hindu gods as representation of the cultural identity of India through its nature and

styles. We have known through the study of history about the philosophers and different sects which were spread the ideas on different dynasties in India was helped to found the powerful dynasties to overthrow the foreign invasions and built-up the local empires to protect its original culture and identity. If we analysed the coins of Vijaya Nagara, the intension of the rulers really reflected in the images of coins which protected the cultural identity of Vijaya Nagara dynasty. The rulers of Vijaya Nagara have given importance to mint the religious symbols on their coins because they were influenced by the teachings of Sankaracharya, Ramanuja and the Vidyaranya, the Saivite and the Vaishnavite gurus. The rulers thought that though the symbols of gods and their vehicles could be possible to unification of the people and to protect the culture. Henceforth, the rulers might have been brought the symbols of religious gods, as also they personally believed the gods to be protectors of the dynasty from the neighbouring empires.

### **The Saiva Images of Coins and their Influence of Vijaya Nagara Culture:**

As we know the rulers of Vijaya Nagara are predominantly Vaishnavite, though the first dynasty the Sangama, was Saivite in its faiths, which is also patronised Vaishnavism. The Tuluva and Aravidu was predominantly Vaishnavites but they have given priority to Saivite also the Saivite symbols of Sangama dynasty are Uma Maheshwara, issued by Harihara I, and Devaraya I, Elephant symbols of Saivite in Sangama dynasty issued by Ramachandra Devaraya II, and Mallikarjuna. Vrushabha the bull symbol of Sangama dynasty issued by Devaraya II, are prominent symbol of Saivism in Sangama dynasty of Vijaya Nagara. The Tuluva dynasty of Vijaya Nagara also patronised the Saivism through its symbols which minted on the coins. A major Saivite symbols in Tuluva dynasty are Siva Parvati and Vrishidha, coins of Srikrishnadevaraya, the Aravidu family also patronised the Saivism. In the part of patronization Tirumalaraya I, issued Vrishabha and elephant symbols and Sriranga II, also issued the Vrishabha type of coins. The Umamaheshwara coins of Harihara II, and Devaraya I, the lord Siva appears as Umamaheshwara seated with his consort. His hand in the Abhaya mudra or posture of production, and holds in his two other hands Trisula and a drum. The fourth hand holds the Uma in an embrace. The reverse of the coin the legend minted with Nagari as Sri Pratapa Harihara. This image represents the oneness of the god and the goddess which unity is symbolized in the concept of Arthanariswara when lord has given half of his body for his consort (Umamaheshwara coins of Harihara II, Devaraya II). "Saivism in its present form is a bundle of cults. In vedas, Siva is praised for wealth strength, welfare, and protection of cattle, sons, and progeny. There are verses in which Rudra (Siva) is described as ferocious deity implored by the worshipper not to injure men and cattle, not to cause havoc and diseases among children, cattle and horses. When Rudra ceases to be angry and became gracious, he is called Siva. From Satavahana period both the rulers and the ruled were adherents of Saivism. An inscription from Sthanakunduru in Shimoga district in Mysore says that the linga in the temple was worshipped by Satavahana. The earliest Saiva structure, and form of Siva is found at Gudimallam of Chittoor district of Andhra Pradesh. The Bull type of coins and coins having Skanda image were issued by Satavahana monarchs is clear evidence of their religious preference (Tamma Reddy.K.

1994, PP. 180 - 181)”6. The Saivism also flourished in Krishna Devaraya period. He also issued the Umamaheshwara or Sivaparvati coins. The obverse of coins the Siva seated with Parvati on his left thigh both wearing Kiritas (crowns), right hand with trishula and left hand holds his consort in an embrace. The reverse of the coin in Nagari Srikrishnaraya and the Umamaheshwara species represents the oneness of god by unifying his consort parvati as depicted in their coins (Umamaheshwara coin of Krishnadevaraya). The Elephant type coins represent the symbol of Ganesha in VijayaNagara. Elephant represents the Ganesha the son of Siva and Parvathi. The Elephant represents the power. The strength of the empire which proclaims the strongness of culture in Vijaya Nagara. The Elephant symbols have been introduced by Devaraya II of Sangama who adopted these symbols from the Gangas. Gajapathi type coins have minted by Devaraya II, Mallikarjuna, and Tirumalaraya I of Aravidu. “Devaraya II was introduced Elephant symbols on the coins of Vijaya Nagara. This is explained by his being a dept in elephant hunting and his assuming the Biruda (title) Gajabentakara. His coins especially the copper issues bear a representation of the scene of fight between the king and wild Tusker elephant which was ultimately tamed down by the powerful strokes of the spear with which the king was armed (Aiyangar Krishna. S, 2000, P.109)”7. Another important symbol was the Vrishabha or the Bull. The Vrishabha or the Bull is vehicle of Siva, in front of every Siva temple there should be a statue of the Bull, the authenticity of vehicle of Siva. These Vrishabha symbol represents believeness or trustworthy of the servant to his owner, as relation between king and the people. If we observe the administration of Vijaya Nagara, we will understand the friendly relations of king and his people in Vijaya Nagara dynasty. These coins issued by Bukka II, Devaraya I, of Sangama, Krishnadevaraya of Tuluva, Tirumala Raya and Sri Ranga of Aravidu dynasty. These are the major symbols of Saivism which represents the cultural identity and unity of Vijaya Nagara dynasty.

### **The Vaishnva Images and Impact of Coins on Vijaya Nagara Culture:**

The Vaishnava faith was influenced the rulers of Vijaya Nagara to mint different Vaishnava images on their coins. many kings of Vijayanagra was attracted to Vaishnavism and followed its principle because the chief literature comprised two epics The Ramayana tell the story of an Ideal king subsequently transformed into a incarnation of Vishnu, While the Mahabharatha presents Krishna another incarnation of him. The teachings of Madhava in the court of Harihara-II focused to pay the taxes in money instead of in kind. From the “Prasara Madhaviya” which was commentary or “Prasara Smirti” was proved that the administrative reforms of Vijaya Nagara kings which leads to development minting and issue of the coins. As part of taxation and administrative policies the Vijaya Nagara rulers issued coins which also reflect the culture and identity of the dynasty. The major symbols or images that were minted by the rulers of Vijaya Nagara are largely in Vaishnava symbols. “Vaishnavism in early period of south Indian culture was occupied second place. It was the religion of the eastern Gangas rulers and therefore was influential in north coastal Andhra region. The next position among the Hindu sects was occupied by the old Vedic religion. They have

practiced different forms of the cults of minor deities and popular beliefs in the post kaktiya period where saivism and Vaishnavism underwent major fluctuations in their fortunes. saivism though didn't experience any significant doctrinal changes, maintained its influential edge overall the other sects of Hindu religion till the middle of 15<sup>th</sup> century AD, subsequently, it declined losing its first place of importance. Vaishnavism which occupied the second influential position at the beginning and finally came to occupy the first place among the hindu sects. The advent of a few new vaishnavite sub sects like vallabhas, chaitanyas, vittalas, e.t.c., into the region and further sub division of some of its subsects like sriVaishnavism on doctrinal matters, strengthened the position of Vaishnavism. The first part of the 16th century A.D., when the major part of Andhradesa was under the Vijaya Nagara rule, can be regarded as the golden age of Vaishnavism in the Telugu country (Soma Reddy.R, 1984, P.5)"11. "Vaishanava narrative carvings form a unique and important group within Vijaya Nagara sculpture. The Ramyana Narratives in particular are of immense interest. The unique presence of icons of Anjaneya (Hanuman) is a reminder of the Ramayana association with the site of Hampi the Ramayana incidents connected with the Vijaya Nagara area centre on Ramas meeting with the hanuman and his alliance with Sugriava. Bhagavatha Purana is the only Purana whose myths are found in the Vijaya Nagara image so its popularity arose from the wide following Krishna enjoyed on the city there are numerous beliefs of Krishna in Vijaya Nagara. The story of Vishnu as varadharaja rescuing Gajendra from the crocodile is one of the major images of the Vijaya Nagara art. In Saiva images the Linga images around the Hampi are numerous and there are famous forms of seating and standing forms of Siva and Siva Parvathi images are pre dominated Vijayangara temples. (Dalla Piccola. L. Anna. 1998, PP. 21 -23)"8. The important Vaishnava images of Vijaya Nagara coins are: Garuda symbol which was issued by Harihara-I of Sangama, Krishnadevaraya and Sadasivaraya of Tuluva and Ttirumalaraya-I of Aravidu family of Vijaya Nagara dynasty. The image of Garuda which appears sometimes without wings and sometimes shown in a leaving posture facing the right in Harihara-I coins the Garuda which posturing right face and the legend in Nagari Sri Vira Harihara was minted. The Garuda image represents the royalty as lord's vehicle which is symbolic to expand the cultural values of Andhradesa. The other important image is Laxminarayna which was issued by Harihara-II, Devaraya I of Sangama, Sadasivaraya of Tuluva and Tirumalaraya-I of Aravidu family of Vijaya Nagara this is an important Vaishnava symbol which expressing the peace and prosperity to the devotees of the dynasty including the rulers and the people. Vishnu and Laxmi are seated together where the lord holds the Sudarshana Chakra with three conventional flames and one left hand holds the Sanka the other left arm embraces Lakshmi and the other right arm is in then Abhaya Mudra which symbolizing to protection and prosperity of the dynasty. Many rulers in faith the lord will give protection and prosperity to rule their people in the better was and the images shows the strengthening of power identity of this dynasty. Another important image of Vaishnava symbol was Venkateswara, the Venkateswara was the chief deity of Vijaya Nagara and this type of coins numerously issued by the vijayangara rulers the venkateshwara image was

issued by krishnadevaraya of Tuluva, Sri Ranga –I, Venkatapati Devaraya -II, Sri Rangaraya-II of Aravidu family of Vijaya Nagara on the coins the image of Venkateswara standing to front with Kirita and upper and lower ornaments. The back-right hand has the Chakra and left has the Sanka. The front right hand holds Abhayamudra, while left hand is in points of his feet which gives refuge for devotees. The Arch have lion which supported by two Makaras, the Arch which had two ornamental shape one is star shaped the lower parts of which covered by planks, the deity stands on ground supported by a lotus. The image was showing the way of rituals and peace to the devotees. The rituals and offerings in the temple were continuing till present day, the Vijaya Nagara kings constructed the Mantapas in the campus of which explain the Vaishnavism in the dynasty of Vijaya Nagara, The Varaha, the Sanka chakra symbols also predominantly propagated the Vaishnavism in Vijaynagara.

### **Cultural Identity of Vijayanagara Coins:**

The foundation and existence of vijaynagara dynasty was laid on the pillars of its cultural identity. Many coins of Vijaya Nagara have been found in religious centres with the religious images. The cultural identity of Vijaya nagara have been focused in the works of their rulers by reviving the Vedas and Vedic culture and the temples and Mathas, the coins which were reflected in major centres of Vijaya Nagara on their images. The Vijaya Nagara rulers to revive Vedic culture through the large grants made by them to Sringeri and for well-known commentaries, namely Vedadasya of Saynacharya, who was closely linked with the Sringeri Matha headed by his brother Vidhyaranya this Mathas became a new orthodox centre and a new religious network covering the whole India. The Vedic norms have also have been constantly emphasized in the inscriptional claims depicting the king as the protector of the Vedas and twice born. The inscription of references also gives a new pilgrimages network that covered the whole India presumably with Virupaksha of Hampi as its centre. In process of sacred centres, Tirupathi, Kanchipuram and Srirangam became a vital pilgrim' centres where the question of dominance was resolved by the reaffirmation of the deity's supremacy as evidenced by the Stalapuranas and the coins. The kings are seen undertaking pilgrimages to such centres where the new erected thousand pillared hall, Portrait and sculptures of the kings. "In worshipful attitudes emphasized the ruler's devotion and interest in protecting the sacred character of the centre through the large-scale donations (Champakalakshmi.R, 2011, PP.637-638)"<sup>9</sup>. Thus, the rulers predominantly prior to the major centres to protect the culture and its identity, The Vijaynagara rulers have given importance to the religious images which was struck on the coins because to show the cultural identity through spreading the coins as medium of exchange which also expressed the Identity of culture in Vijaynagara dynasty to the outside the world. Thus, we can say coins played an important role to promote cultural identity as medium of exchange from Vijaya Nagara dynasty to the other dynasties of India and world.

### **Conclusion:**

Though the foundations of Vijaya Nagara have lay down to protection of regional culture and religious nature of South India. It is approached secular policies towards other beliefs. The rulers of Vijaya Nagara have maintained good relations with the Portuguese and some of the Muhammadians. It is very interesting to note that the Vijaya Nagara rulers recruited the Muslims into their army Devaraya II recruited Muhammadin archers and gave them liberal concession in the matter of religion, political necessity was the prime consideration not the religious faith. Bukka – I, declares “As long as the sun and moon endure the Vaihnava creed will continue to protect the Jaina Darsna. The vaishnava and Jainas are one. The Vijaya Nagara rulers were more than tolerant towards the Portuguese who belonged to Christian religion Depending on the Portuguese merchants for horses they patronized their religion. Ramayana allowed practicing Christian religion where he permitted to construct at Santhome by Jesuit fathers (Satyanarayana 1982: P.378 – 380)”<sup>10</sup>. It shows the religious tolerance of the Vijaya Nagara rulers which leads to integrity and secular identity of Vijaya Nagara as part of circulation of coins. They also have given permission to the foreign and private traders to mint their own coins in the dynasty. “The Portuguese traders in India issued as early as 1510 AD their Gold ‘Cruzodo’ of the same size, value and weight as the Varahas so that their money would be acceptable to lead traders. They also introduced gold coins called pagodas which were minted Porto novo where they had trade settlements. The Dutch United East India Company issued the Tegnapatam Gold pagodas with the image of Vishnu on the obverse. They also issued Porto Novo type pagodas which showed Laxmi on them. The Danish East India Company issued their ‘C7’ Pagodas with the figure of an Indian Idol on the reverse. The East India Company acquired Madras in 1639-40 Ad from the Raja of Chandragiri (Vankata III) have permitted to mint coins with the images of Vishnu, Laxmi and also issued star pagodas and three Swamy pagodas (Prasanna rao Bandela, 2003, P.76)”<sup>11</sup>. The religious tolerance of Vijaya Nagara rulers have been spread over our culture from India to abroad. Many companies the Portuguese, The Dutch and the East India Company adopted the religious symbols of Hindu gods to mint on their coins. It shows the Integrity of the Vijaya Nagara symbols and secular state in nature to develop the bilateral relations between India and abroad which practiced those days and also have role model to present day. Thus, we can say, the coins of Vijaya Nagara was promoted political sovereignty and supremacy of the state and cultural Identity, unity and Integrity of the dynasty which was alive till today though its celebrating 500 years of Glory past of unforgotten empire the great dynasty of Vijaya Nagara.

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# Design and Implementation of Smart Boat Technique

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**Abstract-**The Aqua smart boat which has inbuilt automatic fishing technique is designed by using DTMF technology, as it is a wireless, it can be easily mobilized and also controlled. Remote control fishing is a fishing technique accomplished by using a remote control boat. This project utilizes two DC Motors which are connected to the propellers of the aqua smart boat which are used to move the boat in several directions. Advantages of a brushed DC motor include low initial cost, high reliability, and simple control of motor speed. The driver used for DC Motors is L293D. The ARDUINO Microcontroller takes the input from the DTMF decoder and fishing rod sensor and communicates with the motor driver to perform necessary actions. LED indicator which it can indicate the motor ON/OFF in case of directions. The mobile phone acts as remote control. In this project we use ARDUINO micro controller, which is programmed to control the input and output modules present in the aqua smart boat. With the help of mobile keypads operations will be done. The aqua smart boat can be operated in a lake or a pond which is best suitable for fishing using a mobile phone which the users carry it daily. The boat has a motor which is connected to the fishing string hold a sensor which is covered by bait(fish food) at the end of the string. Once the boat enters into the lake/pond and when the fish catches the bait the sensor gets activated and the fish is pulled in to the boat.

**Index Terms-** Aqua smart boat, DTMF Decoder , DC Motor, Propellers ,Fish Bait

## INTRODUCTION

Telecommunication signaling employs Dual-tone multi frequency (DTMF) over analog telephone lines in the voice frequency band between telephone handsets and other communication devices. The trade mark term touch tone is the version of DTMF is used for telephone tone dialing and it is standardized by ITU-T. The remote control fishing boats are almost exclusively battery operated, since batteries provide several benefits when compared with glow engines: less noise during operation, consume no power during idle time, requires no oxygen, easier to maintain, finer power and speed control, etc. The aqua smart boat is mainly used to catch the fish automatically by operating it wirelessly by the user as the user need not to enter into the water or require a huge boat to go for fishing.

## STUDIES AND FINDINGS

This research paper uses experimental method with DTMF (Dual tone multiple frequency) decoder design. The decoder decodes the DTMF tone into its equivalent binary digit and this binary number is sent to the micro-controller (ATmega328). This research is collected from Design and Implementation of mobile operated Toy Car by DTMF. In the existing system this technique was implemented for designing a car, here we replaced car with boat using DTMF technique for smart fishing.

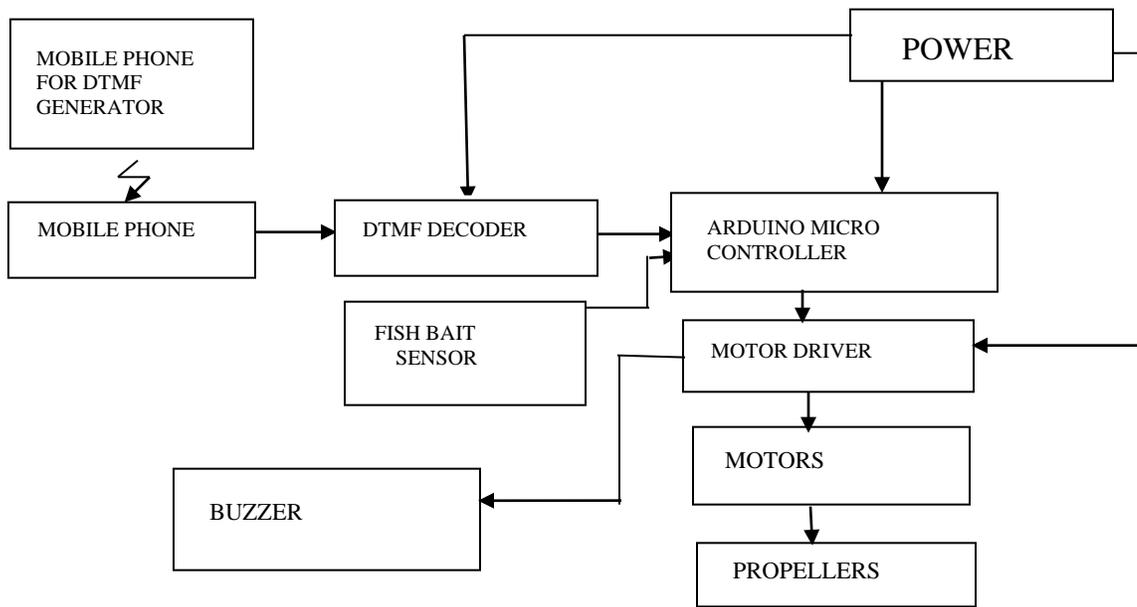


Figure 1: Block diagram of Smart Boat

The important components of this boat are DTMF Decoder, microcontroller (ATmega328), Motor driver(L293D),Power supply module(LM2596).A mobile phone that makes a call to another mobile phone attached to the boat which acts as a remote. For that reason this paper does not require any receiver and transmitter units. DTMF Decoder detects the DTMF tones and generates binary sequence corresponding to the key pressed in the DTMF keypad. The pins (d0,d1,d2,d3) of DTMF Decoder are connected to the digital pins(2,3,4,5) of microcontroller(ATmega328).The operating voltage of microcontroller is 5V,flash memory is 32kb in which 0.5kb is used by boot loader and it contains a 16Mhz crystal oscillator. The pins(8,9,10,11)of microcontroller are connected to (IN1,IN2,IN3,IN4)pins of motor driver(L293D).Motor driver is used to provide bi-directional drive currents to drive the motors. The 293D consist of four drivers. Pins IN1 through IN4 and OUT1 through OUT4 are the Input and output pins respectively, of driver1 through driver4.The boat has one more motor which is directly connected with power supply module with ken switch. Which is connected to the fishing string hold a ken switch which is covered by bait at the end of the string , once the boat enters into the lake, when the fish catches the bait the ken switch get activated and the fish is pulled into the boat.

*B. Use of IDE software*

In this research we used Arduino software written in Embedded C on windows .The Arduino Integrated Development Environment (IDE) is a cross platform application(for windows, mac-OS ,Linux)that is written in programming language java. The arduino IDE supports the languages C and C++ using special rules of code structuring. Most Arduino boards contain a LED and current limiting resistor connected between pin13 and GND, which is convenient feature of many tests and program functions.

**EXPERIMENTS AND RESULTS**

DTMF is used to here to train the commands for the Boat. DTMF consists of four output pins D0-D3.Whenever a command is given , the binary values of the address is given to the output pins D0-D3.The key tone commands as shown in table 1:

Table 1: Commands

COMMAND	ADDRESS	DTMF module outputs(D0-D3)
Forward	2	0100
Backward	1	1000
Left	4	0010
Right	3	1100
Stop	5	1010

- ( a ) when key 2 is pressed boat moves FORWARD direction.
- ( b ) when key 1 is pressed boat moves BACKWARD direction.
- ( c ) when key 4 is pressed boat moves LEFT direction.
- ( d ) when key 3 is pressed boat moves RIGHT direction.
- ( e ) when key 5 is pressed boat STOPS.

### EXPLANATION AND RESULTS

The components we are using for making the smart boat module is 12v Battery, Power supply module(LM293D) which is connected to PCB's(Printed circuit board) with 12v and 5v, DTMF(Dual tone multiple frequency) which generates the tones in binary sequence , Arduino UNO with ATmega328, Motor driver which is used to provide bi-directional drive currents, BO(Battery operation) which converts electrical energy into mechanical energy, Two DC motors which are connected to propellers and a switch which acts like a sensor as shown in FIGURE 2:

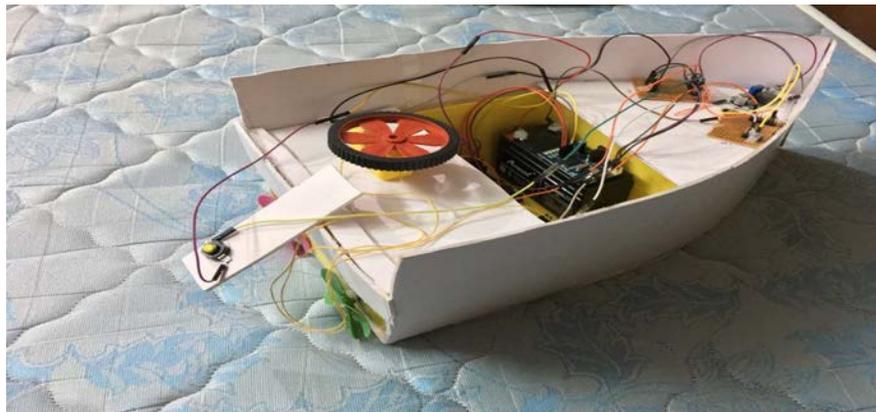


FIGURE 2. Smart Boat Module

This Boat works in Lakes , Ponds and Rivers which consist of less content of water . By giving the commands from DTMF Decoder through smart phone which acts like a remote the boat moves forward , reverse , left side and right side. The working of the boat in water is shown in FIGURE 3:



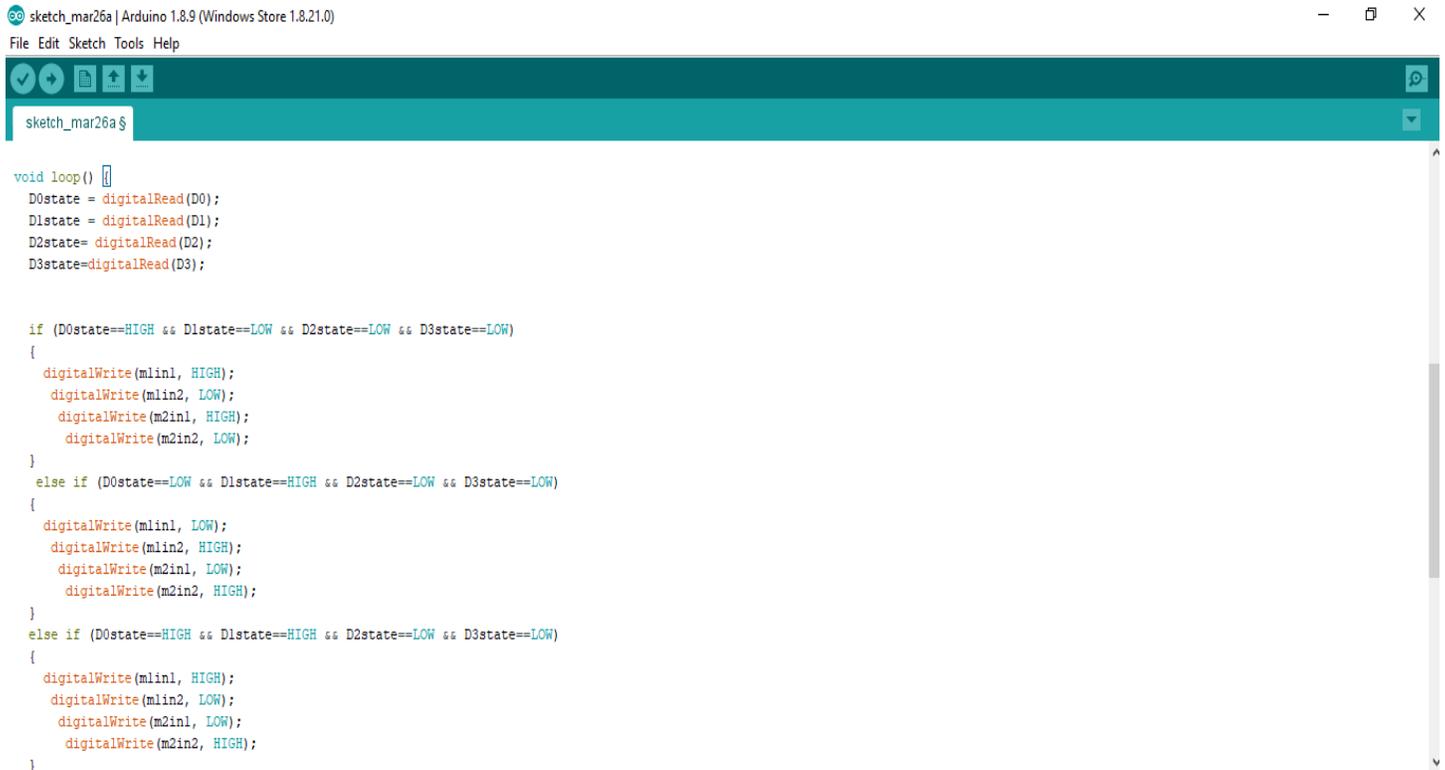
FIGURE 3 .Output of the project

### CONCLUSION

In this project, the boat is controlled by a mobile phone that makes a call to the mobile phone which is attached to the boat. In the course of a call, if a button is pressed, a tone corresponding to the button pressed is heard at the other end of the call. This is a wireless controller boat hence the limitation of wired is completely overcome by using latest technology of mobile phones. However there are lots of scope to improve the stability and ability of the system. The mobile phone that makes a call to mobile phone stacked in the boat acts as a remote. Hence this project does not require the construction of receiver and transmitter units.

### APPENDIX

The programming code for this model done in the programming language embedded c is given below:



```
sketch_mar26a | Arduino 1.8.9 (Windows Store 1.8.21.0)
File Edit Sketch Tools Help

sketch_mar26a $

void loop() {
  D0state = digitalRead(D0);
  D1state = digitalRead(D1);
  D2state= digitalRead(D2);
  D3state=digitalRead(D3);

  if (D0state==HIGH && D1state==LOW && D2state==LOW && D3state==LOW)
  {
    digitalWrite(m1in1, HIGH);
    digitalWrite(m1in2, LOW);
    digitalWrite(m2in1, HIGH);
    digitalWrite(m2in2, LOW);
  }
  else if (D0state==LOW && D1state==HIGH && D2state==LOW && D3state==LOW)
  {
    digitalWrite(m1in1, LOW);
    digitalWrite(m1in2, HIGH);
    digitalWrite(m2in1, LOW);
    digitalWrite(m2in2, HIGH);
  }
  else if (D0state==HIGH && D1state==HIGH && D2state==LOW && D3state==LOW)
  {
    digitalWrite(m1in1, HIGH);
    digitalWrite(m1in2, LOW);
    digitalWrite(m2in1, LOW);
    digitalWrite(m2in2, HIGH);
  }
}
```

FIGURE 4: Arduino software (IDE) with Embedded C code

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# The Difficulties and Improvements of Green Accounting in India

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**Abstract-** Green accounting is another accounting field whose principle work is to adjust the advancement on both economy and condition through viable esteem the executives and joining accounting and natural economy. Attributable to the absence of relative guideline and the nonappearance of administrative supervisory, there are a few obstacles blocking its training. So as to tackle those issues, generally entrenched laws, legislative mediation and preparing youthful bookkeepers are required in this procedure.

**Index Terms-** Green Accounting, Ecological Insurance, Financial Advantages, Supportable Advancement

During the time spent usage of green accounting, a large portion of the endeavors in India are as yet detached to shoulder natural insurance duty, or departure from bearing it. For this situation, it is of incredible hugeness to discover the answer for the issues happening amid the usage of green accounting and push advances the development. It is useful to the economical advancement, to smother the biological and asset emergency, and to put the asset sparing and ecological insurance arrangement into impact by consolidating the financial business accounting mode and the task result reflection mode together, which contains the natural outcome causing by the gross social item, trading, expending, and item subject into monetary business accounting.

## I. THE GENERAL EXAMINATION ON GREEN ACCOUNTING

The primary motivation behind Green Accounting is to understand the mix of monetary improvement and natural security by powerful esteem the executives and coordinating accounting and ecological economy. In particular, Green Accounting is a recently brought into the world subject that investigates the ecological adequacy and the impact of the natural exercises on the undertaking's monetary outcomes. It is depended on cash as the fundamental unit of estimation, in view of important laws and guidelines, estimating and recording the expense of ecological contamination, natural control, natural improvement costs, support and advancement of the arrangement of the advantages to the earth in the meantime sensible estimation and report. The reason for Green Accounting is to consolidate accounting with ecological financial aspects, through compelling quality administration, accomplish the objective of organizing monetary advancement and natural insurance. In 1992, the world condition and improvement meeting passed four automatic records on insurance of nature, from that time, ecological issues began to be concerned. In 1999, the Assembled Countries talked about the declaration on the situation of the natural accounting and detailing, and framed a total arrangement of universal ecological accounting and report rules. Governments have set up their own arrangement of natural accounting. In India, the administration built up the "green accounting advisory group" in Walk 2001. In June 2001, endorsed by the service of money, accounting society of India built up the expert board of trustees of the seventh-natural accounting proficient advisory group, India's green accounting research transforming into another stage. Compared with created nations which had started to research and execute green accounting in the mid 1970s, India is moderately late in the green accounting hypothesis inquire about and pragmatic investigation.

## II. LITERATURE AND RESEARCH SURVEY

Ge Jiashu (1992) once said, green accounting was an intriguing issue in western accounting field during the 1990s. Be that as it may, due to the shortcoming of green accounting hypothesis inquiring about, up until this point, the improvement of green accounting is very moderate. To dispose of shortcoming of green accounting hypothesis, it is important to develop the green accounting hypothesis structure as quickly as time permits. This view has assumed a spearheading job in extending the green accounting research field. Over the previous decades organizations have perceived the advantages of ecological detailing. Accordingly, there was emotional increment in the quantity of organizations announcing from numerous points of view.

Nasir Zameer Qureshi et.al., (2012) in their examination paper, natural accounting and revealing: an fundamental segment of business methodology, depicts the natural segment of the business procedure, delivering the required execution reports also, perceiving the numerous abilities required to measure, gather and break down the imperative information. Unique accentuation of the exploration is on age of reports and their guidelines, for the scope of business furthermore, administrative purposes. Malarvizhi P (2008) in an examination corporate natural giving an account of the web: an understanding into Indian practices attempted to build up the methodology what's more, extent of natural accounting and revealing, as it exists today. The investigation depended on an example of 24 records including yearly reports, ecological or manageability reports and other pertinent reports of past years. At first organizations in the example were delegated producing and nonmanufacturing segments. Since certain organizations work in the two segments broke down, the task to a explicit one was resolved based on

primary action completed by the organization. Green accounting technique for India and its States, a task done by Haripriya Gundimeda et.al (2005). Contend the case for Green Representing India (for example a structure of national records and state accounts appearing net increments to riches) what's more, to display a favored approach and models to reflect common capital

and human capital externalities in India's national records, estimating as devaluation the exhaustion of characteristic assets and the future expenses of contamination, and remunerating training as an expansion to human capital stock.

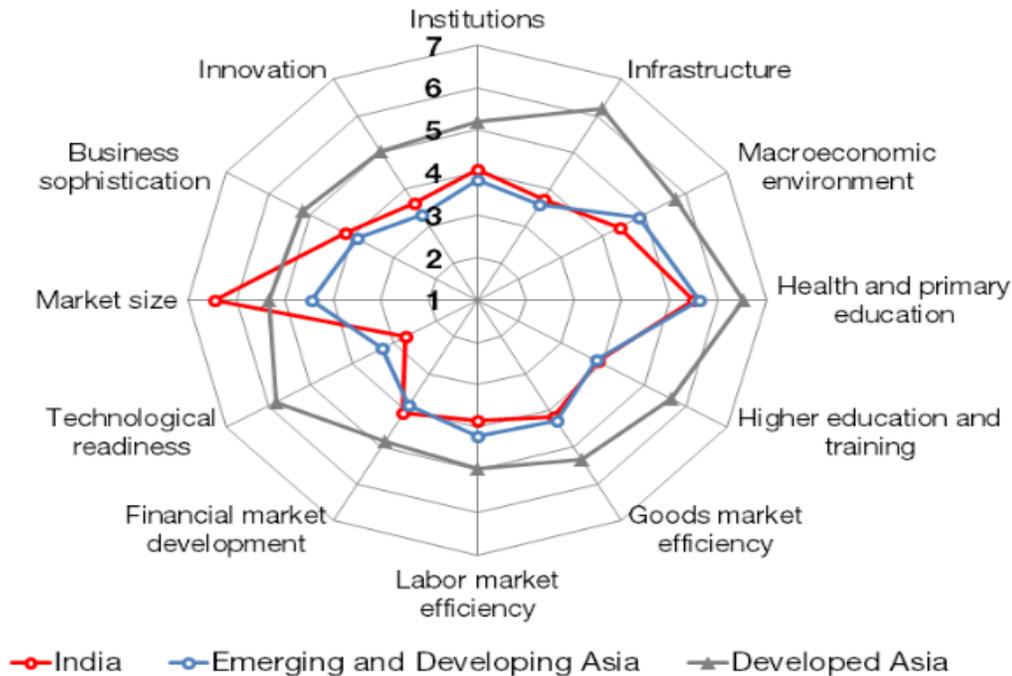


Figure 1.1

The world preservation association, clarifies Natural accounting as an imperative device for understanding the pretended by the characteristic condition in the economy. And afterward advanced to improve mindfulness, fabricate a sensible green accounting framework, ideal the significant legitimate structure for green accounting system; contrasted green accounting and customary accounting contrasts by examining the essential standards and key components, Green accounting can react to conventional accounting can't totally supervision and the board exercises to enhance, the expansion in capital estimation of deformities, accentuating the advancement of green accounting is helpful for the reasonable advancement of endeavors, draw in outside speculation, accounting change and development. Then investigated of the current accounting framework and green accounting isn't versatile, taking note of that the procedure of execution of green accounting ought to pursue the long haul and progressive, adaptable begin and outskirts, precise and win-win guideline.

routine with regards to joining the hypothesis support. Thusly, the accounting hypothesis research ought to be reinforced, and effectively be investigated. In light of its absence of for the most part acknowledged accounting speculation, accounting gauges and accounting object, accounting strategies for green accounting is controversial

**3.2. Applicable Laws and Guidelines Not Impeccable:**

India has not yet framed an exceptional green accounting laws and guidelines, the undertaking accounting framework and data divulgence of the significant laws and guidelines are once in a while including natural issues . In the accounting practice, there has been no arrangement of green accounting and data divulgence framework and determinations. Due to the absence of compulsory standards, the partners' interest for corporate divulgence of natural data isn't solid. Additionally, endeavor natural data divulgence has quite recently begun, and accordingly, it the absence of important determination.

**3.3. Nonappearance of Legislative Successful Supervision Measures:**

At present, India actualizes one-year-end review of corporate yearly reports , rather than the green accounting. In this manner, it needs considerable social supervision . Without social supervision, it is hard to execute green accounting when the undertaking just depend on self-control.

III. THE CHALLENGES IN THE GREEN ACCOUNTING USAGE

**3.1. Absence of Relative Hypothesis:**

Because of the decent variety of green accounting framework and the accounting of entangled articles, particularly the estimation procedure which has not yet been leap forward, every one of those components make the green accounting need



**Figure 1.2**

### **3.4. Business visionaries ‘Myopia towards Ecological Assurance:**

Since the change and opening up our nation, so as to help the fast monetary advancement, more accentuation on network development in the quantity of Gross domestic product, overlooking natural contamination and different issues. Which effectively lead to a large number of our organizations green and natural awareness of other's expectations isn't solid, Feature economy while help condition and "Treatment after contamination", such sorts of musings are typical in India. Undertakings frequently essentially center around interests, helping perspective of natural assurance and the development of green accounting .Among them, the venture to the natural security issue exists silly conduct.

### **3.5. Absence of Green Accounting Talents:**

Green accounting has a place with a developing field in our nation. India's green accounting began generally late, and its improvement advance is fairly gradually. The nonappearance of the preparation in related enterprises , and the absence of shaped hypothesis framework cause the deficiency of skilled green accounting faculty . Furthermore, there is a silly circumstance that the need and request of green accounting abilities can't coordinate one another. Individuals in India are insensible of green awareness. The harm of social open offices, and abusing open spots are likewise the signs of the powerless feeling of green accounting

## **IV. SOLUTION FOR THE ISSUE OF TROUBLE IN GREEN ACCOUNTING**

### **4.1. To Manufacture a Sensible Arrangement of Green Accounting:**

India's green accounting framework ought to do the followings: right off the bat, reclassify the accounting targets and decide the objective so as to accomplish manageable improvement, acknowledging monetary advantage, natural advantage and social advantage adjusted advancement; furthermore, for the conventional accounting theory, accounting components of the accounting framework, accounting technique, the framework ought to be saved to the best degree, to perfect with the current accounting framework, to lessen the obstruction of green accounting framework execution ; at that point, separate the accounting subjects from the financial factors in the record settings so as to the accounting report revelation of ecological data; in the accounting personality subjects, for example, expanding the pay of ecological resources, ecological Goal so as to reinforce exhaustive green accounting data divulgence; at long last, as per the brought together bore, gather a complete green accounting data.

### **4.2. Create and Ideal the Important Legitimate Structure for Green Accounting Framework:**

So as to advance green accounting in India as quickly as time permits, measures will be taken to fortify the development of the lawful arrangement of green accounting. Green accounting is a convoluted framework, including financial issues, natural and social issues, yet additionally the issue of reality. So the fundamental rule will be featured. Green accounting and supervision which have been recorded in the "accounting law", are resolved its status and job as law . Endeavor ecological results of the accounting framework, can through the authenticity of the fiscal reports mirror the undertaking condition matters and credibility, mirror the equality.

### 4.3. Improve the Social Obligation Appraisal Framework, Fortify the Supervision of Green Accounting:

Green accounting data ought to be given by the completely uncover the venture social duty regarding natural assurance. Assessment of big business ought to be coordinated with big business social advantages, social expense and social benefits for the standard, remain in the point of view of social endeavors in all parts of execution, so as to keep up social assets and condition, national macroeconomic guideline and control . Can expect organizations to report condition ought to be as a piece of the monetary report, submit together with the yearly money related report, and report discharged through the Web business condition, expanded the straightforwardness of corporate ecological data report, fortify supervision, and examination of endeavors. All gatherings in the public eye. Administered by the administration from one viewpoint ; then again can likewise be dispatched by the legislature to take an interest in supervision of an unprejudiced outsider, for example, accounting firms and other commission.

### 4.4. Set up Ventures Ecological Duty:

Endeavors ought to abstain from sparing expenses to the detriment of the natural conduct, setting up both social advantages and monetary advantages. So as to all the more likely secure nature, can from the accompanying two viewpoints: 1) broad

dialogs on the topic of ecological assurance and asset sparing and preparing, reinforcing the cognizance of big business ecological insurance and asset preservation, advance green creation and the consistent utilization of clean vitality, ecological assurance innovation, urge ventures to build up the improvement of green accounting . 2) as indicated by the genuine circumstance of every undertaking, pick a couple should concentrate on reinforcing the ecological insurance cognizance of corporate fund as a pilot, from point to surface, continuously actualize green accounting.

### 4.5. Advance Green Accounting Instruction Framework:

Set up a comparing arrangement of remunerations and disciplines, ecological enhancements to assume a functioning job in advancing venture offer certain substances or reward strategy, to decimate the earth of the undertaking to offer discipline, to guarantee the reasonable. To improve the open natural cognizance, shaping of the supervision by popular supposition of the endeavor. Colleges ought to reinforce natural organizations, organizations cooperate to develop green accounting work force. Papers, radio, Web and other commitment to streng-then purposeful publicity, advance the idea of Green Accounting.

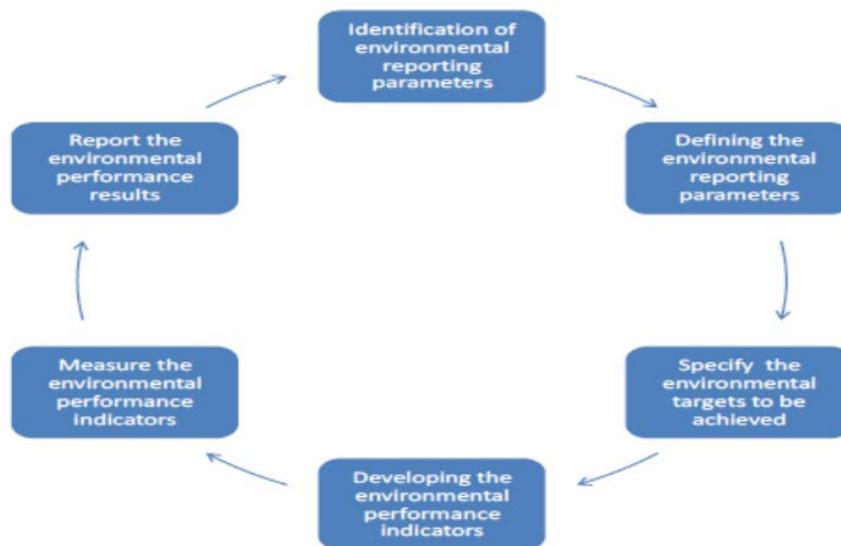


Figure 1.3

## V. CONCLUSION

The significance of the execution of green accounting expands worry of the network. Because of fragmented green accounting norms, despite big business childish about ecological issue absence of government supervision, absence of green accounting experts, there are challenges in green accounting execution. As the nation keeps on being the standard of law, particularly for green accounting guidelines bit by bit flawless, endeavor changing administration thought, and impeccable the social duty evaluation framework, fortify the supervision of social gatherings on green accounting. Will in the long run illuminate the troubles in green representing India restricted will be effective

utilization of common assets, biological condition will be improved in our nation, the economy will be progressively solid advancement, the general public will turn out to be increasingly agreeable.

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# A review article on Anti-Fungal Nail Lacquer Using Treatment of Onychomycosis

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**ABSTRACT-** The purpose of written review paper on anti-fungal nail lacquer which is used in treatment of Onychomycosis skin fungal disorder was focus on the disease causes and treatment by nail lacquer, onychomycosis causes by the pathogens include dermatophytes, candida, and non-dermatophytes. Improvement clinical efficacy and also proper the patients compliance. Nail Lacquer preparation by simple mixing non-volatile, gloss, smoothness to flow, drug diffusion studies drug content estimation, Nail lacquer is used on fingernails, toenails of the human beings. Which is protect the nail but, nail plate but most of significant in maximize the beauty, gloss, impart colour. Nail lacquer is mostly applicable for those drug which have poor bioavailability in oral formulation this techniques is used in maximize the topical bioavailability of drug across the nail.

**Key word-** Fungal infections, Nail Lacquer, Onychomycosis

**INTRODUCTION:** All over the last time of period the treatment of illness has been carried out by administration drugs to human body by many routes namely oral, topical, inhalation etc. human nails do not have only protective and decorative act, but can also be regarded as an substitute tract for drug delivery, particularly the nail disease such as psoriasis. These nails disease are to great degree dispersed in the population, particularly among older and immune composition patients. The successful treatment nail disease the used active drug must permeate by the dense keratinized nail plate and arrive deeper layers, nail bed and the nail matrix. The nail disease is caused by the fungal infection, these disease is cured by achieving desired curative concentration.

**FUNGAL INFECTION-** The fungus is crude organism and the fungi can live all over in the air, in the soil, on the plant and in the Fungal infections the classed by capable of causing harm fungi are very common determine, and it not so serious if they are diagnosed fast and right treated. All the same while fungal infections are solicitude, one of treated again injection can easy fall out, as fungi can be create problem to skill. The fungal are frequently present in the totality of surrounding conditions.

**OCCURENCES-** The fungal spores are available in the totality of surrounding conditions and can inhale the spores. They can lead on the people the fungal infection are begins in the respiration or in the skin.

**EXAMPLE OF FUNGAL INFECTIONS-** Athlete's foot, ringworm, yeast infection, jack itch, fungal infection of the slain, psoriasis.

## PRONE OF THE FUNGAL INFECTION-

- Person with low immune system are that are children older person are suffering from AIDS, HIV infection, cancer and diabetes.
- The people are relation with those people suffering from the fungal infection.
- People have highly dermis bend.
- The people are often generally place or site with moisture and that is rooms, present and since fungi require moisture to develop and minimize.
- The person who has more sweat and use sweating clothes and shoes can high chance the fungi develop on the dermis.

## CAUSES OF FUNGAL INFECTION-

The yeast is general fungus that is candida the fungal infection fall out in fungal spores come in dermis or fungus are inhaled.

## TREATMENT OF FUNGAL INFECTION-

The fungal infection, doctor will treated having base on several kind of infection that is fungal, it may prescribed the topical antifungal medication, most fungal infection can be cure with concluded the counter or prescription creams.

## SOME MEDICINES NAME WHICH IS APPLY IN TREATMENT OF FUNGAL INFECTIONS-

Topical antifungal is fluconazole creams, antifungal nail lacquer. Oral medication Terbinafine 250 mg tablets.

### NAIL DISEASE-

The nail plate may seem not in normal as a conclusion of congenital defect, disease of dermis with attachment of the nail bed, systematic disease, minimize of blood supply, local trauma, infection of the nail folds, Infectious nail plate.

**A- GREEN NAIL SYNDROME-**Pseudomonas is kind of fungus which is cause the infection

### B-PARONYCHIA-

**1-ACUTE PARONYCHIA-** Bacterial infections e.g. group. A streptococci .that is cause the swelling violent pain.

**2-CHRONIC PARONYCHIA-** Mainly fall out in patients whose hands are an invariably in water with recurrent lower trauma prejudicial the cuticle so that throne can farther harm the nail fold. Generally get infected particularly with pseudomonas develops a green or black discoloration.

**C-NAIL PSORASIS-** Scurfy dermis the nail plate gets cavities dry and frequent tumble and also appears red, orange and brown with red dots.

**D-YELLOW NAIL SYNDROME-** A not widely known position qualify via yellow nail with lack of cuticle, develop slowly and it minimize or separated.

**E-ONYCHOMYCOSIS-** It is chronicle for third of integumentary fungal infection and one half of all nail disease.

**PARAKERATOSIS-** Presenting hyperkeratosis.

### ONYCHOMYCOSIS-

People with infection are frequent feel shame about nail not in figure, because it can one time limits the quality of moving freely, it may indirectly minimize peripheral circulation because of that decline position that are several stasis and foot ulcers Fungal infections of the nails can also dispersed to another site of the body to another human.

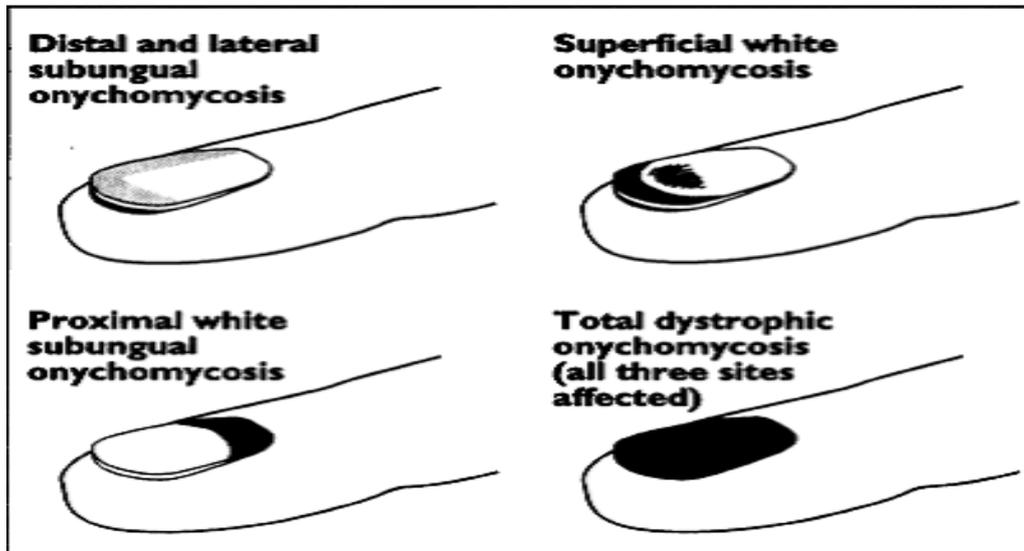


### ONYCHOMYCOSIS

#### CLASSIFICATION OF ONYCHOMYCOSIS-

- A- DISTAL SBUNGAL ONYCHOMYCOSIS-** The more general form may growth in the toenails, fingernails or both, infection is normally caused by trichophyton rubrum which attach in nail bed and the bottom of the nail plate, starting at migrating proximally done inherent nail matrix.
- B- WHITE SUPERFACIAL ONYCHOMYCOSIS-** Once 10% of cases which is caused by several fungus that direct attach the superficial layers of the nail plate and develop well represented opaque white island on the plate the nail is rough, soft and friable. This several of disorder can be treated with topical antifungal drug alone.

- C- PROXIMAL SUB UNGAL ONYCHOMYCOSIS-** It is fall out while infecting organism commonly attach the nail through proximal nail fold, penetrate the newer develop nail plate and then migrate distally.
- D- CANDIDA ONYCHOMYCOSIS-**It can category into three part-
- 1-Infection starting as infection structure encompassing the nail known felon.
  - 2-Chronicle for lower than 1% of disorder this position is seen in immune via media patients and attach direct of the nail plates.
  - 3-While nail plate has removed from nail bed.



**CLASSIFICATION OF THE ONYCHOMYCOSIS**

#### **CLINICAL FEATURES-**

The nail plate can having become thick yellow or cloudy looks. The nail can get hard and friable or can removed from the nail bed. There is normally no pain or another bodily sign and symptoms, unless the disorder is service fungal free skin that one time from as conclusion of fungal infection in other site of the human body.

This could take the form of imprudently incurring risk or itch in an site of the human body that is not infected with fungus. People with fungus infection may experience problems in appearance of the nails.

#### **DIAGNOSIS OF ONYCHOMYCOSIS-**

Conventional method for identification fungal organism in the nail plate of the patients include direct microscopy, fungal culture and histopathology. Surgical pathology testing using PAS stain is the current gold standard for diagnosis, newer method for diagnosis include polymerase chain reaction, optical coherence tomography, confocal laser scan microscopy, matrix-assisted laser desorption/ionization time of high mass spectroscopy, contrast hard x-ray microscopy. Conformational of observation and availability and cost must be considered before these newer methods for diagnosing can be incorporated in clinical practice.

#### **TREATMENT OF ONYCHOMYCOSIS-**

Several modalities can be used for the treatment of disease topical therapy, systemic therapy, combination therapy, nail removal and nail lacquer.

#### **NAIL LACQUER-**

Nail polish or nail varnish is used for people fingernail or toenail to decorate and/or protection the nail plate. Conventional nail lacquer have been applied as cosmetics since a large duration for beautification and protection of nails. Topical nail preparation like lacquer, enamel and varnish are integral part of today's beautification curative. It is help for defence to the nail plate, but most significantly it maximize their glowing, imparting colour.

Formulation of active objects, large tissue concentration for capacity for the treatment of nail fungal disease.

The medicated drug are colourless and non-glossy to be applied for male patients, and more significant the drug are produce from the film so it can penetrate in to the nail the drug consisting polymer film may be considered as a matrix type controlled release the drug are closely spread with polymer and predicted the spread drug in polymer film before it is produce.

### MECHANISM OF NAIL LACQUER-

Dispersed drug will soluble in the polymer film before it is produce. Drug is produce from the film will be governed by Fick's law of diffusion that is across plane surface of unit area will be given by:

$$J=D \text{ dc/dx}$$

Where

D= diffusion coefficient of the drug in the film, dc/dx= concentration gradient of the drug across the diffusion path of dx.

The thickness of the diffusion path grow with time, as the film surface adjacent to the nail surface becomes drug increase in concentration in lacquer result increase drug uptake.

Drug consisting nail lacquer are new formulation. Marketed formulation begin marketed in 1992 is clean colourless liquid and consists the antifungal amorolfine 5% eudragit RL 100 glycerol triacetate, butyl acetate, ethyl acetate and ethanol. The nail lacquer is used 1-2 time weekly to infected nail plates for up to 6 months and 9-12 months for toenails, approved by FDA in 1999. A clean colourless liquid, it consist the antifungal agent it is used up to 48 weeks. The film is separated every 7 days with alcohol before re use of nail lacquer.

### ADVANTAGES OF NAIL LACQUER-

- It cannot be easily separated through rubbing or washing.
- In mixing, the effectual is large lasting, once using of lacquer give defence for once week.
- Produce and rate of diffusion can be made optimal by choosing the lacquer preparation (solvents, polymer and plasticizer).
- Formulation is easily as equivalence to oral dosage form.
- Lower or no systemic adverse effect.
- Regarding nail pharmacokinetics a lots of less portion of oral dose arrives nails. Localized therapy there by aid minimizing dose.

### DISADVANTAGES OF NAIL LACQUER-

- Rashes associated to side effect that is erythema of proximal ail fold were presentation more often.
- Another side effectual which were thought to be normally related consist nail disorder that are shape change, irritation, ingrown toe nail and discoloration.



### MARKETED ANTI FUNGAL NAIL LACQUER

### CONSTITUENT OF NAIL LACQUER-

The general nail lacquer contain of solvents, film forming polymer, resins which enable the film to in accordance with to nail plate and made known shinning to the film, colouring agent and suspending agents.

- A- FILM FORMERS-** A numerous of film forming material have been advice for nail enamels, These consists nitrocellulose, cellulose acetate, ethyl cellulose and various polymers applied as film former.
- B- RESINS-** Resins pass on adhesion and make proper gloss. Generally resins are chaired to enhance moisture opposite. They are dissolve in more bulky and solvents.
- C- PLASTICIZERS-** Plasticizers pass on flexibility and adhesion to the surface there are various kind of plasticizers, solvent and non-solvent plasticizers. The number of plasticizers which can be applied in nail lacquer varies mostly and may vary form 25% to 50% of film former.
- D- SOLVENTS-** Although evaporation character are of firstly significance in nail lacquer, but fast rate of evaporation cause a pot flow of enamel conclusion in uniform and marked with use. Solvent are commonly category according to their boiling points.
- E- PIGMENTS-** Pigments applied as nail should have the same properties as applied in other cosmetic. Generally applied pigments are titanium dioxide, yellow iron oxide, red iron oxide, etc.
- F- SUSPENDING AGENTS-** Not soluble pigments and inclination to settle, thence to avoid this suspending agents such as colloidal clays like bentonite can be used. The preparation construction for nail use and few methods applied to maximize the topical bioavailability of the drug across the nail, least in drug delivery across the nail.

### **ABSORPTION THROUGH NAIL-**

Nail plate is around 0.25-0.6 mm, which is around 100 fold thicker than the stratum corneum. In the opposition to the stratum, the nail plate nature like a concentration. Hydrogel instead than membrane. Hydration can effectual the effective pore size of hydrogel and thence the trans ungal transport, hydrated person nail plates nature like a hydrogel of more ionic strength to the polar & semi polar alcohols. Furthermore the nail is firstly make better with largely disulphide-linked keratin. The nail make better for the penetration of short hydrophilic molecules. Most pharmaceutical agents are large and highly lipophilic and therefore unable to diffuse across the nail at curative concentration. Lipophilic vehicles and particularly nail lacquer are most place for topical used on the nail than aqueous system because of their good adhesion. Penetration by the nail plate follows first order kinetics after a lag time of 400 hours. The duration of penetration primarily is membrane-controlled and later gets a matrix controlled method because of the membranes largely permeability.

### **TO ACHIEVE SATISFACTORY FILM IT SHOULD HAVE THE FOLLOWING CHARACTERSTCS-**

- It should have better wetting and flow properties so that film former is even.
- It should have uniform colour.
- It should have better gloss.
- It should have good adhesive properties.
- It should have amount flexibility so that it does not crack or get brittle.
- It should have amount hard surface which is opposite to impact and scratch.
- It should have reason drying time 1-2 minutes.
- It should be capable to proper the above mentioned for reasonable time about one week.

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# A Review Article on Floating Drug Delivery System Used in Treatment of the Depression

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**ABSTRACT-** The purpose of written on review on the Floating drug delivery system use in treatment of depression is the main object on floating drug delivery system mechanism, needs and application and the main focus on used in treatment in depression mental state, floating drug delivery system is extreme valuable process and capability to prolong and control the gastric emptying time which domicile in the stomach for long time and floating system is more significance in enhancement of bioavailability and minimize the drug wastages, depression is most serious mental state today many people is know that depression not disease but it is serious mental disease which is cause anxiety etc. And floating drug delivery system is very useful on those drug which have lower bioavailability and in this disease. And in this mental state patients not want to take medicine two to three times because they not feel good and normal and floating system is most useful for patients compliance so floating drug delivery system is very applicable in anti-depressant drug for example Venlafaxine hydrochloride.

**Key word-** Gastro retentive system, Floating drug delivery system, Depression

**INTRODUCTION-** Oral drug delivery system is aid to arrive to resistance to change of position therapeutic plasma drug concentration in to the preparation. These drug dosage forms disclose good patient compliance and assumption drug release profiles. Moreover these were not constructed to counter the difficulties attached with physiological position of the human body that are gastric emptying which more important effectual the bioavailability and in turn the curative capacity to produce a desired effectual of the drug dosage forms. Thus gastro retentive dosage forms such as hydrodynamic balanced systems, modify density system, GIT release the drug in absorption zone and extended the gastric residence duration by antagonistic gastric emptying method. The groups can controller release of the drug in absorption zone before eviction of the dosage form from the human body thence make proper the bioavailability of the drug.

Gastric emptying of dosage forms is an utmost various method and capability to extended and control emptying time is vital plus for dosage forms, which domicile in the stomach for a large time than conventional dosage forms, while the dosage form is lower absorption/non absorbing phase. These kinds of problems defeat by the floating drug delivery system. It is the gastro retentive drug delivery system.

**GASTRO-RETENTIVE SYSTEM-** Gastro retentive system can stay in the gastric site for many hours and thence importantly extended the gastric retention made better bioavailability minimize drug wastage and make better, solubility of drugs that are less soluble in high pH environment. Gastric retention generate newer curative possibilities and substantial profits from patients.

Gastro-retentive system are those dosage form which is able for retain itself in the stomach of gastric content to maximizing the produce absorption drug from medium of acidic in control manner.

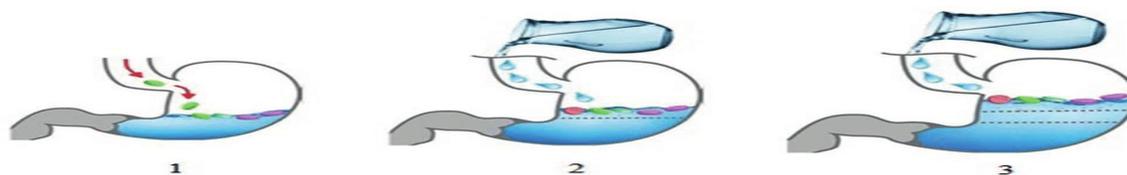
Gastro retentive system are favourable drug which is improving their.

- Bioavailability
- Therapeutic effective
- Possible reduction
- Reduces drug wastage
- Rise solubility for drug that are less soluble in high pH

**FLOATING DRUG DELIVERY SYSTEM-**

Floating drug delivery system are less density which buoyancy is capable amount for float over the gastric content. It stay buoyant in stomach without affective gastric empty retention time. Conclusion maximize the gastric retention time for better control of fluctuation in plasma drug concentration.

Devis is primarily introduce the floating system that floating drug delivery system to use the difficulty of swelling of dosage form and presented the modern gastro retentive drug delivery system to the pharmaceutical or pharmacy industry. Today the more of effectual control drug release dosage form.



### FLOATING DRUG DELIVERY SYSTEM

The main purpose of floating drug delivery system is arrive assuming and maximize in bioavailability. Today pharmaceutical scientist are mostly participate in development of floating drug delivery system. The dosage form has vantage of once dose for cure and should be deliver the active drug material directly at specific site. Floating system is beneficial as drug with narrow absorption window, which is importance for local action to other dosage form of tablets which are absorbed in the stomach. Floating drug delivery system will maximize the bioavailability of the drug from by floating dosage form in the stomach for large duration and produce for extended time and these several kinds of system are significant for narrow absorption. Useful the special category of the dosage form. Gastric emptying is most fast in fasting stage, bulky in the presence of food to slow emptying and give important liquid for efficient buoyancy.

#### NEEDS OF FLOATING DRUG DELIVERY SYSTEM-

- The Transitional gastric emptying time is reason of drug absorption.
- Drugs which are absorbed from the site of gastro intestinal tract.
- Local delivery system or sustained drug delivery system from the stomach.
- Drugs which are low soluble or degrade in alkaline. They are encounter at the gastro intestinal lower part.
- Mostly applied in cure in peptic ulcer.

#### IDEAL CHARACTERSTICS OF FLOATING DRUG DELIVERY SYSTEM-

- The floating drug delivery system is should be maximize the bioavailability.
- It should be provide beneficial systematic effectual.
- Applied of those substance which provide maximum bioavailability.
- Drugs, which are primarily absorbed in the stomach and upper site of gastro intestine.
- The absorption of drug in gastro intestine tract with narrow window absorption.
- The drug acts local in the stomach.
- The drug which are unstable in the colon.
- Should be enhancement effectual for in treatment and should be low adverse effect.
- It should be nice stability.

#### IMPORTANCE OF FLOATING DRUG DELIVERY SYSTEM-

- Drug dosing is low
- The adverse effect of drug is low
- The cure of gastric disorder is useful.
- The dosage form of drug is applicable for firstly absorbed in gastro retentive intestinal tract.

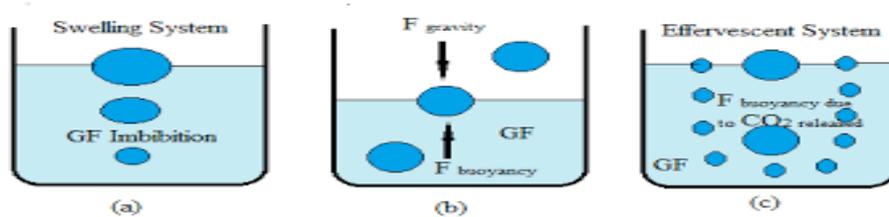
**MECHANISM OF ACTION-** In this system after releasement of the dosage form, the residuary system is nothing to contained from the gastro intestinal tract, conclusion maximize the gastro retentive time and better determine the fluctuation in the plasma drug concentration.

Static, Moreover a lowest gastric content useful to permit the appropriateness accomplishment of buoyancy retention base, a lower flat of the floating force (F) is permit is needful the jog the drug dependable buoyant on the surface of the repast. Lower gastric content is useful to permit the accomplishment rightness for buoyancy F is the function duration that needful primary

recessed the object first is the float is nice F is on maximize positive side. The setup is needful in bar the hindrance, the buoyancy ability fluctuation.

$$F = f \text{ buoyancy} - F \text{ gravity} = (D_f - D_s) g v$$

Where F= total vertical Df= fluid density Ds= object density v= volume and g= acceleration due to gravity.



### MECHANISM ACTION OF THE FLOATING DRUG DELIVERY SYSTEM

**ADVANTAGES OF THE FLOATING DRUG DELIVERY SYSTEM-** The legion of the floating drug delivery system are following as.

- Extended release of the administered drug from the several kinds of the dosage form like tablets, capsules, microspheres of the system.
- The Floating system is enhance the bioavailability.
- This system is more desirable the proper of being selective in receptor activation.
- Large effectual concentration.
- For the local infirmity marked therapy of the method in the upper site of the gastro intestinal tract.

### FACTOR AFFECTING THE FLOATING DRUG DELIVERY SYSTEM-

- **DENSITY-** Density of the gastric retention time dosage form function from buoyancy which is to be contingent upon the density because of density of dosage form is effectual the gastric emptying rate, While buoyancy of the dosage form is effectual the gastric emptying rate, when buoyancy is lower than gastric emptying rate than system is float.
- **SIZE AND SHAPE-** The size and shape of dosage form is also effectual the gastro retention, the ring contour of devices have superior to another gastric residence time as comparability with another shapes.
- **NATURE OF MEAL-** Eating of digested with difficulty polymers and fatty acid and salt can modify the form of the stomach hence minimizing the gastric emptying rate and extending the release of the drug.
- **GENDER-** Lower gastric emptying rate of the female candidate than male candidates.
- **MENTAL STATE-** Stress will be maximize in the gastric emptying rates whereas depression low it down.
- **AGE AND POSTURE-** Elder candidate particular those over 70, have an important larger gastro retentive time. Slower the gastric emptying time of the duration ascertained in elder. Gastro-retentive time can alter between indolence and consecutive posture province of the patients.

### TYPE OF THE FLOATING DRUG DELIVERY SYSTEM-

There are two types of the floating drug delivery system-

#### A)-EFFERVESCENT TYPE OF FLOATING DRUG DELIVERY SYSTEM-

#### B)-NON EFFERVESCENT TYPE OF FLOATING DRUG DELIVERY SYSTEM-

**EFFERVESCENT TYPE-** Effervescent type of the floating drug delivery system is also known as the gas generating system which is formulated by the aid of the swelling type polymer such as methyl cellulose, chitosan and several type of effervescent compound like sodium bicarbonate, tartaric acid and citric acid. The relative magnitudes of two quantities of citric acid and sodium bi carbonate is optimal stoichiometric for gas generating in the floating is slightly convexity of the drug delivery system can be neglected by inert gas CO<sub>2</sub> by effervescent chemical reaction between organic acid citric acid and carbonate.

**MECHANISM OF ACTION-** Effervescent system are formulated with aid of the swelling polymers and several types of the effervescent type compounds are apply in formulation when they come in attach with acidic gastric content then they freedom CO<sub>2</sub> and gas ensnare in swollen hydro colloids which furnish buoyancy to the dosage form.

**NON EFFERVESCENT TYPE-** Non effervescent system is made by gel forming largely swell cellulosic hydrocolloids HPMC hydroxyl propyl methyl cellulose, polysaccharides, matrix polymer in large (20%-75%) to tablet capsule, it is non effervescent swelling system. In this technology dosage form is attaches mixing of drug with gel that is swell close interaction with after administration of oral and keep a comparative unity of shape and bulk density of lower than 1.

**MECHANISM OF ACTION-** After swallowing bang up investment via absorption of a liquid by a solid or gel of gastric fluid to the point which is preclude their outlet from the stomach non effervescent type system is also known as plug type system. First forming a gel at the surface of the dosage form is mechanism of swelling of polymer or bio adhesion to mucosal bed in gastro intestinal tract hydrate by first formed a gel on the surface of drug dosage, conclusion construction of a gel power to determine the diffusion of solvent-in and drug out of the dosage form. Having base on the mechanism on the swelling of polymer or bio-adhesion the mucosal bed in gastro intestinal tract. Resultant diffusion rate of solvent in drug out from dosage form controlled by the gel emphasis.

#### **APPLICATION OF THE FLOATING DRUG DELIVERY SYSTEM-**

Several type of application of floating drug delivery system are following as-

- **Maximize the bioavailability-** Gastro retentive floating drug delivery system is applied for extended the activity of the dosage form, drug to extended action bioavailability is maximize.
- **Action sustained drug delivery-** The oral controlled release formulation are skirmished with difficulties that is gastric residence in gastro intestinal tract. To defeat with floating drug delivery system can stay in the stomach for long time of the gastric fluid.
- **Drug Delivery System act on specific site-** Gastro retentive floating drug delivery system act decently in specific location of drug delivery system and give appropriateness action that Vantages for dosage form by these system which is in distinction from other absorbed from the stomach. Controlled drug delivery system is lower and furnish the quantity that can fulfil a need local curatives levels and boundary the systemic vulnerability to the elements to the dosage form. Drug in blood circulation is cause minimize the adverse effect. Furnished the accessibility gastric from spot directed delivery system may also decrease the dose frequency E.G Furosemide and riboflavin.
- **Minimize the absorption-** The dosage form have less bioavailability specific site absorption from the upper part of gastro intestinal tract. Enhancing the absorption of the dosage form.
- **Decrease the adverse activity of the colon-** Holding of the dosage form in the gastro retentive system decrease the amount of drug that arrives the colon.
- **Minimize & fluctuation of drug concentration-** The fluctuation in drug effectual are reduced and concentration be contingent side effect reduction can be prevented. Special significant for dosage form with a narrow curative index.

#### **DEPRESSION**

Depression is also known as the Major depressive disorder. The most common and serious medical illness that is negative effectual on feelings, the mode your and how your act, But its treatment is available, depression cause by the emotional state of the feelings of dreary and also lost of interested activities of the joy and happiness. Depression is mainly assortment of emotional and physical difficulties and minimize in ability to process of work at the home and another working place.

- Feeling down in depression situation- change in brain chemistry cause the depression position. Most scientist or researchers says about depression which is depression is caused by these several factors which is-
  - Hormonal Factors
  - Medical Factors

Depression is the situation of unhappy and sorrow. Today the mostly people suffering from depression because of our modus vivendi is so horrendous. While person are in depression, person provender at every point sad for few days, weeks or months or only some days. Some people think depression is common like normal state and not a real health status but this not correct thought, Depression is real disease with original sign and symptoms. It is not kind of weakness, but treatment is possible and most of person is cure or recover the disease of the depression.

Depression is trivialities status but it is commonly is present in today life. W.H.O World health organization is display the several suffering person how they overcome the depression. And also present the report how many people suffering by this disease 1 in 5 women and 1 in men at same point life duration of time 21% of women and 12% of men are suffering from the depression.

#### **SIGN & SYMPTOMS OF DEPRESSION-**

- A) Feeling of unhappiness, hopelessness can give the depressive temper.
- B) Involvement in joy and pleasure is minimize or almost lost.

- C) Feeling guiltiness also occur in depression condition cause the weight loss or weight gain in appetite.
- D) Problem generate in making decision of thinking or in disease condition.
- E) Angriiness is over much in depressive mood.
- F) Loss of interest in friend family party or get together activities in depression.
- G) Biochemistry- Changes of chemical reaction in brain chemistry may be cause of sign and symptom in disease of depression.
- H) Genetics-Depression in hereditary from families 70% of chance cause by the generation.



**A PERSON WITH DEPRESSIVE MOOD**

### **TREATMENT OF THE ANTI DEPRESSANT-**

- A) **Selective serotonin reuptake inhibitors (SSRIS)** - The selective serotonin reuptake inhibitor (SSRIS) are more general and famous category which is prescribed for anti-depressant this antidepressant are general by accessible for example Paxil, Prozac, Zoloft other drug for bipolar disorder.
- B) **Serotonin and Noradrenaline reuptake inhibitors (SNRI)** - The category of antidepressant is newest types of antidepressant is newest type of anti-depressant. The name of this category of drug is (SNRI). So the name of class presented their action this is used in block the process of using up of both serotonin and norepinephrine Duloxetine, Venlafaxine etc.
- C) **Norepinephrine and dopamine reuptake inhibitors (NDRIS)**-Only once of drug bupropion. The drug give effectual on the consuming again of norepinephrine and dopamine.
- D) **Other Antidepressant-**
  - 1. **Tricyclics**- Tricyclic are other class of antidepressant that is mirtazapine etc. This type of drug show effectual on neurotransmitters but does not forbid reuptake in the same mode.
  - 2. **Older**- It is applied for treatment of depression, tricyclic and MAOIS were not better situation for individual who was diagnosed just, but sometime it is aid with treatment immune depression like anxiety. Like Imipramine, Nortriptyline etc.

### **Treatment resistant depression (Antidepressant)-**

- 1- **Monoamine oxidase inhibitor (MAOIS)** is natural enzyme which is crush the serotonin, epinephrine and dopamine, conclusion neurotransmitters become encouragement. Downside of MAOIS forbid the capability of crush to another medicines metabolism by that and increasing in value of High B.P that is more danger.
- 2- **Nutraceuticals or medical food**- Prescription of also called as an essential vitamin B6, B. frequent of depression lower level of folate effectual on neurotransmitters that control temper and L-methyl folate proof to effectual in modulate the formation of neurotransmitter. SSRI selective serotonin reuptake inhibitor first on market in 1988. This class of drug is mostly prescribed.
- 3- **Non medicated treatment**- Exercise may be aid against mild depression. Its neurotransmitters  
Brain simulation treatment attached electro conclusive therapy electro conclusive therapy used in depression. Professional like psychiatric hagiologist and nurse or physicians.  
Psychotherapy is called as talk-therapy applied alone for therapy of extreme depression with anti-depression medication For example family or couples therapy.  
Cognitive behavioural therapy found in therapy of depression. It is focused on current and difficulty solving and identified malformed thought and then change behave and thought.

### **Floating drug delivery system applied in anti-depressant-**

Depression is serious disease at this time because of stress and many anti-depressant used in treatment of the depression floating drug delivery system used in enhancement of bioavailability then increase the action due to prolong duration time at GIT drug give extent action and minimize the dose and act on specific site, so depression is type mental disorder this system is very applicable. Because person is suffering from the depression create difficulties in dosing and because of extent stay at gastric site of floating system which is minimize the dose frequency this is so important properties of this system is used in anti-depressant medicines as well as give action on specific site this is very helpful.

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# The Constellation of Tobacco Issues: The Strategy of Gappri's *Stakeholder Relation* among the Negative Campaigns against the Cigarette Industry

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## ABSTRACT

*The Tobacco Products Industry with the main products of cigarettes currently faces severe challenges. Marked the incessant campaign with health arguments delivered by various groups. Ranging from Non-Governmental Organizations (NGOs) to governments driven by the Ministry of Health. Aside from the health side, the industry is also pushed by government policies that continue to raise cigarette excise. From an economic point of view, the tobacco products industry contributes significantly to state revenues in the form of excise which reaches more than IDR 159 trillion a year. Even though, for anti-tobacco groups, the economic contribution is not comparable to the adverse effects that produced by the tobacco products industry. The focus of this study is to explain the constellation in the tobacco products industry and how the stakeholder relations strategy of the Association of Indonesian Cigarette Manufacturers (Gappri) in responding to negative campaigns against the industry. The theories and concepts used in this study were organizational communication, the theory of organizational sustainability, the theory of stakeholders, and the theory of conflict. The results of the study indicate that the association runs an organization with a strategy analysis approach by using opinion leaders to fend off negative campaigns. In addition, it actively engages in synergy and collaboration with various groups to support the vision and mission of the organization.*

Keywords: *Stakeholders Relation*

## 1. INTRODUCTION

The Tobacco Product Industry with the main products of cigarettes currently faces severe challenges (Rachmat, 2010: 67). Marked the incessant campaign with health arguments delivered by various groups. Ranging from Non-Governmental Organizations (NGOs) to governments driven by the Ministry of Health. Aside from the health side, the industry is also pushed by government policies that continue to raise cigarette excise.

From an economic view, the tobacco products industry contributes significantly to the state revenues in the form of excise that reaches more than IDR 159 trillion a year (Likke, 2000: 69). Even though, for anti-tobacco groups, the economic contribution is not comparable to the adverse effects that produced by the tobacco products industry.

The Tobacco Control Support Center and Indonesian Public Health Expert Association stated the prevalence of tobacco consumption tended to increase in both men and women. More prevalence it increases in women from 1.7% in 1995 to 6.7% in 2013, while in men from 53.4% in 1995 to 66% in 2013. Thus, the number of smokers in Indonesia continues to rise every year.

According to the Tobacco Control Support (TSC), the cigarette industry must be controlled because in terms of production it continues to increase. The anti-tobacco group also questioned the Tobacco Product Industry Roadmap compiled by the Ministry of Industry No. 63/M-IND/PER/8/2015 for the 2015-2020 period, with the main point being hoisting exports while controlling production in the range of 5-7% per year, increased partnerships between cigarette producers and mutually beneficial tobacco farmers.

The road map that became a mess and the framework of the cigarette industry was later revoked by the Supreme Court after the anti-tobacco group sued the Roadmap to the Supreme Court. The Supreme Court through Decision Number 16P/HUM/2016 granted all requests for judicial review of the Regulation of the Minister of Industry Number 63/M-IND/PER/8/2015 concerning the Roadmap for the Tobacco Products Industry in 2015-2020.

The Supreme Court stated that the Minister of Industry Regulation was in conflict with the five higher regulations, namely Law Number 36 of 2009 concerning Health and Law Number 39 of 1999 concerning Human Rights. Then, Law Number 11 of 2005 concerning Ratification of the International Covenant on Economic, Social and Cultural Rights; Law Number 23 of 2002 concerning Child Protection and Law Number 11 of 1995 concerning Excise (Rahman & Widodo. 2015: 94) .

With the publication of this Supreme Court decision, no further efforts to defeat the larger interests, namely public health. The roadmap of the tobacco industry undermines the demographic bonus of 2030 because promoting products containing dangerous addictive substances then actually encourages cigarette production to reach 524.2 billion cigarettes in 2020. The roadmap benefits the cigarette industry and does not benefit the community so that it is worth revoking.

The Association of Indonesian Public Health Experts considers cigarette consumption to be very high because in terms of selling prices it is still very cheap. While the Department of Demography at the University of Indonesia recorded only 281.571 direct workers in the cigarette industry in 2012. This number is not as much as the food industry and other industries. The cigarette industry claims that claim to absorb a lot of labor are due to including indirect workers in their calculations such as traders and household members who are covered.

The findings of the Demographic Institute, the average wage of cigarette industry workers under the foreman is lower than the average wage of the food industry and other industries. This has happened consistently in the last 13 years. In 2013, the average cigarette industry wage was IDR. 1,196,200 while the average food industry wage is IDR. 1,375,100 and the total industry wage is IDR. 1,636,200 per month.

The Association also highlighted that there was a tendency of the government to be helpless before the cigarette industry. There are seven categories noted that the government does not have bargaining power when dealing with the cigarette industry. The seven categories are the level of participation in policy making; activities claimed to be corporate social responsibility (CSR); providing benefits to the cigarette industry; unnecessary forms of interaction; transparency; conflict of interest; and preventive measures (Hayati, Istiqomatul. 2017 ). In the category of the level of participation in policy making, the government actually composes regulations that are driven by the cigarette industry. This was seen when the legislative board chose to continue discussing the Bill on Draft Law until later it remained in the National Legislation Program 2018 (Abadi, Tulus: 2016)

The Indonesian Legal and Human Rights Assistance Association assesses the regulation of addictive substances between cigarettes and alcohol is very lame. In fact, both are addictive substances. Different treatment happens when making the Draft Bill on Alcohol and the Broadcasting Bill which allows cigarette advertisements. In the process of drafting the law, it must always harmonize with the Preamble of the 1945 Constitution. In the Draft Bill on Alcoholic Prohibition, the reference to the Opening of the 1945 Constitution is used to suppress the circulation of alcoholic beverages. Ironically, when drafting the Broadcasting Bill which allows cigarette advertisements, the legislative board does not refer to the Opening of the 1945 Constitution (Hayati, Istiqomatul. 2017).

The cigarette industry is also highlighted by anti-tobacco groups on the side of the corporate social responsibility (CSR) activities. The government is considered to always receive assistance from the cigarette industry. For example, CSR activities of a cigarette company when planting 12 thousand trembesi trees on the Cipali toll road. The Demography Institute of the Faculty of Economics, University of Indonesia also assesses the cigarette industry often influences policy and drafting regulations. For examples, the preparation of the Excise Law No. 39 of 2007. In the regulation it was stated that every decision to increase excise tax must be consulted with the industry. There is no obligation for the government to listen to the public. (Samodro, Dewanto. 2017).

The hard attitude towards the tobacco industry was also conveyed by the Indonesian Consumers Foundation (Abadi, Tulus. 2017). It stated that the government's attitude is clear in terms of the cigarette industry, only the Ministry of Health. Other ministries are supported regardless of health aspects. The Foundation also stated that the government considers cigarettes is not a disaster and actually supports the cigarette industry (Ariyanti, Fiki. 2016).

The Indonesian Consumers Foundation assessed cigarette excise as little compared to the socio-economic impact of cigarette consumption. Jonan's statement on cigarette excise, aside from being misleading and wrong, will also make the cigarette industry even bigger head (Bata, Frederikus. 2017 ). It assessed the statement of the Minister of Energy and Mineral Resources, Ignatius Jonan, who gave the view that the economic contribution of the cigarette industry exceeds Freeport, where PTFI's tax deposit was only IDR. 8 trillion, compared to cigarette tax payments of IDR. 135 trillion.

The anti-tobacco group assesses the indication of the government's partiality in the cigarette industry, because there are regions compiling rules on the prohibition of cigarette advertisements, Minister of Political Law and Human Rights Tedjo Edhy Purdijatno calls on two regional governments, Jakarta and Bogor. Cigarette producers are also untouched by law enforcers, in this case the police and BPOM, despite violating rules such as in the promotion of cigarette advertisements.

The attitude of the House of Representatives and the Government to draft the Bill on Tobacco was also suspected as part of protecting the industry as well as a part of the government's refusal to ratify the Framework Convention on Tobacco Control (FCTC) (Rachmaningtyas, Ayu. 2016) Anti-tobacco groups and pro-health groups have the view that tobacco does not have any positive effects. So that FCTC access is a must. The excise tax on cigarettes must also be increased to 150% (Aisyah, Arina. 2018)

The spotlight on the tobacco industry also comes from religious organizations. Muhamadiyah noted that smoking had an impact on family welfare. Based on statistics, the smokers' family expenditure on cigarettes was ranked second after rice (Nasrullah, G. Yahya. 2017). Then health will have an impact on productivity, if it decreases then income also decreases. If income decreases, poverty increases. While the Chairperson of the Indonesian Church, Bambang Wijaya, suggested that the price of cigarettes should be increased so that children would not buy them. As Father Benny Susetyo also suggested that the price of cigarettes be made expensive or equated with international prices.

In the National Socio-Economic Survey in 2010, young smokers aged 10-14 years increased by 3.96 million or 10,869 new smokers every day (Lestari, Martina. 2017). In the same year, Basic Health Research found that young smokers aged 15-19 years had tripled over the past five years.

From the industry side, with various criticisms that continue to be conveyed and also the absence of regulatory guidance after the tobacco industry roadmap has been revoked, industries such as not having clear regulatory references. This condition is certainly a challenge, how to 'negotiate' business interests with various pressures from various community groups. With the public being increasingly critical of the industry, accompanied by pressure from the government in the form of excise and tax policies, business competition is increasingly tight where the tobacco industry group is only concentrated in several brands while the sentiment between cigarettes makes the cigarette industry very solid. Therefore a comprehensive approach of *stakeholders relation* is needed so that the industry stays in the midst of various pressures and siege from various sides.

## 2. LITERATURE REVIEW

### 2.1 Strategy

Strategy originated from said Greece *strategeia* (*Stratus* = military; and *ag* = lead), that the meaning art or science for to be a general. Strategy can also interpreted as something plan for division and use power military and material on certain area for reach certain aim. According to Stoner, Freeman, and Gilbert (2005), concept strategy get it defined based on two different perspectives i.e. (1) from perspective what that something organization want do (intends to do), and (2) from perspective what that organization finally do it (eventually does) (Stoner, et. al. 1995).

Based on the first perspective, strategy could defined as program for determine and reach aim organization and implementation their mission. That is, that managers play important role that active, be aware of and rational in formulate organization strategy.

While based on the second perspective, strategy defined as pattern response or response organization to the environment all along time. On this definition, every organization certainly have strategy, although strategy that is not ever formulated explicitly. This view applied for managers that are nature reactive, that is only respond and adjust self to environment in a manner passive when needed.

According to Tjiptono (2008) at in something organization there is three strategy levels, corporation level, unit business level or line business, and functional level. Strategy Levels of Corporation, formulated by top management that set activities and operation organization that have line or business. Strategy Levels of Business Unit, more directed on management activities and operation something business certain. Strategy Level Functional is strategy in framework function of management that could support strategy of unit business level (Tjiptono. 2008).

According to Rangkuti (2009) strategy could grouped based on three types of strategy that are: Management Strategy. Includes strategy that could do by management with orientation development strategy in a manner macro, for example: strategy of product development, determination price, acquisition, market development, and so on (Rangkuti. 2009).

Investment Strategy, is activities that oriented on infestation. For example, company wants to do strategy growth aggressive or attempted hold up penetration market, strategy development back something division new or divestment strategy, and etc. Business Strategy. It called as business strategy in a manner functional because this strategy oriented on functions in activities management, for example marketing, production or operational, distribution strategy and etc.

### 2.2 Stakeholders

Public institutions have used the term stakeholder extensively into decision making and decision processes. In simple terms, stakeholders are often stated as parties, cross actors, or parties related to an issue or a plan. Freeman (1984) defines stakeholders as groups or individuals who can influence and/ or be

influenced by an achievement of certain goals. Whereas Biset (1998) briefly defines stakeholder as a person with an interest or concern for the problem.

According to ISO 26000 SR, stakeholders (<https://www.iso.org/>) defined “individuals or groups who have an interest in organizational decisions and activities”. The views above show that the introduction of stakeholders does not merely answer the question of who the stakeholder is an issue but also the nature of stakeholder relations with the issues, attitudes, views, and influence of the stakeholder. These aspects are very important to be analyzed to get to know stakeholders.

Based on the strength, important position, and influence of stakeholders on an issue, stakeholders can be categorized into several groups; primary, secondary and key stakeholders (<http://momentumsudutdanrotasibendategar.blogspot.co.id>) That is:

1. **Main Stakeholders (primary).** The main stakeholders are stakeholders who have a direct relationship with the interests of a policy, program and project. They must be placed as the main determinant in the decision making process.
2. **Supporting Stakeholders (secondary).** Supporting stakeholders (secondary) are stakeholders who do not have direct links to the interests of a policy, program, and project, but have concern and concern so that they share their voices and influence. Like local non-governmental organizations (NGOs): NGOs engaged in areas that are in line with the plans, benefits, impacts that arise that have a “concern” (including related mass organizations).
3. **Key Stakeholders.** Key stakeholders are stakeholders who have legal authority in terms of decision making. If at the policy level, the key stakeholders in question are executive elements according to their level, legislature, and agency. With the important role and position of stakeholders, decision makers in the organization must truly implement the activities that considered important by stakeholders. In the sense that the organization needs apply bear it he replied to stakeholders and too apply good corporate governance. For Helena and Therése (2005), society is stakeholders most important for an organization and media holding on role important in communicate activities organization to stakeholders. Media also have power for reveal information company, if company do action that not appropriate. So that organization need apply principle good corporate governance and corporate social responsibility for keep reputation in front of its stakeholders. Following this is the chart who explained classification stakeholders in a general manner. Organization should able to pay attention all over stakeholder interests in a balanced manner and not only pay attention interests holder stock (*shareholders*). This ability will be very determine success and sustainability life of company in long period.

### 2.3 Organizational Sustainability

In order to live and grow sustainably, organizations must integrate business objectives with social and ecological goals as a whole. In the perspective of this theory, society and the environment are the basic and

main pillars that determine the business success of an organization so that it must always be protected and empowered.

Every development and expansion of the business to be carried out must consider economic, social and environmental factors so that it does not leave negative impacts in the future. Then (Coblentz, 2010) revealed that in order to run well, an organization must have three things that are applied continuously. “A sustainable organization needs to be strong institutionally, financially and morally. It needs all three in equal measure. Not even exceptional strength in one can overcome weaknesses in the others “.

## **2.4 Organizational Communication**

There are two views in organizational communication; objective and subjective views. An objective approach to the organization is something physical and concrete, and the structure of the boundary - a definite boundary. The term organization implies that something tangible encapsulates people, relationship relationships and goals. While the subjective views of organizations as activities carried out by people. The organization consists of actions, interactions and transactions involving people.

The term comes from the Latin *organizare*, which means alloy of parts that are interdependent of each other. The correlation between the science of communication with the organization lies in its review which focuses on human beings involved in achieving the organization's goals. Communication science questions what forms of communication take place in the organization, what methods and techniques are used, what media are used, and what processes, what factors are the obstacles and so on.

The answers to these questions are for study material to then present a communication conception for a particular organization based on the type of organization, the nature of the organization, and the scope of the organization taking into account certain situations when communication is launched. Organizations are typically regarded as nouns, while organization is considered a verb (Pace & Faules. 2006: 11). Communication and organizational success are interconnected. Improving organizational communication means improving the organization.

## **2.5 Conflict Theory**

Etymologically, conflict comes from Latin *con* which means together and *figure* which means collision. There is a collision from each wishes or needs, opinions, and desires involving more than two parties. According to Degenova conflict is something that normally occurs in every relationship, where two people never always agree on a decision made ( DeGenova. 2008) . Kurt Lewin explained that conflict is a condition in which the impulses in a person are in the opposite direction and almost the same strength (Kurt. 1997).

According to Richard E. Crable, “conflict is a disagreement or a lack of harmony”. The sentence can be interpreted as a conflict is an incomprehension or incompatibility. Weiten (2004) defines conflict as a state where two or more motivations or impulses to behave that are not in line must be expressed simultaneously.

Sociologically, conflict is defined as a social process between two or more people (can also be a group) where one party tries to get rid of the other party by destroying it or making it powerless. Conflict means a perception of perceived divergence of interest or a belief that the aspirations of the conflicting parties are not achieved simultaneously (Susan. 2010) .

According to the Big Indonesian Dictionary, conflict is defined as disputes, disputes, and conflicts. Whereas social conflict is a conflict between members or society that is comprehensive in life. Conflict is the process of achieving goals by weakening the opponent, without regard to the prevailing norms and values (Soekanto. 1993). In another sense, conflict is a social process that takes place by involving people or groups that challenge each other with the threat of violence.

Conflict is experienced by differences in the characteristics that individuals carry in a community interaction. The differences that often occur one of them is concerning physical characteristics, intelligence, wealth, knowledge, regional customs, beliefs, and so forth. With the differences of each individual that makes a reasonable situation in society. Because, not one community has never experienced conflict between its members or other community groups. As Ralf Dahrendorf said that the process of social conflict is the key to social structure.

There is another key concept in conflict theory that is “interest”. Dahrendorf divides social groups into pseudo groups and interest groups. First is a pseudo group. This pseudo group is a prospective group which will later become an interest group. It's just that the pseudo groups at that time were not yet aware of what interests must be fought for or said to be latent.

While the interest group is where this group has been aware of what must be fought for and become the interest of the association or manifest. It should be noted that the mode of behavior that moves (not yet aware of being conscious) is included in the characteristics of the interest group for the transition from the pseudo group that is finally aware.

Based on the parties involved in the conflict, Stoner and Freeman (1989: 393) divided the conflict into 6 (six) types. They are: conflict within the individual, conflict among individuals, conflict among individuals and groups, conflict among groups in the same organization, conflict among organizations, conflict among individuals in different organizations. Conflict is an expression of conflict between individuals and other individuals, groups with other groups for several reasons. In this view, disputes indicate differences between two or more individuals expressed, remembered and experienced (Pace & Faules, 1994: 249).

### 3. RESEARCH METHODS

The research method used by the writer is the case study. According to Yin that case study has three rationalizations: *firstly*, when the case is that the case is important in testing a theory that had been developed well, *secondly*, cases present a case of extreme or unique and *thirdly* is the case of disclosure

(Irawan, 2018: 75 836). In this study, the technique of collecting data used the in-depth interview method. The main subject of this research is the Chairperson of *Gappri* Ismanu Soemiran as a key informant. Other informant is the Chairman of the Indonesian Tobacco Farmers Association, Agus Parmuji. Mohamad Sobary, Cultureist. Salamudin Daeng, tobacco researcher at the Indonesian Political Economy Association. Enny Sri Hartati, director of the Institute for Development of Economics and Finance (INDEF). Firman Soebagyo, former Chairperson of the RI Legislation Body.

#### 4. RESULTS AND DISCUSSION

The Indonesian cigarette industry is currently in the Shakeout-Maturity phase with characteristics: Saturation of users: young consumers are more health-conscious, and there is a shift from SKT products to SKM-LTLN. Repeat purchase reliance: rely on loyal customers. Growing selectivity of purchase: consumers who are sensitive to purchasing power will tend to trade-down when economic conditions are difficult.

Then Fight & Difficulty in Gaining share: the level of competition is getting tougher because some players issue new product variants at lower prices (to respond to slowing economic conditions). Emphasis on efficiency: with excise rates that tend to increase every year and the level of intense competition makes the company have to focus on efficiency to maintain profitability. Shakeout of the weakest competitors: intense competition has made many small (generally traditional) players close production.

As a result of the increase in excise tax and the increasing number of negative campaigns against tobacco, the number of cigarette companies experienced a significant decline from 3,255 companies in 2009 to 600 companies in 2014. The future cigarette industry is expected to experience low-single digit volume growth due to the domestic economic recovery process (and globally) it is estimated that it will still be slow. Shifting consumer tastes from SKT products to SKM.

*Gappri* is an organization that bridges industrial interests, in this case the company, with various stakeholders, especially the government. The organization was established with a firm attitude that tobacco which thrives in the archipelago is a gift that needs to be preserved.

*“To create a conducive business climate in the tobacco sector business, professional organizations that are reliable and strong are needed in facing the demands of the globalization era, as well as a fostering forum to become strong partners and ambassadors with the Government in facing the tobacco sector both nationally and internationally,”* (Joint Articles of Association of the Indonesian Cigarette Factory Association) .

The organization was established to realize the tobacco industry which contributes to the national economy and the acquisition of foreign exchange. GAPPRI was established as a unifying forum for businesses in the tobacco sector that can accommodate all national tobacco companies both from upstream to downstream to the marketing and export sectors and the domestic market. GAPPRI encourages the ability

of members to become competitive and professional tobacco sector business actors. Then, establish relationships with institutions and agencies as well as parties related to both the tobacco sector at the national and international level.

*“Creating an organization based on a sense of family and mutual cooperation that is independent, professional and broad-minded as a unifying forum for business people in the tobacco sector, in achieving a strong and reliable tobacco business in facing the national and international coffee scene,”* (GAPPRI Articles of Association Page 4) .

The Tobacco Products Industry has many interests. As seen in the following table:

**Table 1**  
**Grouping and Explanation of the Status of Cigarette Industry Stakeholders**

<b>Stakeholders</b>	<b>Status</b>	<b>Explanation</b>
Indonesian Cigarette Factory Association (Gappri) Association	Pro	Maintain turnover Cigarettes are businesses that have profits so they will continue to strive to keep producing and selling
Indonesian Tobacco Farmers Association (APTI)	Pro	Livelihood Business hereditary It's not easy to change professions
Solidarity of Public Advocates for Tobacco Control (SAPTA)	Counter	Reason for health hazards Campaign funding support Power is quite strong Solid campaign
Directorate General of Taxes/ Customs/ Ministry of Finance	Pro	Source of state income Meet the annual APBN excise target Keep the deficit not to wider
House of Representatives	Neutral	Being split between supporting and refusing Gerindra PKB Golkar PDIP relatively supports tobacco PKS rejects tobacco policy
Ministry of Industry	Pro	Maintain industrial performance Meet the country's revenue targets Keeping no bankruptcy
Ministry of	Pro	Strategic commodities

Agriculture		The existence of millions of farmers
Ministry of Health	Counter	Health argument Maintain the young generation Unproductive expenditure Dangers of various diseases caused by smoking
Muhammadiyah	Counter	Cigarettes are <i>haram</i> , not useful A lot of evil Anti-smoking campaign from donors
Nahdhatul Ulama	Pro	The cigarette industry has an economic contribution   Business hereditary Industry is in the NU base
Indonesian White Cigarette Manufacturers Association ( <i>Gaprindo</i> )	Pro	The economic contribution of cigarettes to the country Cigarette market leader Maintaining the positive trend of the mild cigarette industry
Cigarette Entrepreneurs Association ( <i>Gapero</i> )	Pro	Industrial base in the area Keep millions of workers There are SME businesses in the regional cigarette industry
Indonesian Women Without Tobacco ( <i>WITT</i> )	Counter	Damaging Health Threatening the Young Generation
Indonesian Consumers Foundation	Counter	The government's attitude is too pro-industrial It is not strict to raise cigarette excise
Clove Community	Pro	Cultural Heritage of Clove Hereditary efforts
General East Java Chamber of Commerce and Tobacco Revitalization Team	Pro	Economic contribution Tobacco producing area
Home of Indonesian	Counter	Damaging the Young Generation

People's Study and Advocacy		Government Protects Industry
World Health Organization	Counter	Health Protection The threat of health continuity
Center for Indonesia Taxation Analysis (CITA)	Pro	Economic contribution Labor factor There is no substitution of state revenues
Indonesia Corruption Watch (ICW)	Counter	The cigarette industry is detrimental The government is weak against the industry
National Tobacco Control Committee	Counter	Damage health Cigarette excise is not significant Economic losses
Indonesian Legal Aid Foundation	Counter	The cigarette industry does not need to be protected
Demographic Institute (LD) UI	Counter	The cigarette industry's contribution has diminished There are still many other sources of income More negative economic impacts

As for the negative campaign, tobacco, both *Gappri* and the Indonesian Tobacco Farmers Association, have similar views. The Chairman of the Indonesian Tobacco Farmers Association, Agus Parmudji worried, on a negative campaign, at the end, will kill tobacco commodities which in fact become the livelihood of farmers in the region.

Agus Parmudji explained:

*“We see it is a conspiracy to kill tobacco farming. Examples of pharmaceutical companies are now aggressively producing Nicotine Replacement Therapy (NR). They also carry out other campaign movements. This happens because Indonesia is still a soft land for multinational industrial industries. “*

Chairperson of *Gappri*, Ismanu Soemiran, said that in 2014 with an increase in excise tax approaching 12 percent, there had been layoffs of 10,000 clove cigarettes workers, almost all women (Nurmayanti, 2015).

General Chairperson of *Gappri* Ismanu Soemiran explained:

*“How complicated this industry is. Especially when talking about hand clove cigarettes. It's labor intensive, 90 percent of women. When it comes to women, the government must be able to see this can be a double income for families. Husband works, wife works. That's from the perspective of labor. Many policies from the government corner the cigarette industry. Now this anticlimax is, our industry*

*has a lot of rules. Until the area without cigarettes and so on. We ask for protection, security and maintenance. There is an imbalance in health information related to cigarettes. In addition, a firm attitude from the government is needed regarding the development of the domestic cigarette industry.*“

In each policy formulation of a regulation related to industry always gives input, information, related to the real condition of the industry. Therefore, it is expected that the government, as one of the main stakeholders for the industry, can be clearer in drafting and implementing a regulation. In the tobacco products industry there are a number of important stakeholders with each interest.

In developing the strategy, *Gappri* can apply the principle of analysis to measure strengths, weaknesses, opportunities, threats. SWOT analysis can be applied by analyzing and sorting out various things that affect the four factors, then applying them in the SWOT matrix image, where the application is how strengths are able to take advantage of existing opportunities, how to overcome weaknesses which prevents the existing opportunities, then how strengths are able to deal with existing threats, and finally how to overcome weaknesses that are able to make threats become real or create a new threat. Following analysis SWOT of *Gappri* which can be explained:

#### **A. Strength**

1. Economic contribution. *Gappri* with members, contributed significantly to the country's income. Every year the tax and excise contribution is close to IDR. 200 trillion.
2. Mastering market share. *Gappri* members, especially the combined PT Gudang Garam Tbk and Djarum dominate the cigarette market. In the regions, *Gappri* members also controlled the market.
3. Credibility. *Gappri* is the oldest organization in the tobacco products industry. Has a network of various stakeholders. Credibility is the basis for the establishment of trusts from stakeholders that prove to be a crucial point in business development.
4. Representing the interests of domestic products. *Gappri* is an organization where the majority of members are local manufacturers with clove cigarettes.

#### **B. Weakness**

1. Lack of Campaign. In compiling a campaign to ward off negative issues, *Gappri* only relied on certain moments such as anti-tobacco days.
2. Cross-group synergy is low. Collaboration of interest group synergies to support the *Gappri* target is less solid. Rarely do joint activities and still incidental.
3. Activities with media are lacking. Collaboration with the media is an important part of encouraging the dissemination of positive information. In this section the event with the media is still low.
4. Education about cigarette excise has also not been routinely carried out.

#### **C. Opportunity**

1. By having two large cigarette companies, PT Gudang Garam and Djarum, *Gappri* has the opportunity to prepare more massive campaigns on various media channels.

2. The trend of Low Tar Low Nicotine cigarette. The cigarette market has changed dramatically. Consumers increasingly like its products. An opportunity for *Gappri* to change products according to market demand. The high level of public health awareness and lifestyle that considers the cigarettes are cooler allows changes in the trend in the cigarette industry.
3. Regional market. With a network of cigarette factory members spread to the area, it becomes an opportunity to enlarge cigarette products according to regional consumers.

#### D. Threats

1. Regulations concerning anti-smoking. This regulation allows a reduction in the number of smokers and requests for cigarettes that occur in an area that has an anti-smoking regulation.
2. Internal competitor. Each *Gappri* member manufacturer began to explore the market share of mild cigarettes. For now big cigarette producers have produced mild cigarettes, Gudang Garam has Surya Signature, from Djarum's, LA Light was born, which is quite threatening to Sampoerna at this time, from the Bentoel Prima stronghold there is Starmild which is third in the mild cigarette market, even small producers of cigarette, like Nojorono Tobacco Indonesia, enlivened the Indonesian cigarette industry by carrying out Class Mild products which were ranked runner-up.
3. The high tax on cigarettes. The high cigarette tax makes the people's purchasing power low on cigarettes resulting in a decrease in demand for cigarettes.
4. Reduced event sponsored by cigarette companies. Reduced cigarette-sponsored events are an impact of the community mindset that supports anti-smoking and wants to reduce the promotion of cigarettes found in events, especially youth events. With the reduction in events sponsored by cigarette companies making cigarette companies difficult to promote their products and over time awareness levels will decrease.
5. NGO of anti-tobacco. Every day various opinions expressed by anti-tobacco groups are voiced in the media. The statement further made the industry depressed and at the same time perceived badly by stakeholders, especially the public.

With this analysis, it can be considered the interests and influence of stakeholders in the Tobacco Products Industry in table 2 below:

Table 2: Interests and Effects of Tobacco Industry Stakeholders

Stakeholders	Main interests	Strength and Influence
Government	Excise and Tax	Determinants of Policy, Regulating Regulations, Budget Planning.
Non-governmental	Refusing cigarette circulation	Change affects public perception

organization	The negative product campaign Clear tobacco	
Consumer	Purchasing power	Product revenue/ repurchase
Cigarette factory	Business continuity, profit growth, stock increase	Funding support for the organization
DPR	Arranging regulations Pressing the government	Add to changing regulations
Farmer	Continuity of business of cultural sustainability	Direct support demonstration
WHO	Anti-tobacco regulations Health Aspects Pharmaceutical Protection	Financial support for anti-tobacco campaigns

In responding to negative campaigns, *Gappri* also used opinion leaders to influence the public. The opinion leader question was then prepared in the press release form to be distributed to the national and regional mass media. In addition, *Gappri* and members also synergize with other organizations that have similar interests. The collaboration strategy was chosen to further increase bargaining power and position in the eyes of the government. Pro-tobacco groups issued a joint attitude to urge the government to be careful in designing excise policies and policies that would harm the industry.

The Malang Association of Cigarette Entrepreneurs (*Gaperoma*), firmly requested that the government count carefully about the increase in excise. In the request, *Gaperoma* gave input that in raising the excise policy must be in accordance with economic development. It was stated that industrial conditions experienced a sharp decline. Furthermore, the increase in high excise tariffs led to a decrease in sales volume, which resulted in many tobacco products industries being closed and termination of employment. The tobacco products industry lobbied the government to adjust production to anticipate an industrial slowdown. The application was submitted by the Kudus Cigarette Company Association (*PPRK*) to the Minister of Finance. In the letter, it was explained that the demand was in line with the government's increasing target in terms of taxes and excise.

Then the General Chairperson of *PPRK* Dodiek T.Wartono explained that in the context of state revenues, if the Second Group of Company is given a production limit of more than 3 billion, it will increase production because the positive trend in group 2 (medium) cigarette companies is quite significant and its selling ability remains competitive because it can sell at a price that matches the share market. In terms of labor absorption, the second class cigarette industry houses and employs more than 60 thousand

people. With such a large number of workers and keeping in mind their well-being that must be fulfilled and with the obligation to keep abreast of wage increases, the second class cigarette industry must continue to maintain business and existence so that it can continue to support the government's efforts to increase and maintain active labor. "We from the second class (middle) cigarette companies are ready and willing to support and assist government policies related to the development of the national economy and we hope that we can add to our contribution to the national economy, especially from the cigarette industry tax and excise income".

## 5. CONCLUSION

Based on the results of the study and discussion analysis, the conclusions in this study are: 1) The *Gappri* communication model is an organizational communication model. In fighting negative campaigns, *Gappri* used opinion leaders to explain the condition of the tobacco industry, 2) *Gappri* communicated to the public at certain moments. Relatively incidental, 3) there is a change in the consumption pattern of cigarette products into the category of low tar low nicotine. This change in consumption forced the industry to import tobacco, 4) *Gappri* synergized with other organizations, including Apindo, to fight negative campaigns, while at the same time suppress the Government in tax policy, 5) Communication with other stakeholders is constrained because it has a point of interest that cannot be met. For examples in the Bill of Intensification, farmers urge that imports be limited in the hope that maximum domestic products can be absorbed. However, the industry does not want the market to be disrupted, so it always encourages any policies that are considered to be detrimental to be canceled through various approaches, either lobbying the government or creating opinions in the mass media. 6) Anti-tobacco campaigns tend to use foreign institutions. So that each of these campaigns, despite health claims, was suspected of having other ideological interests, 7) Farmer groups use the communication channels of the party elite affiliated with the government. The Indonesian Tobacco Farmers Association meeting with President Jokowi, bridged by PDI-P politicians, named Ganjar Pranowo, to open access to President Jokowi, 8) As a result of massive anti-tobacco campaigns, in terms of business development, the domestic cigarette industry stagnated in the last four years, and 9) There are four things that affect the tobacco industry. Firstly, competition between developing countries and developed countries in fighting over the cigarette market. Secondly, competition between tobacco companies and processed tobacco products with pharmaceutical companies in fighting over the nicotine market. Thirdly, the fight between large cigarette companies and, fourthly, competition between large cigarette companies and small cigarette companies. 11. High excise adoption by referring to foreign interests besides hitting the cigarette industry also increases the circulation of illegal cigarettes. Excise policies and price increases are carried out as haphazardly as they will not be effective. The impact to the industry, the number of manufacturers will continue to decline.

Based on these conclusions, it is recommended the following: 1) The organization and the pro-tobacco work together, not just campaign incidental to the need to fend off negative news that conveyed the anti-tobacco, 2) *Gappri* need to develop a team of strong communication for counteracting negative campaigns, and 3) the relevant Ministry of Education is expected to be wise in implementing rules relating to the tobacco products industry. Because each policy that is born will have a very broad impact. The increase in excise hit small industries. Regarding these challenges, the government must try to find steps to protect workers and also industrial interests.

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# Tshwane Declaration: A new dawn for Information ethics in Africa

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**Abstract:** *Information ethics is at its infancy in Africa. Enormous contribution to information ethics has been done by academicians from the western world and another fair share from the Far East countries. Africa is considered the cradle of humanity and therefore rich in social and ethical diversity. It is thus apparent that in this information and knowledge edge era, Africans should now shift the paradigm to information ethics. Concerted efforts have been fronted by academicians in information science to develop a working formula for information in Africa. These lead to the formation of the Tshwane Declaration for information Ethics in Africa. This Declaration formed a framework of developing integrated information ethics for Africa. However, the extent of this declaration implementation is questionable. This paper, therefore, is intended to provide a background on the Tshwane declaration, explore the impact of this declaration on information management in Africa provide a recommendation on the way forward for information managers in Africa.*

## Introduction

Information ethics is a multidisciplinary area of study that explores the ethical issues arising from the information continuum, which encompasses information; generation, gathering, organization, retrieval, distribution, and use. Information ethics is also perceived to be an interdisciplinary field of study that covers a conglomeration of discipline, for instance, computer science, library and information science, philosophy, communication science, journalism, and mass media. Consequently, the areas of concern include the following: the right to privacy, the right of access to information, the right to intellectual property and the quality of information (Bitz, 2013).

In recent years, there has been a growing urge to integrate leading African scholars into international ethics discourses with the intention of rationalizing the impact of new information and communication technologies in Africa. The integration of scholars in the ethical discourses initiated the organization of the first ever Africa Information Ethics conference which was held on 7<sup>th</sup> February 2007. Roughly 100 academics and policymakers from Africa and world at-large converged for the conference on Information Ethics which steered the adoption of the Tshwane Declaration on Information Ethics in Africa. The three-day conference was held at Kivietskroon outside the South African capital Pretoria, under the theme: Ethical challenges of the Information Age.

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This paper therefore, attempts to look at factors that led to Tshwane declaration on information ethics and highlights the extent to which it will impact on information management in Africa.

### **Background of Tshwane Declaration for Information Ethics**

In the the better part of second half of the 20<sup>th</sup> century, computer scientists for instance Norbert Wiener (1989 - 1950) and Joseph Weizenbaum (1976) brought to the limelight the societal challenges of computer technology. The initial academic discussions centered on the responsibility of computer professionals (Capurro 2013).

Capurro and Bitz (2010) observed that the ethical paradymes of the worldwide information society formed the the bigger part of the UNESCO agenda. Since 1997, UNESCO introduced a sequence of events allowing specialists and decision makers to address the ethical dimensions of the information society. The primary objective of the UNESCO Information ethics Congresses, organised in 1997, 1998 and in 2000, was to inspire the reflection and deliberation on the ethical, legal and societal aspects of the information society by converging participants from the most significant possible number of countries representing the broadest range of educational, scientific, cultural and social environments. The ethical, legal and societal effects of information and communication technologies (ICTs) formed the larger part of the three priorities of UNESCO's Information for All Programme (IFAP).

The two World Summit on the Information Society (WSIS) meetings held in Geneva (December 2003) and Tunis (November 2005), had specific intentions of deliberating on the ethical dimensions and challenges facing the global information society. After the first meeting in Geneva, two significant documents were published, that is, the Declaration of Principles and the Plan of Action. The second high-level meeting in Tunis agreed on two extra documents, namely the Tunis Commitment and the Tunis Agenda for the Information Society (WSIS 2003/2005). In clauses 55-56, the Declaration of Principles explains the ethical dimensions of the information society. Additionally, the document stated that the global information society must uphold the fundamental values of human freedom:

- ✓ Human rights should be respected;
- ✓ There should be no offensive use of contemporary ICTs.

Capurro (2007) further narrates, that in October 2004 an intercontinental convention on Information Ethics was held in Karlsruhe Germany. This convention was organized by the International Center for Information Ethics and sponsored by the Germans' Volkswagen Foundation. Prominent internationally recognized experts in the field of information ethics were invited to participate, and it was a first of its kind in the world. The symposium

concentrated on the novel and puzzling ethical question raised by modern information and communication technologies within the paradigm of globalization and knowledge economies. The idea of this conference that surfaced from this symposium was; localizing the Ethical Internet Issues in Intercultural Perspective. Themes deliberated on by the participants included subjects such as privacy, access to information, intellectual property rights, quality of information, security, spamming, advanced capitalism and the digital divide which involved the question of the information-rich versus the information poor.

It was eminently clear to all participants that the African continent had poor representation at the symposium. The handful of African participants were mainly sourced from expatriates. Consequently, there were cardinal reasons that occasioned the absence of African scholars in the summit. Some of the ideas just to mention a few relate with; Lack of international recognition; poor funding and facilitation for attending international events and also not much research has been done on the African continent on this critical information ethics topic. A closer scrutiny portrays a picture that indicates seems that African scholars have meager publications compared to their global counterparts and therefore they did not have much to offer on ethical challenges facing Africa in the era of globalization. Rafael Capurro searched for Publications related to African Information Ethics by African scholars and came across a limited number of publications (Africainfoethics.org)

Having seen the challenges encountered by African countries, about 100 academics and policymakers from Africa and other parts of the world convened at the Africa conference on Information Ethics leading to the adoption of the Tshwane Declaration on Information Ethics in Africa. The three-day conference was held at Kivietskroon outside the South African capital Pretoria, under the theme: Ethical challenges of the Information Age.

The conference was hosted by the South African Government, via the Departments of Communications and Arts and Culture, with the official patronage of the United Nations Educational, Scientific, Cultural Organisation (UNESCO) (Capurro 2101), The New Partnership for Africa's Development (NEPAD) e-Africa Commission, the Presidential National Commission on Information Society and Development and in close collaboration with the International Centre for Information Ethics, the University of Pretoria in South Africa and the University of Wisconsin-Milwaukee in the United States of America (USA/US).

African academics and policymakers sought to address the ethical challenges of the information society from their perspective with the belief that the mobilization of the academic research in Africa is crucial for the sustainable social, economic, technical, cultural and political development of the continent.

It was realized that the use of contemporary Information and Communications Technologies (ICTs) such as computers, the internet, radio, and television poses many ethical challenges in the African continent, for instance, a social exclusion which is triggered by a lack of access to relevant information. Other challenges included computer illiteracy as well as the adequate protection of core information based on human rights. These rights included the right to freedom of expression (FOE) and the right of access to information (FOI).

Delegates at the Africa conference adopted the Tshwane Declaration on the Information Ethics in Africa with a commitment to focus on enhancing African discourse on developing norms and values for the African Information Society.

Apart from the Tshwane Declaration, the University of Pretoria committed itself to establish a Research Centre for Africa Information Ethics, to enhance research areas on information ethics in the continent.

Delegates also established the African Information Ethics Network that will enable academics and ICT and information policymakers to participate in a global dialogue to discuss the challenges posed by the information society.

To enable academics and policymakers to address the practical applications of ethical challenges of the information society, delegates recommended the establishment of Information Society and Development Advisory Councils to advise African governments and other stakeholders on the central ethical issues about the development of information and ICT-related policies in Africa.

In a nutshell, the adopted declaration was a basis for enhancing the field of Information Ethics in Africa, and resolve to uphold the following principles:

- ✓ Entirely, people have equal rights as illustrated in the Universal Declaration of Human Rights. Therefore, people need and ought to have access to information over and above the ability to benefit from it to exercise their human rights.
- ✓ Recognition of Information as a fundamental tool for promoting the freedom goals, democracy, understanding, global security, peace and development and should be used as such.
- ✓ Information availability, accessibility, and affordability across all linguistic groups, gender, differently abled, elderly and all cultural and income groups should be paramount.

- ✓ International, the information centralization is manifested as nations move towards Information and Knowledge Societies. They are attaining the reality of global Millennium development goals demands that Africa should be a key player in this movement.
- ✓ Policies and practices that regard to the creation, dissemination and utilization of information within Africa should be pegged on ethics based on universal human values, human rights, and social justice.
- ✓ Africans can contribute to Indigenous knowledge and cultural diversity to the global Information Society. This indigenous knowledge should enrich the universal body of knowledge by preserving, fostering and enabling its applicability.

### **The impact of the Tshwane Declaration on information management in Africa**

The Africa Information Ethics Conference converged scientists and politicians to discuss what could and should be thought and done to create an excellent African information society. The conference endeavored to champion for information ethics in Africa and from an African perspective. As a result, it encouraged African scholars to make explicit the perspectives and challenges of the African information society as a whole.

Tshwane declaration was an African tailored approach to information ethics. It created the foundation for an African discourse on Information Ethics and set the stage for the advancement of the conversation. For instance; On 6 - 7 September 2010, the second African Conference on Information Ethics was held in Botswana and focused on the teaching Information Ethics in Africa, the present status of Information Ethics, and the prospects and challenges. On 5 - 7 September 2012, the third African Conference on Information Ethics was held in Pretoria (South Africa). It also shed more light on Online Social Networks (OSN) in Africa. Two workshops preceded the conference, one from 2 - 3 June 2012, taking place in Nairobi (Kenya) on information for sustainable development and another one on 3 - 4 September 2012 in Pretoria, which was concerned with the basic concepts of Information Ethics (Capurro, 2013).

The declaration ushered in the establishment of an African Center for Information Ethics (ACIE) as a coordinating agency of the African Network for Information Ethics (ANIE). This center was meant to cooperate and coordinate with international partners such as the International Center for Information Ethics and the University of Wisconsin–Milwaukee. The coordinating agency created the platform for exchanging information about African teaching and research in the field of information ethics. Consequently, providing an opportunity for scholars around the world having a shared interest in African information ethics to converge and exchange ideas

Information and knowledge sharing was highly encouraged through the enormous emphasis placed on applying existing technologies and traditions as a starting point. Occasionally, this starting point has often been referred to as the information and communication culture. Existing resources, for instance, the conventional paper documents, were converted into learning tools and presented through radio or oral demonstrations with the community, e.g., using the modest tools, technologies and other capabilities such as the human voice, hand signals, or radio (Capurro, 2013). The learning tools facilitated the creation of African information and knowledge base

Tshwane conference elicited various disciplines of potential cooperation with UNESCO. The subjects for collaboration were identified, and it was agreed that would not only put the outcomes of the conference into effect but also place it is placed in the international context facilitated by UNESCO. One discipline associated with the ethical dimensions is the implementation of e-government in Africa. The WSIS Declaration and Action Plan, for instance, conveyed the desire for governments to implement e-government systems to facilitate administrative activities and services delivery to their citizens. Ultimately, Africa embarked on the e-government road with countless e-government projects, and NEPAD (the New Partnership for Africa's Development) launching an e-government initiative urging African governments to implement e-government projects. E-government has since become an essential driving force in Africa, in fact, it is a goal to be achieved by most governments. Countries including South Africa, Egypt, Nigeria, Kenya, and Mauritius have heavily invested in e-government projects and the training of people to implement these projects (Capurro, 2013)

Throughout the conference, academicians and practitioners from all corners of the world met in small groups to discuss and identify possible research opportunities in the field of African information ethics. It was anticipated that philanthropic organizations such as the Gates and Ford foundations would be approached for funding. The research emphasis was on the practical implications of the ethical challenges associated with knowledge sharing and the use of information on the African continent (Capurro, 2008). The conference empowered and encouraged intensive research in the field of African Information Ethics, therefore accelerating publication and development of its content.

Tshwane Declaration initiated the induced greater transparency in the provision of government products and services to the public and businesses. It necessitated making available information about those services more complete and pro-actively accessible to both the media and the public. Therefore, the entire section of the society will be better informed and educated about what is precisely offered; when and how to obtain those services; and how to ensure that promised services are delivered (UNESCO 2009).

Acknowledging the hitches in the teaching of information ethics in Africa, the publication of a Reader on Africa Information Ethics was launched. This publication was used as a textbook for students and scholars. This, therefore, contributed to the development of a distinct field of African information ethics and ushered in a new era where information ethics and eventually it started to teach in African schools.

To a greater extent, the Tshwane declaration prompted inclusivity. The inclusivity does not just refer to institutions and organizations, but it also relates to sub-populations that have special needs — for instance, ensuring the inclusion of women and men, youth (girls and boys), diverse linguistic and cultural groups, elders, people with disabilities, literate and illiterate people, the unemployed, underemployed and migrant populations, minority ethnic, racial and religious groups, among others. This in-turn created unity in diversity within the broader African arena, therefore, creating a coherent and ethnically unified information society (Capurro, 20130).

The conference led to the establishment of a Summer School on Information Ethics, hosted at the School of Information Studies at the University of Wisconsin–Milwaukee. The summer school trained African practitioners and scholars on relevant issues about African information ethics, therefore, developing human capital in that field.

The Ethics Declaration for Africa Information Society is perceived to be a possible and necessary means of having a common ground for tackling global issues, although it presupposes a broad and sustainable analysis and critical discussion of the issues at stake (Cappurro & Britz, 2010). Despite the challenges that Africa encounters, Tshwane declaration developed principles that need to be articulated by its African states which created a common understanding for addressing ethical issues. The declaration minimizes or instead eliminates assumption by Ladd (1985) argument that the very idea of a code of ethics is a contradiction since ethics is inherently problematic, and that what can be codified are ethical principles as the temporary result of argumentation, not established by consensus or decision-making.

### **The way forward for Information Managers in Africa**

The new information and communication technologies with the present challenges and opportunities created by the fast moving technologies and the emerging new frontiers of information call for new approaches. The Tshwane Declaration for information Ethics in Africa has led to the creation of African Network for Information Ethics, Teaching of information ethics in African Schools, scholarship on information ethics research, Unity and commonness in addressing African Ethical Issues, encouraging knowledge sharing among others. New types of partnerships, involving governments, local organizations and academic institutions are

called for and should be engaged in a series of well-targeted practical initiatives. Such alliances will grow Information ethics which is at its infancy in Africa.

Based on input from African institutions, this paper proposes the following types of initiatives which new partnerships could immediately implement to develop information ethics in Africa:

**Working with African academics and policymakers:** Useful and practical actions that could be developed through the mobilization of the academic research in Africa include enacting enabling laws for the creation of information ethics in the utilization of information resources.

**Institutional capacity-building:** Local academic institutions need greater capacity to support the teaching of information ethics in African Information Schools, collaborate with the west for transfer of skills and part-ownership in the development of online content on the subject. Local institutions should also be enabled to help the continent comply with international information ethics requirements. This can be done through training on the verification of unethical practices on information utilization.

We are raising awareness among scholars and other stakeholders not just about the potential opportunities in Information ethics which is at its infancy in Africa, but also about how to overcome barriers and engage in international information ethics through conferences, workshops, and seminars organized worldwide as part of the capacity building at the lower levels.

**Technology-sharing:** By using open source databases libraries with the support of international partners and groups of local institutions and experts can be helped on the necessary training from within shared platforms that are locally owned and managed.

African governments should pay particular attention to ICT infrastructure facilities and service provision in their policy to encourage the growth of information management ethics in Africa.

## **Conclusion**

After realizing the shortcomings of African countries during the World Summit on the Information Society in 2004, the Tshwane Declaration was adopted by the participants of the African Information Ethics Conference. It was appreciated that Information Ethics in Africa is a young academic field. However, there lies a long history of Information Ethics in Africa which concerns Africa's rich oral and written traditions throughout many centuries about different kinds of information and communication practices using different moral codes and media. These conferences led to the adoption of the Tshwane Declaration which centered on major basic principles. Currently, the rationale of the declaration is felt far and wide. For instance; the creation of African Network for Information Ethics, Teaching of information ethics in African Schools, scholarship on information

ethics research, Unity and commonness in addressing African Ethical Issues, encouraging knowledge sharing among others. Conclusively, Positive impact of Tshwane declaration is indeed immense and commendable in regards the change of African paradigm towards information ethics.

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# Unravelling the Political Parties' Role in Kenya's Multiparty and Democratization Roadmap

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**Abstract-** A political party is a key component of the democratization process. Political parties can equally be abused by the political system, members and environmental structures within which the party is situated. This study investigates the understanding of the political party, so as to correctly review multipartism, democracy and electioneering in Kenya. It purposes was to locate the function of political parties in democratic governance, examine the problems encountered by political parties in the process of building and sustaining competitive political systems and look back at the conditions that have led to a resurgence of multiparty democracy. In so doing, key questions that need answers are: How is a political party supposed to be constituted? Are the universal theoretical understandings of political parties affect or apply in Kenya (and Africa)? (To what extent either for or against)? What structural challenges do political parties face? What is the assessment of these parties in terms of management, membership, duty, role and what is their future? This study seeks to expand existing knowledge on the role of political parties in elections with specific reference to how processes of centralisation, inclusiveness and institutionalisation influence levels of participatory democracy. As such therefore, the role of political parties is critical in unravelling these in the context of the political landscape and democratic structure of Kenya. This study uses Kenyan political scenery as a unit of analysis in investigating the level of democratic development in the country since the inception of multipartism and comparing them with the era of single party politics. This is then based on the democratic structure of politics, the place and contribution of political parties and the manner of electioneering.

**Index Terms-** Political Party/Democratization/Multipartism

## I. INTRODUCTION

Political parties are vital political institutions for the functioning of a modern democracy. They are essential for the organization of the modern democratic polity and are crucial for the expression and manifestation for political pluralism (Mutua, 2006; 109, 113). Political parties are presumed to be central to the democratization of any state. Defined as an organization whose prime objective is to mobilize its supporters to assume a leadership role, a political party of any significance is viewed or views itself in terms of providing alternative policy platforms, ideological direction, as well as redefining the agenda of government (Makara, 2007; 44).

## 1.1. Rationale

The search for peaceful, transparent and credible elections has had a long history to the people of Kenya. This search started with the advent of independence and has gained momentum ever since. Elections and indeed the principle of democracy being new to Kenyans has had several predicaments in its development due to the societal injustices accrued upon the Kenyan citizenry, first by the colonialist and later on by the independence leadership.

Elections in Kenya still remain critical to the societal fabric. Over the past two decades, each election cycle has resulted to not only loss of property and human rights abuses, but loss of life. Political parties being at the centre of the whole process are important in the determinations of as to whether peaceful, transparent and credible elections will be held. Toerell, (1999) points out that democratic theorists and policy makers generally concur on the critical role that political parties play providing a link between their members and elected representatives. This process is nonetheless undertaken within certain socio-political factors that any community has that distinctively provides a challenge to the role of political parties.

## II. THEORETICAL CONCEPTUALIZATION

The theory used is Rokkan and Lipset's (1967) Social cleavage theory. It is of relevance to study the concept of multipartism using social cleavage theory, as did Lipset and Rokkan do in the 1960's because it responds well to the understanding of social constructions in Kenya. The theory helps the author understand such questions as why people choose to be under specific cleavages, and demand that their political representations including political parties be established as so. Secondly, is the discussion of how much developed or underdeveloped is multipartism under such cleavages. Thirdly, what are the socio-political and economic issues that contribute to the founding of such cleavages, and how are they relevant to political parties and political processes like democratization. Fourthly is the attempt to answer if there is a triangular relationship between the above questions as regard the development of politics in Kenya.

## III. METHODOLOGICAL CONCEPTUALIZATION

This study sought to establish a working explanation of political parties as institutions of political organisation as key determinants to the success, definition and determination of electioneering processes in Kenya. It explores the various conceptions of political parties in comparative political thought

and literature and contextualizes this within the broader debate on democracy and more specifically participatory democracy. It pays particular attention to the historical, socio-economic and cultural determinants of the evolution and development of political parties. The author consequently applied analytical qualitative design, critically reviewing relevant literature and analyzed conclusions and discussions.

#### IV. REVIEW OF LITERATURE

Sartori aptly describes a political party as “any political group identified by an official label that presents at elections, and is capable of placing through elections, candidates for public office” (Sartori 1976: 63). This definition however still falls short of capturing the organisational as well as interest aggregation and articulation dimensions of political parties. It is thus preferable, for the purposes of this discussion, to adopt the definition by Maliyamkono and Kanyongolo (2003:41) that “a political party is an organised association of people working together to compete for political office and to promote agreed-upon policies”. This definition, in the view of the author fits the description and tenets of the social cleavage theory that are used as the study’s theoretical framework.

The foregoing conceptualisation of political parties is derived from a general consensus on the utilitarian and functional view of their perceived “usefulness” in modern democracies. The importance of political parties lies in the functions they perform in modern democracies by linking citizens to government. These include the articulation and aggregating of diverse interests, recruitment and preparation of candidates for electoral office, crafting policy alternatives and setting the policy agenda, organising and participating in electoral competition and forming effective government and thus integrating groups and individuals into the democratic process.

Consequently, political parties not only provide the means by which citizens can participate in the governance process, but also structure the political landscape to enable competition between varying interests and policy objectives (Arowolo and Aluko, 2012; 1, 6).

The modern analysis of politics in Kenya began as part of the studies on “political development” that flourished during the 1950s and, especially, the 1960s. Despite the fact that such studies often downplayed the role of political institutions, political parties were rapidly acknowledged as an important role, both as manifestations and instruments of political development. However, it is imperative to point out that during this time, parties were just taking shape in most of Africa and their scientific study was based on the development of other established parties in the developed world since African parties were expected to follow in their trend. Thus, several collective and individual works were produced on the subject.

The new, recent wave of studies of Kenyan parties clearly marks a break. The reforms of the 1990s postulate the centrality of democracy as a value and a goal in itself, something whose achievement cannot be negotiated – at least not in principle – nor ‘traded’ for economic progress or national unity. In this sense, multiparty reforms denote a significant (if far from clear-cut) discontinuity not only in the political life of the continent, but also in the study of this reality. They contributed to a growing

integration of the study of politics in Kenya within mainstream political science.

Political parties are pre-eminent institutions of modern democratic governance. The general consensus in comparative political thought and among policy makers is that political parties play a central role in deepening and fostering democracy in both established as well as emerging democratic polities (Maiyo, 2008: 13). This is aptly captured by the assertion that “political parties created democracy and modern democracy is unthinkable, save in terms of the political parties” (Schattschneider, 1942: 1). The relevance of political parties in the organisation of modern politics and governance is not a recent phenomenon of contemporary societies. Political parties have been part and parcel of political organisation since the creation of the nation state.

The paradox of the majority of African political parties is that most of them are poorly organised and lack institutional capacity, their decision-making processes are unstructured and power often lies in the hands of the party leader and a few cronies who are usually wealthy enough to bankroll the party (Wanjohi, 2003). The role of the party membership is reduced to a bare minimum, usually to endorse decisions already made by the elite. Political mobilisation assumes the form of personality cults and loyalty is often to the party leader as opposed to the party as an institution. This encourages the politics of “party hopping” where leadership disagreements may lead to one leader jumping from one party to another and carrying his supporters with him/her. On the other extreme are the well organised, highly centralized and structured parties that have been in power since independence such as Chama Cha Mapinduzi (CCM) in Tanzania (Mutua, 2006; 120). Centralisation then takes away decision making power from lower party organs and branches and concentrates it on a core group of party oligarchs such as the Central Committee of the CCM. Such parties are usually found in single-party regimes where the party and the state are so fused that they became indistinguishable from each other. Whatever the case may be, both categories of parties, either by default or design, are considerably lacking in internal democracy (Maiyo, 2008: 18).

#### V. DISCUSSIONS AND ANALYSIS

##### 5.1. Structural, Philosophical and Theoretical Components of Political Parties in Kenya

The political party mechanisms in their universal nature contain unique features regarding structural, philosophical and theoretical features. The performance or relevance of political parties is determined by how these mechanisms are constituted. In the Kenyan context, party financing, ideology, internal democracy, internal mechanisms and political mobilization were studied and their findings presented as follows.

##### 5.1.1. Party Financing

Party funding remains to be a contentious issue in democratization process in Kenya as it is in other developing countries. To function well, they have to perform and run like an organization, hence requiring finances (Kriegler Report, 2008: 8-9). The question raised therefore are who provides these resources? This question is important since the bankrollers of parties have to be equally motivated by the need for democracy since it is the key mandate of political parties. On the flipside, what

if the bankrollers are not interested in democracy as an end, but the means to attaining it? This is the situation that Kenyan political parties find themselves in.

A major finding is that those sources of income that are low, such as party investments and membership contributions are sincere and desired at democratization. Whilst they come in little dosages, they don't have strings attached to. However, those that contribute the most have hidden agendas, especially from local partners. A good example are the friends of the current president who contributed millions in two hours to facilitate his re-election (Daily nation, 11<sup>th</sup> June, 2017; pp1). The financial and technical support given to the Kenyan opposition from international friends has over the recent years alarmed the government. Mr George Soros who is an international funder of reforms in the developing world has been quoted as having supported the Kenyan NASA Coalition with intent to facilitate regime change; a tag he supposedly carries. He has also been mentioned in the US (Daily Nation, Monday, 7<sup>th</sup> August, 2017).

### 5.1.2. Ideology of Political Parties

As pointed out in the literature review, political parties come as a result of citizens who feel the pull to create an organ that they use to express certain ideas to the public for communal progression and development. At an advanced level, these ideas form concrete political ideologies either fronted by an individual who pulls followers to the said ideology or events necessitate the creation of a particular ideology for example the need for peace after long and exhausting periods of conflict.

This is however lacking in Kenya. Analysis points out that political parties are no longer established because of ideologies. In fact, the only parties established using concrete ideologies in Kenya's party history are KANU, KADU and APP. These are pre-independence parties. The rest are established with minimal intonations or semblance of ideological realms. It is also argued that FORD, although ideologically created to take up KADU's ideology of devolution, lost it to ethnic clientelistic politics. Since then, all parties created by leaders that were under FORD tended to prefer socialist democracy and devolution while all those parties that were formed by leaders from KANU tend to be advocates of liberal democracy and centralization. These are the only semblances or intonations parties have to ideologies. In reality, they are established to serve the client – patron structure of politics in the country, representing different social cleavages.

### 5.1.3. Political Party Internal Democracy

Intra-party democracy entails how parties implement democracy within their party organizations, a process that impacts on political socialization, recruitment, membership, political communication, policy-making, among other party functions. A major finding is on two perspectives seek to answer the question as to how parties run their internal affairs. One of the perspectives favours the elite model, which posits that the elite make decisions for the party. The second perspective views intra-party democracy as a bottom-up process, whereby ordinary party members fully participate in the party's decision-making processes. This perspective requires real involvement of the rank and file in intra-party decisions, irrespective of party hierarchy. These in the context of Kenya is a reflection of the former model. It is what

kills parties making them not go past ten years on average, examples being URP, TNA, NARC and other small parties.

Political parties in Kenya have certain characteristics that influence intraparty democracy. Most parties tend to draw their support mainly from their ethnic base; they tend to be dominated by their founders or key funders; their activities revolve around influential personalities; most of them have no registered membership and have not been keen to recruit members; have weak ideologies which are often unknown and are of little influence in policy-making; have difficulties organizing functions, even party elections are often flawed and infiltrated by rival parties; and they do not have structures that strongly link them to the citizenry.

### 5.1.4. Internal Mechanisms of Political Parties

These include checks and balances, appointment of officials amongst other features. Kenya's political parties exhibit functional weaknesses, compounded by patrimonialism, ethnic loyalties and political insecurity, leading to their ineffectiveness in performance of political parties. In Kenya and most of Africa, the party is often subordinated to the state and thus energies are not directed toward strengthening the party, to make it the crucible of policy initiation and agenda setting. The current party structure Kenya still puts the president or party leader at a position higher than the party. The quality of its personnel and the technical nature of the policy process, especially the drawing of development plans and evaluation of policy impact and holding implementing officers accountable, are some of the major bottlenecks. Under this milieu, political parties' role is limited to that of ratifying decisions made in the executive or other circles.

### 5.1.5. Political Party Mobilization Structure

The mobilization role of parties in Kenya is often effective depending on issue saliency and on ethno-cultural cleavages, especially ethnicity to concretize their appeal and impact. Issue-based mobilization such as the independence struggle, the agitation for multi-party democracy in early 1990s, and constitutional review referendum (2005 and 2010) or any other issue of national importance, have often attracted phenomenal support from the citizenry (Masime & Oesterdiekhoff, 2010). However, such mobilization is not based on enduring party loyalties. Rather, it is often a temporary phenomenon, which fizzles away 'shortly' after realization of the specific purpose. It has often been the case in Kenya that the party in power or the dominant member of a coalition often uses state resources, including government vehicles and funds, the Provincial Administration and other civil servants, and security agents to campaign and mobilize support for the party/government position in a struggle between the government and opposition parties.

## 5.2. Functionality of Political Parties in the Kenyan Political Environment.

Any political environment keeps changing and brings with it a set of demands that political parties and other stakeholders must live up to. The study sought to assess how political parties function in three broad categories which were the capability of political parties, efficiency of political parties and professionalism in political parties. These are analysed below.

### 5.2.1. Capability of Political Parties

Voters can give more effective direction to government by supporting a team's program rather than an individual's. By holding entire parties rather than individual politicians accountable for what government does, voters create an incentive for responsible governance that might not otherwise exist. In this regard therefore, political parties are by their nature supposed to tap the broad spectrum or variety of support they get from members to gain a particular standing in political realms. In spite of the hegemonic clientelistic approach Kenyan politics are, political parties have found ways to survive and represent members. However, their capability has been dogged down by the same paternalistic- client oriented politics.

The capabilities of parties were tested based on the following parameters; having a strong social base, prescription of appealing platform to voters, attraction/retaining of party activists, attraction/retaining of political leaders, party organizational strength, party organizational complexity, institutionalized mass support, strong linkage to social organizations/groups, accessibility to finances, ownership of strong manifesto, ownership of internal democracy, coming from a strong historical background, and having a strong linkage to international platforms. While Kenyan political parties are capable can and ought to do more, their assessment is an average on the various parameters provided. It is only the lack of a strong social base that is regarded as worst performing. Parties were also praised for their capabilities to attract/retain of party activists, access finances and have strong historical backgrounds.

### 5.2.2. Efficiency of Political Parties

This study sought to find out how parties are efficient in performing their roles. These roles according to Bosire, (2010) are; aggregating diverse interests, recruitment and preparation of candidates for electoral office, crafting/setting policy agenda and policy amendments/alternatives, organizing and participating in electoral competition, forming government, integrating groups/individuals into the democratic process, how political parties provide means through which citizens can participate in the governance process and how political parties structure the political landscape to enable competition between varying interests and policy objectives. However, political parties have not been as efficient as they are supposed to be.

Aggregating diverse interests, provision of means through which citizens can participate in the governance process and integrating groups/individuals into the democratic process are ranked as the weakest performance of parties. In terms of structure the political landscape to enable competition between varying interests and policy objectives, recruitment and preparation of candidates for electoral office and crafting/setting policy agenda and policy amendments/alternatives are ranked as fair. Organizing and participating in electoral competition and forming government are equally observed to be doing fairly well.

### 5.2.3. Professionalism in Political Parties

Sebastian Elischer, (2008) in his study of political parties in Ghana, Kenya and Nigeria concerning democratic party behaviour, both within parties and among them and systemic consequences of party types concludes that programmatic parties behave most democratically and that, moreover, there seems to be

a relationship between a party's internal democracy and the way it interacts with other parties. Political parties cannot be running in a healthy manner unless they are well constituted and run well just like any other public organization. The perils that Kenyan political parties face in terms of professionalism including poor administration, presence of briefcase parties, threat of political brokers to parties and the acute access to infrastructure and finances among others. These are compounded by the lack of professional leaders to lead and advice political parties.

## VI. CONCLUSION

The study shows that there are factors which greatly impact on the advancement of political parties. Among other factor that impact political parties and multipartism in the country include: the internal party mechanism, social cleavage/grouping which enhance ethnicization of political parties and historical injustices in the Kenyan political history which are all important aspects of political party development in the county.

Political parties and the environment they exist within are crucial in understanding party systems. How parties organize themselves depends greatly on their ecologies. If the political environment is positive; either legally, democratically or otherwise, then the parties that come out are generally regarded as progressive. In Kenya, and in Africa generally, political environments are not steady, more often being dictated upon or redefined by the political and circumstantial factors like conflicts.

## VII. RECOMMENDATIONS

This study recommends a review of the manner with which social cleavages are constructed, political party development and the entrenched patron client politics that are now part of political culture. This study argues that while multipartism offers an opportunity for political development in Kenya, democracy needs to be natured so that it can be fruitful.

Secondly, regardless of the constitutional changes (2010), the political structure in Kenya does not seem to have regard for legal structures that have been put in place. The institutional character and internal dynamics of political parties need reform so as to be in tandem with the demands of democratization and that the electoral processes in Kenya needs more reform and development to international standards.

As regards the manner and style of establishing political parties, the study espouses that the structure put in place by the political parties are insufficient to meet and carry out their mandates as expected of them by their members and as stated by their manifestoes. Party members feel that the issues revolving around features like youths and women are well catered for and that these (youth and women) have equal and fair chances to leadership within and in the party. However, a concern is in the structure as it does not sufficiently address certain issues of interest such as violence, party nomination, corruption, bribery, favouritism, voter buying among others. Other quarters also argue that much more could be done to better improve the party structure.

Fourthly, while parties have good grassroots mobilization for voter registration and education, there is a strong urge for better

structures and manifestoes and some of the issues that have been stressed upon across the divide including equity, integrity, sober leadership and real time change especially concerns addressing social issues like education, medication, security, cohesion and economic development.

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# Multipartism and Democracy are Under Test in Kenyan Politics

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**Abstract-** Democracy and multiparty politics are unique bedfellows. One cannot do without the other. While multipartism can have variations, including being replaced with single party politics, democracy can still survive. How the system is structured ultimately defines and builds democracy is what counts. Nonetheless, the understanding of multipartism – democracy relationship is best analyzed by studying the democratization process as multipartism is roped in. This study focuses on the link between multipartism and democracy in elections. This study was limited to the electioneering process, probing therefore the institutions that are and still are involved in elections in Kenya. The area of concern to the researcher was based on the foundation that multipartism is hinged on progressive development to any country. This is however, determinant on the uptake of multipartism. How it is used or manipulated determines that varied results witnessed through such avenues as elections, quality of politics and models of governance. In Kenya, multipartism was re-introduced in 1992 and has been in practise up to date. The continued varied results of elections and quality of politics regrettably portray a negation to the ideals of multiparty politics in comparison to what the general public expected. The major concern is whether there is a difference in democratic practise in elections, different from the previous elections in the single party era that were reported to be non-democratic in nature. The study uses Social Cleavage theory, propounded by Lipset and Rokkan (1968) to explain the various reasons that constitute the formation and practise of political parties. The study hence sought to understand the shortfalls of democracy that Kenya faces within its multipartism political realm.

**Index Terms-** Democracy/Multipartism/Elections/Politics

## I. INTRODUCTION

**E**lections in Kenya still remain critical to the societal fabric. Over the past two decades, each election cycle has resulted to not only loss of property and human rights abuses, but loss of life. Scholarly gaps exist on the quality level of multiparty politics in Kenya in the context of quality elections, the impact of a high number of political parties; currently standing at more than 40 (Maiyo, 2008), and both positive and negative impact multipartism has had on Kenya's political realm. Kenyan political system has had coalition building, broadened democratic space and inclusivity in decision making for voters. These have led to improved quality of service delivery from public institutions. But on the flipside, ethnic violence, patron-client political management, disregard for electoral laws and dictatorial

tendencies of political parties continue to hamper Kenya's democracy.

Scholarly work on democratization in Kenya and Africa in limitedly linked to multiparty politics in the scope of the correct number of political parties, impunious political environment, dynamic social cleavages and the cost of democracy especially in Africa. Equally, progressive constitutional changes, peaceful transitions, coalition construction and management and the improving electoral management in Kenya is narrowly studied. Democracy in Kenya is widely believed as yet to be fully developed, including at party levels and is yet to be fully developed. The main reason for such aspersions is that instead of solving democratic problems, including its low levels, multipartism has brought more problems including strengthening ethnic, religious, class cleavages and party clientelism.

### 1.1. Why Multipartism and Democracy?

The study on multipartism and democratic elections beckons much attention within the African developmental agenda. The historical, social, economic and political realities shaping the development of African political party systems are however markedly different and require a new set of theoretical tools and approaches in order to fully capture the essence of their role in African politics. Normative approaches to the study and analysis of political parties in Africa tend to assume prescriptive perspectives that imply some sort of structural imposition as opposed to appreciation of organic development of parties. These approaches are therefore not best suited for the study and analysis of political parties in emerging democracies in Africa.

Secondly, little research has been done to investigate internal aspects of political party structures, functioning, and institutionalisation in general and processes of internal democracy in particular. Recent work by Mohamed Salih, (2007) and Chege, (2007) under the auspices of IIDEA, only begin to scratch the surface of an increasingly complex and pertinent area of inquiry. Similarly, political pluralism tends to be equated with the presence of multiple political parties contesting elections without regard to the political environment in which they operate and the internal institutional structures and processes by which these parties offer real choices and options to the electorate. It is this realisation that has sustained the long fight for constitutional and political reform in all three East African countries to provide a level playing field for all political parties (Musambayi, 2003). Increased civic awareness from mass civic education programmes especially since the late 1990s may have increased voter turnout and participation (or failing to as was witnessed in 2017) in elections in Kenya, but this is more a reflection of the voters' faith in the electoral process as a means of changing leadership, as opposed to faith in political

parties as institutions of democracy (Chege, 2007). This necessitates the study of the several cleavages to which the voters belong and the tag along parties follow to attract followers within several cleavages.

## II. THEORETICAL CONSIDERATIONS

This study employs the Social Cleavage theory as proposed by Lipset and Rokkan, (1967). The social cleavage theory is a concept used in sociology and political science to explore how society is divided into groups. Social cleavages are acknowledged divisions in society based on specific factors and are used to describe, among other things, voting behaviour.

It is of relevance to study the concept of multipartism using social cleavage theory, as did Lipset and Rokkan do in the 1960's because it responds well to the understanding of social constructions in Kenya. The theory helps the researcher understand such questions as why people choose to be under specific cleavages, and demand that their political representations including political parties be established as so. Secondly, is the discussion of how much developed or underdeveloped is multipartism under such cleavages. Thirdly, what are the socio-political and economic issues that contribute to the founding of such cleavages, and how are they relevant to political parties and political processes like democratization. Fourthly is the attempt to answer if there is a triangular relationship between the above questions as regard the development of politics in Kenya.

## III. METHODOLOGICAL CONCEPTUALIZATION

The author, by reviewing relevant and current literature employed analytical qualitative design. The literatures were critically analyzed and conclusions made based on the relevancy of the source to the topic. As such discussions an analysis of the subject was based on the following major themes;

1. Comparison of Multiparty and Single Party Systems in Kenya
2. Penetration of Democratic Ideals into Kenya's Socio-Political and Economic Fabric

This study reviews these inquiries into the insights and advances produced by these recent studies, focussing on the key issues raised by the return of party pluralism in Kenya and on the utility of existing models, theories and approaches for its understanding on the effectiveness and internal dynamics of political parties.

## IV. REVIEW OF LITERATURE

### 4.1. Multipartism Development in Kenya

The Kenyan political Party landscape has undergone fundamental changes from the independence period to date. In explaining how the focuses of parties have changed over the years, Jonyo, (2013) points out that it is useful to divide the period into phases. To him, this offers a better understanding of major political milestones. These phases are: pre-independence; post-independence (1963-1969); 1970-1990; and late 1991 to present. This review will follow Jonyo's Phases. The researcher further

adds the multiparty phase of post-independence. They are; Pre-independence phase (pre – 1963), Multiparty post-independence phase (1963 – 1969), Single party phase (1970 – 1991) and Multiparty phase (1992 – to date)

During the pre-independence period, the main focus of political parties was magnification of the peril and promise of democratic governance. They embodied nationalist sentiments and vehemently fought for emancipation of countries from colonial subjugation. In the first years of the post-independence period era, parties developed an inclination towards one-party governance status, but in spite of this, embraced and practiced reasonable democratic practices. In the period 1970-1990, parties lost all pretensions to democracy and became personal tools of authoritarian leaders, typified by the events surrounding the formation and proscribing of the Kenya People's Union (KPU), and consequently, lost their savor as democratic institutions.

Political competition was almost entirely suffocated and only the Kenya African National Union (KANU) remained as the dominant party, and later the only political party, after it engineered constitutional changes in 1982 to make Kenya a *de jure* single party state. In 1991, Kenya became a multi-party state and hitherto, parties have had mixed results. Initially, they seemed critical in organizing public preferences and national agenda and generally performed their generic functions. Along the way, they have taken off this trajectory and there is concern that political parties still operate as personal outfits or tribal alliances, concerning themselves more with consolidation and retention of power rather than developing and implementing policies once in office or undertaking the core roles of political parties. This is cause for concern as the role of political parties is not limited to strategizing to capture and retain power. Political parties in a democracy have several functions that include leadership recruitment, political socialization, interest aggregation, and organization, policy formulation, political representation and mobilization.

However, the reintroduction of multiparty politics in December 1991, as Bosire (2010) points out, though a huge step in the country's journey towards becoming a competitive representative democracy, merely resulted in the proliferation of political parties most of which remain ineffectual. The parties have performed dismally in their traditional roles. They have also failed to articulate coherent ideologies, develop concrete political programmes, establish national following and practice internal democracy. Most of them at best serve as electoral vehicles, only heard of at election time, with no known contacts in between elections. Indeed, five multiparty elections down the line and the country is yet to transit into a full-fledged representative democracy (Bosire, 2010: 7). However, Bosire fails to give credit to political parties that have over the years contributed to the socio-political development of the country. He also fails to link political parties to positive aspects the country has gone through thanks to political parties including political transitions and two constitutional referenda.

Although political parties are expressions of social structural conflict situations (cleavages), they more than any other democratic institution have the capacity to generate positive crosscutting cleavages by aggregating diverse interests rather than articulating specific ones. Political parties in Kenya have failed to articulate socio-economic or any other democratically acceptable

ideological cleavages and have tended to articulate interests on the basis of ethnicity, thereby, intensifying already existing societal divisions, tensions and conflicts (Patel, 2001: 155; Whitehead, 2000: 3).

The absence of ideological or policy platforms has not only seen parties appeal to ethnic emotions but also indulge in patronage and corruption, which have further heightened perceptions of ethnic inequality and/or exclusion within the political system. This phenomenon was especially magnified in the period leading to the constitutional referendum in 2005, through to the 2007 General Elections when a dispute over the tallying of presidential votes resulted in widespread post-election violence that led to the death of over 1000 people and the displacement of another 500, 000 (Kriegler Report, 2008)

## V. ANALYSIS

### 5.1. Comparison of Multiparty and Single Party Systems in Kenya

This study sought to compare the state of affairs in the country in both single and multiparty era. This is important so as to ascertain which system is better and in what circumstances. The issues under scope in the comparison are; Politics and governance during the two eras, membership to political parties (here the study tried to find out if the members were enormous during either of the systems, and for what reasons) and achievements of parties in terms of mobilization, development to the country, impact on public policy, direction of the country's ideology, impact on foreign policy (relations and general image of the state as portrayed by the political party).

The main achievements that political parties can be assessed on as a basis in comparing the single and multiparty eras in Kenya are; mobilization role (under social, political and economic aspects), public policy, foreign policy, national integration, ideology conceptualization, national development, democratization, constitutionalism, institutionalism, political inclusivity, political effectiveness and party development characteristics. It is important to assess the achievements of political parties in reviewing the development of multiparty politics in Kenya. This compares the development of political parties and how they were able to perform in both eras.

Under mobilization, the extent to which a party mobilizes social, political and economic features for development is paramount. Generally, multiparty era political parties do better at mobilization as compared to similar or any political party in a single party era. The reasons for these are mainly because political parties when operating within a multiparty setup, tend to compete and in return, their image and technical knowhow is improved. This was lacking in the single party era because the patron was the leader of the country. However, the party under a single party system was found to do better in foreign policy, national integration and ideology conceptualization. Each of these features were found to be doing better than in the multiparty. Political effectiveness also did better in the single party era. It was pointed out that these four performed better owing to the centralized and unified manner of national politics. This was and still is the benefit of single party systems. States in such systems have strong foreign policies owing to the strong or towering figure the heads of state enjoy back at home; which catapults him/her to more accolade

status than their counterparts in the region. The example of Presidents Yoweri and Kagame of Uganda and Rwanda respectively can be provided as examples. These Heads of State have more status than their East African counterparts, all thanks to single party tendencies in their countries that have overpowered multiparty politics.

National development, democratization, constitutionalism, institutionalism, political inclusivity and party development do better under a multiparty system over the single party system. It is argued that national development is as a result of public participation and inclusivity, as discussed above, and directly involved in democratic principles and constitutionalism. Such features as separation of powers, creation and maintenance of strong independent institutions; does not create a vacuum for political parties to fill, as was the case in the single party era. Parties are secluded to policy and interest articulation and in the legislature only. However, it can be argued that keeping a party secluded is not the best choice. While supporting multiparty systems, there is need for strong political parties, just like in Uganda, Tanzania and Rwanda to be replicated in Kenya. Strong parties ensure national development, which in turn gives room for the growth of democracy an institutionalism. No system, single or multiparty will work within a poor economic environment.

### 5.2. Penetration of Democratic Ideals into Kenya's Socio-Political and Economic Fabric

Under this theme, the researcher asks, is democracy embraced by all? Does it merge/compliment Kenya's ideology? Elections, in terms of their origin in Africa, were a colonial contrivance that evolved as part of the institutional transfer of the superstructure of liberal democracy (Jinadu, 1995: 76). Although the pre-colonial political systems in Africa had some shades of democratic principles and practices embedded in them, the concept of voting and the notion of a political majority and minority were not part of the African political tradition. Consensus, dialogue and the political collective were emphasized, as opposed to individualism, atomization and the majoritarianism of the western capitalist political system (Buijtenhuijs and Rijnerse, 1993).

While electoral pedagogy took place under colonial rule, colonialism produced three sharp contradictions or paradoxes for post-colonial electoral politics and behaviour, particularly of the leadership. First, colonialism by its very nature and character is antithetical to the logic and philosophy of elections and democracy, having been constructed on a base of authoritarianism and domination. Thus, super-intending the electoral process, particularly when the colonial regime itself was deeply interested and involved in the politics of power transfer, was very complex and problematic, and the extent to which an impartial or a free and fair colonial electoral process was possible was therefore questionable. Second, although the decolonization project was woven around democratic principles and the ideals of self-determination and social justice, the emergent political elites were educated and socialized under a highly centralized and authoritarian order (Chazan, 1993). This was to later affect their post-colonial political behaviour. Third, the statist character of colonial rule, which survived the era, was later to determine the object and terrain of electoral competition. What are the

implications of the foregoing for electoral politics in post-colonial Africa?

The durability of democracy is assumed to originate from a constitutional order. However, dominant state parties tend to undermine constitutionalism. An example is in the 2017 General Elections and the many court cases regarding the Constitutional interpretation of electoral processes, including the landmark ruling of the Supreme Court of Kenya nullifying the presidential election. It may be noted that the failure of constitutionalism in Africa is not a result of lack of popular constitutions but of governments seeking to escape from constraints imposed by constitutions. Instead personal rule in Africa has become a norm. It can also be noted that where there is, in fact, the potential to resist arbitrary rule, either society is not sufficiently organised politically to challenge it, or the political and legal institutions are too weak in the quality of their personnel and in their political support from society, to resist or counter balance the executive power. In effect therefore, democracy is neither here nor there.

Executive power in Africa is overwhelming partly because the leaders do not believe in constitutional rule or those provisions that limit their powers (Makara, 2007, p57). At the same time institutions of representation simply become what is termed as "rubber stamps." In assessing African political elites, it can be observed as a paradox in their commitment to constitutionalism and their emphatic rejection of classical principles of liberal democracy. Such a paradox, it can be argued, produces the conditions where the political elite in Africa believe that instead of controlling a government, the constitution is there to serve government, leaving a room for manipulation.

Finally, liberal democracies go a step beyond, as they are strictly bound by the state's constitution and the rule of law, with horizontal accountability among officeholders, protection of pluralism and freedoms, and the lack of "reserved domains of power for the military or other actors not accountable to the electorate". (Howard & Roessler, 2006; Pp 367-368). It is this liberal democracy that Kenya strives to get to as prescribed by the 2010 Constitution and other multi-sectoral electoral reforms.

## VI. RECOMMENDATIONS

In view of the findings from the data analysed the author recommends the following suggestions:

### 6.1. Social cleavages

Social cleavages are integral in political mobilization as the study finds. However, they have unique impacts if they are not directed. Since people collect themselves based on similarities owned, there is need to have caution so that these mobilizations can be controlled. If people collect themselves based on wrong similarities that exist in social settings, then there is jeopardy of the same society passing these wrong features as normal and okay.

### 6.2. Patron-Client politics

Patron-clientelist politics in Africa has become entrenched as this study reveals. Political leaders have over the years used their executive power to offer services in exchange for political support to themselves and their parties. This is a direct product of single party system countries go through. There is need to rework on ways of eliminating this political tendency that is rampant in Africa.

## 6.3. Democratization

The democratization roadmap as the study reveals is poised to offer any society positive gains in political management and Africa should be keen on this. African countries are on the right path towards this in spite of few countries that scuttle this. Nonetheless, there is need to assess democracy in the context of African political systems without heavy input from non-African societies so that African political structures can develop democracy based on continental perspectives

## VII. CONCLUSION

In most African countries, recent developments suggest that elections are only an expedient political exercise for ruling regimes, partly because of their economic implications in terms of aid flows and economic assistance, and partly because of their public relations advantage in propping up the political profile of the regime in the international arena. Even where regimes came into power through popular elections, they have since relapsed into autocratic rule, conducting "fabricated" elections. Thus, the dominant practice is that most rulers organize an electoral "coup d'état" which ensures their "selection" in the name of a popular electoral process. The tactics employed include stifling opposition parties and reducing them to docility, covertly corrupting the electoral process or embarking on outright election rigging.

This study concludes that while democratization and multipartism have each gone through divergent ecological stages, their development is more beneficial when much support comes from outside the two than when they complement each other. Other components include elections, governance, politics and constitutionalism. Their quality does a huge favour to their development than they can do by themselves. In essence, it is not just enough to have a democratic space and existent multiple party system. In themselves, political un-doings may take root as the study has shown in Kenya.

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# EliQzer (A Brown Kelp) clinically proven for splendid stress buster of crop to get good yield

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**Abstract-** The aim of the present study is to depict the benefits of the bio-stimulants available in the market. The present study explores the benefit of the product EliQzer clinically proven by Parijat Industries for its extensive benefits which is found acting as a best stress buster for the crop. The composition of this crop buster EliQzer consists of naturally occurring compounds which aids the cell division and elongation which in turn results in increased Leaf Index area & Chlorophyll level. It increases the flower production and qualitative and quantitative yield along with enhanced shelf life.

**Index Terms-** Carotenoids, Cell division, Nutraceutical, Root -zone, Shelf life, Stimulants, Cold extraction process

## 1. INTRODUCTION

Agriculture and its allied sectors are unquestionably the largest livelihood provider in India, more so in the vast rural areas. It also contributes a significant figure to the Gross Domestic Product (GDP). The paradigm shifts to be a significant nation in the globe being the largest producers in Pulses, Wheat, Rice, etc. has been a very arduous task. It has taken in a lot of research and diligence on the part of the scientists and the tremendous drudgery on the part of the farmers that today we can proudly say that India is self-sufficient in feeding its population.

The green revolution unlocked with it a serious of Crop protection technologies, and people became aware of the use of pesticides and Plant growth promoters, and how its use could increase the production. As time advanced new advancements and introductions paved its way into crop protection and crop care. People become more aware about the various crop nutrients and Bio-stimulants that can help them boost the actual potential of the crop and ultimately get good yields. All this brings us to the current situation where just in the Plant growth promoter segment, we have a series of products ranging from the amino acids, humic acid based products to advanced combinations of plant extracts. Currently we have diverse formulations of compounds, substances and micro-organisms that are applied to plants or soils to improve crop vigor, yields, quality and tolerance of abiotic stresses. Nowadays, in respect to Plant Nutrients, brown kelps are also considered to be promising resources of functional ingredient in the development of novel products Brown kelps have their abundant availability in the aquatic system have the potential to become excellent sources of bio active compounds and nutrients for plant growth. The reason is that consumers are increasingly interested in the possible benefits of functional foods, since this trend is in relation to nutritional genomics (nutrigenomics and nutrigenetics) of functional foods and aims to utilize their health promoting or disease preventing properties. Brown kelps form an integral part of marine coastal ecosystems. They include the macroscopic, multicellular marine algae that commonly inhabit the coastal regions of the world's oceans where suitable substrata exist. Brown kelps are the second most abundant group comprising about 2,000 species which reach their maximum biomass levels on the rocky shores of the temperate zones. They are the type most commonly used in agriculture. The benefits of brown kelps as sources of organic matter and fertilizer nutrients have led to their use as soil conditioners for to increase plant growth and yield. Numerous studies have revealed a wide range of beneficial effects of brown kelp extract applications on plants, such as early seed germination and establishment, improved crop performance and yield, elevated resistance to biotic and abiotic stress, and enhanced postharvest shelf-life of perishable products.

## 2. USE OF BIO STIMULANTS IN AGRICULTURE

Bio-stimulants are the organically derived stimulants that fosters the plant growth in a demonstrated way throughout the crop lifecycle from seed germination to plant maturity. These can be applied to different parts of plant either seed, soil or other growing media the idea behind that the plant can assimilate and utilize the nutrients for its proper growth and development. Other names for Bio-stimulants include plant strengtheners and conditioners, Phyto stimulants, bio activators and soil, yield, crop and plant growth enhancers. Numerous researches showed benefits of Brown kelps application on plants, such as early seed germination, improved yield, and elevated resistance to biotic as well as abiotic stress and enhanced post-harvest shelf life.

Agricultural bio stimulants include diverse formulations primarily manufactured from in-organic compounds termed as plant growth regulators, often also formulated from organic compounds or micro-organisms. These are used either on plants or soils to improve crop vigor, yields, quality and relieve from stresses situation.

Bio stimulants foster plant growth and development throughout the crop life cycle from seed germination to plant maturity in a number of demonstrated ways, including but not limited to:

- ≈ Improving the efficiency of the plant's metabolism to induce yield increases and enhanced crop quality;
- ≈ Increasing plant tolerance to and recovery from abiotic stresses;
- ≈ Facilitating nutrient assimilation, translocation and use;
- ≈ Enhancing quality attributes of produce, including sugar content, color, fruit seeding, etc.;
- ≈ Rendering water use more efficient;
- ≈ Enhancing soil fertility, particularly by fostering the development of complementary soil micro-organisms.

### CONCEPT OF CROP NUTRACEUTICAL™

Global package and practices in agricultural have been evolving and moving towards semi-organic to organic practices for a sustainable or environmental friendly opportunities. Modern agriculture is aiming towards reduction in use of chemical inputs without reducing the yield and quality of Crops.

There are various ways and means to achieve such goals, viz improved breeding programs, tissue culture, biotechnology so on and so forth. But all such processes either time consuming or expensive processes.

But considering the facts of global agriculture economy and the developing countries having real limitation of the investment capacities by the farming communities towards expensive inputs, they rather look for innovative practices.

The identification of vegetable origin foliar nutraceutical support are facilitated through brown kelp natural extracts contain a wide range of natural bioactive compounds. These molecules are able to activate plant metabolism, nutrient assimilation process & nutrient use efficiency that allow significant improvement in crop yield performance in a short period of time and in an economic way further to the advantages by enhancing tolerance to biotic and abiotic stresses.

In this article, future prospects of vegetable origin foliar nutraceutical support are discussed with a focus and particular attention to **Crop Nutraceuticals™** of vegetable origin for intensive agricultural systems such as fruits & vegetable crops.

In fruits and vegetables the use of brown kelp natural extracts application leads to reduction in fertilizers usage without affecting yield and quality, which otherwise lose or deplete or leach out from the root zone during the growing season. Moreover in leafy vegetables, brown kelp natural extracts enhance primary and secondary root growths, leaf pigments viz. Chlorophyll and carotenoids also increasing the antioxidant potential of plants to reduce senescence for prolonged yield in multi-picking crop.

### 2.1 Modes of Action of Growth Stimulatory Factors in Brown kelp Extracts

Bio-stimulators are materials that promote growth of the plant, but different with fertilizers owing to their activity they are also referred as "metabolic enhancers". Brown kelps contains those components naturally found in plant like plant hormones, nutrients, vitamins, cytokinins affects cellular metabolism leading to enhanced growth and crop yield.

**Fig.2.1 Schematic representation of physiological effects elicited by brown kelp extracts and possible mechanism of bioactivity.**

**2.2 Chemical Components of Brown kelp that Affect Plant Growth**

The Brown kelps particularly the Brown and Red Algae are the source of unusual and complex polysaccharides which are not usually found in land Plants.

**2.3 Effect on Soil Health, Soil Structure and Moisture Retention**

Besides enhancing the growth factors in plants, it improves the Physical, Chemical and biological properties of the soil this turns again to be the promising factor for growth of plants, because a good quality and moisture retaining soil always gives good yield. This brown kelps improves the moisture retaining capacity of the soil and promoting the growth of useful soil microbes. As found, these consist of polyuronides, salts of alginic acid forms a high molecular weight complex with the metallic ions in soil these complexes absorb moisture, swell, retain moisture and improve crumb structure. This results in better soil aeration and capillary activity of soil pores which in turn stimulate the growth of the plant root system as well as boost soil microbial activity.

**2.4 Effect on Plant Growth and Health, Root Development and Mineral Absorption**

Brown kelp products promote root growth and development. The root-growth stimulatory effect was more pronounced when extracts were applied at an early growth stage in maize, and the response was similar to that of auxin, an important root growth-promoting hormone.

**2.5 Effect on Shoot Growth and Photosynthesis**

The Brown Kelp on application to plants part at the early stage enhances the content of Chlorophyll to its shoot parts as the content of chlorophyll increases gives larger leaf size, increased rate of photosynthesis and thus better yield.

**2.6 Resistance to Environmental Stresses**

Abiotic stresses such as drought, salinity, and temperature extremes can reduce the yield of major crops and limit agricultural production worldwide

**3. RESULTS AND FINDINGS**

**3.1. Brown kelp natural extracts for crop enhancement and EliQzer**

Brown Kelp natural extracts are natural crop enhancer contain marine bioactive substances extracted used in Agriculture input industry as a raw material having nutraceutical advantages that energize the vital plant physiological process used for therapeutic applications. Marine algal species are often regarded as an underutilized bio resource, many have been used as a source of food, industrial raw

materials, and in therapeutic and botanical applications for centuries. Moreover, brown kelp natural extracts derived products have been widely used as amendments in crop production systems due to the presence of a number of natural stimulating compounds.

Brown kelp Extract is a whole food supplement extracted from the brown kelp. It is ecologically harvested in the remote, pristine ocean waters of Patagonia and the extraction process utilizing a highly specialized cold temperature extraction process, Heat, alters the natural structure of numerous bioactive compounds. The brown kelp cell walls when burst allows the release of the main bioactive compounds into the 100% soluble liquid extract Marine algal species are often regarded as an underutilized bio resource, many have been used as a source of food, industrial raw materials, and in therapeutic and botanical applications for centuries. Moreover, brown kelp natural extracts derived products have been widely used as amendments in crop production systems due to the presence of a number of natural stimulating compounds. All the natural key compounds of the fresh brown kelp beneficial to plants and grasses

Out of the various Bio stimulant PGR products available in the market. One such Product which has been extensively tested by **Parijat Industries (India) Pvt. Ltd. is EliQzer**. The product would be introduced both overseas and domestic market in multiple brand. The **brand EliQzer** to represent overseas market whereas the **brand Fuzico** would show its presence in the domestic retail market.

EliQzer is a unique **Crop Nutraceutical™** management product, biologically derived from broad group of multicellular marine Brown Kelp of class Phaeophyceae harvested from Northern hemisphere is an ecofriendly biological storehouse, manufactured under controlled scientific conditions. EliQzer influence as a significant crop enhancer, to unleash optimum output, better assimilation, maximum utilization of soil nutrients and the best stress buster for the crop.

It contains naturally occurring compounds which helps in Quick & Healthy Germination, Immunization and help withstand Stress & pest attack. It increases soil microbial activities and leads to the development of healthy roots with increased root mass. It also increases Cell division & Cell elongation. The results are also suggestive of increased Leaf Index area & Chlorophyll level. EliQzer also reduces senescence and Checks flower & fruit abscission. It Increases flower production and qualitative & quantitative yield along with enhanced shelf life. The Brown kelp algae extraction done by cold extraction process. It applied in liquid state by dissolving in water and sprayed to the Plants cavity. For better result it was much preferable to act it on plants at the vegetative stage. It can be applied on all types of fruits and vegetables as reported by our scientific experts. On applying to various fruits and vegetables some observed phenomenon was reported. The product reported is found acting in the way, Natural compounds such as pigments, vitamins, hormones, amino acids are sensitive to heat so in order to keep Algae Green as active as possible, keeping processing temperatures low during the extraction process is crucial in order to produce an active brown kelp extract. Brown kelp Liquid is the result of OGT's efforts to preserve as much as possible all the key compounds of brown kelp intact and hence benefit directly to the turf and its health.

### 3.2 Product Review

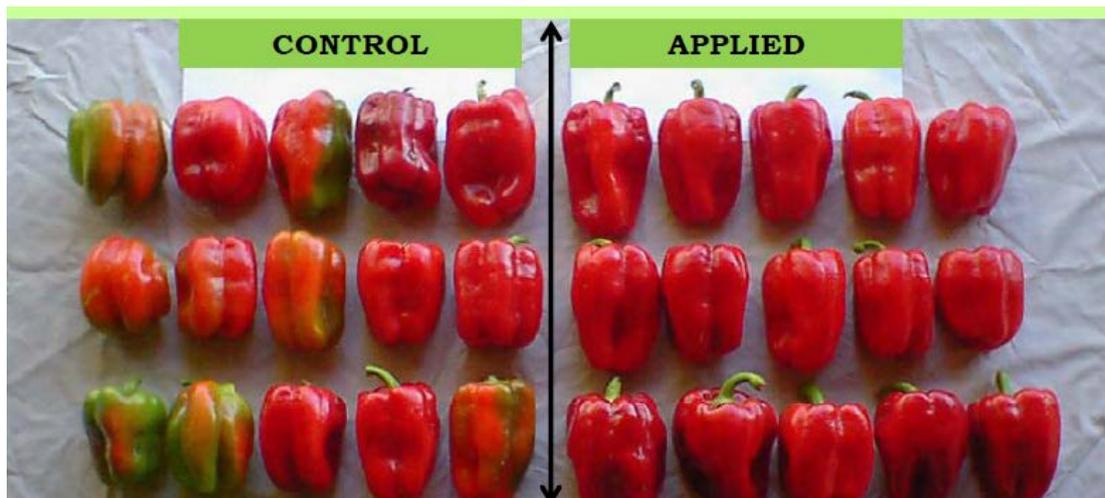
The Product significantly increased the bunching and Yield in Grapes, Capsicum, Beans and Brinjal which are very important Crop from commercial point of view.

The Product significantly increased the bunching and yield in crops, which is sprayed on the plant cavity and the result is observed in 6-7 days. Observed result seen are reported here in the image which showed a better quality and size of the crops as below.

**Fig. 3. 2. 1 Images of Grapes treated and control treatment**



**Fig. 3. 2. 2 Images of Capsicum treated and control treatment**



**Fig. 3. 2. 3 Images of Beans treated and control treatment under water stress**



**Fig. 3. 2. 4 Images of Brinjal treated and control treatment**



**Brinjal Treatment:** The product comes with a very simple usage practice. The dose of application is 250 ml/Acre. It can be applied to all crops including vegetables and cereals.

**SUGGESTED OBSERVATION PARAMETERS FOR VEGETABLE AND CEREAL CROPS**

Vegetables		
S.No.	Particulars	Details
1	Seedling establishment	Plant height, Root Length, Chlorophyll content , General Plant Vigor
2	Flowering	Number of flowers per cluster, Number of flower clusters per plant
3	Fruiting	Number of fruits, Weight of fruit, Even texture and size
4	Yield	Yield in Treated Vs Control
Cereals		
S.No.	Particulars	Details
1	Early establishment phase	Plant height, Root Length, Chlorophyll content , General Plant Vigor
2	CRI/Critical stage	Development of Plant in Critical stage
3	Tillering	No. of tillers/per Plant, Girth etc
4	Panicle initiation	Panicle initiation early in treated, Panicles per Plant , Time taken for maturation

**4. CONCLUSION**

*EliQzer* has been adequately been tested in wide ranges at multi location under various environment. It has proved its worth and versatility. This molecule formulation has been developed on the need of Crop Nutraceutical™ under the present agricultural management where both open rainfed and non rainfed agriculture suffer climatic **vagaries** and multiple stress scenario. Hence in the recent time there is a vibrant paradigm shift towards Crop Nutraceutical™ concept from fundamental usage of plant growth regulator based bio stimulants as well as other crop care products which are normally catered in the Indian Market.

To feed the growing population Crop Nutraceuticals™ and bio stimulant would play a key role in agriculture for now and future population growing and to Bio stimulants are definitely the future in Agriculture as the choice are wider . However having a Crop

Nutraceuticals™ product like *EliQzer* in hand, every farmer will be able to attain the increase yield potential. Thus *EliQzer* surely is an evergreen essence for a splendid harvest.

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# The Analysis of Healthy Lifestyle Mechanism in Overcoming Stress on Public Accountant Firm Auditors

(An Empirical Study of Auditors of Public Accountant Firm in Indonesia)

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## Abstract

*The problem of stress often occurs in auditors who work in Public Accountant Firm, especially during a peak season. Several previous studies showed that the role stress has a negative impact on job outcome. To overcome this, this research tries to provide a solution and test whether through a healthy lifestyle mechanism (healthy lifestyle, vitality and psychological well-being) is able to minimize the negative impact of role stress (role ambiguity, role conflict, role overload and job burnout) to job outcome (job satisfaction, performance, turnover intentions, and organizational commitment). The results of this study indicate that a healthy lifestyle mechanism can minimize the negative impact of role stressors on job satisfaction and organizational commitment. However, this study has not been able to prove that a healthy lifestyle mechanism can reduce the auditor's desire to shift work and improve auditor performance. This study also shows the results that job satisfaction can reduce the auditor's turnover intention and organizational commitment is not a factor that can reduce that intention.*

**Keywords:** Auditors, role stress, healthy lifestyle mechanisms, job outcomes, SmartPLS

## INTRODUCTION

One of the challenges which employees face in working is the management of work stress. The problems of work stress often happen to the auditors who work in Public Accountant Firm especially in the peak season. A peak season is a term used in the period in which companies carry out the financial statements closing process. During the peak season, auditors have a target to complete various inspection programs because the financial statements have to be published immediately.

Robbins (2008) states that a stress level and tension accumulate in the workplace can aggravate an employee mood which makes them feel the negative emotion. This condition is supposed to be a concern for the Public Accountant Firm management so that they can

control better the stress level in their work environment because if the auditors experience excessive work stress, it is feared that it will adversely affect to organizational performance. This statement is supported by Agustina (2009) who states that the work stress which is measured through role conflict, role ambiguity, and role overload, simultaneously gives a significant negative impact on performance and job satisfaction for junior auditors.

One of the phenomena which are often linked to the result of excessive work stress is a turnover intention. This condition is supported by Cahyono (2008) who declares that a work stress which is measured through role ambiguity and role conflict directly, has a positive effect on the employee turnover intention at the Public Accountant Firm and the

research result of Masihabadi, et al (2015) states that a work stress has a negative effect on the organizational commitment and job satisfaction.

The employee turnover intention is one of the serious problem indications for organizations because it will have implications on the intensity of the entry and exit of employees in the environment of an organization. A high employee turnover intensity will result in some losses for an organization, such as:

1. Transfer knowledge which does not run optimally
2. Barriers to personnel shortages in carrying out audit duties
3. The possibility of multiple jobs and/or positions held by an auditor
4. The acceleration of a work unit in running the business process becomes hampered
5. The emergence of recruitment fees to screen prospective new employees.

If these matters happen then it will affect the decreasing of the organizational performance.

Auditor of public accounting firm has a big responsibility to provide adequate confidence that the financial statements are presented fairly and free from material misstatements. Mulyadi (2002:55) mentions some of the auditor's responsibilities, such as:

1. The auditor's responsibility to detect and report errors and irregularities, including detecting and reporting an error and fraud.
2. The responsibility to find a violation of law by clients, including detecting error and fraud.

3. The responsibility to maintain an independent attitude, including maintaining an independent mental attitude.
4. The responsibility to give consideration of the entity ability in maintaining its survival, including evaluating doubt in the entity ability to maintain the company survival.

Based on the description about the auditor responsibility, the challenges faced by Public Accountant Firm nowadays are how the responsibility can be conducted optimally if the problem of the high employee turnover and the low auditor performance still become an issue in the organization.

The researcher observation of some auditor behaviors results in some negative behaviors, such as:

1. The auditor lacks of physical activity and does not exercise regularly.
2. The sleeping time and quality are not optimal because the auditors often do overtime work.
3. Half of the male auditors tend to be smokers and they will smoke if they are under saturation or work pressure.
4. The irregular auditor food pattern, and
5. Sometimes the food type consumed by the auditor is not a healthy food type and not needed by the body.

Based on the researcher interview result to some auditors, it is found the information that half of the Public Accountant Firm management does not consider their employee health and keep on maintaining an unhealthy work pattern.

Meanwhile, according to World Health Organization/WHO, at least there are four main

things who need to be considered in performing a healthy lifestyle. These four things are:

1. Do not consume cigarette and other tobacco products.
2. Do a physical activity.
3. Consume healthy food with beneficial nutritional intake
4. Do not consume alcohol beverages

Auditors and Public Accountant Firm management are supposed to realize that maintaining good health is an important thing. Not only that, Public Accountant Firm management should consider the auditor as a valuable asset for the company, remembering that Public Accountant Firm business type is in the service sector who needs competency, expertise, and excellent physical condition from the auditors as the company business wheel drive. This statement is supported by Paramitha, Novena (2014) who states that people who have a healthy lifestyle tend to have a better physical and psychological endurance than those who do not apply a healthy lifestyle in their life every day.

The study result is hoped to give an understanding to the auditors so they can apply a healthy lifestyle and appreciate their health more. For the Public Accountant Firm management, this research is hoped to give input so that company can compile policy and analysis about the workload, competency index which is needed in doing an assignment and watch the work pattern and the health of their employees.

The researchers argue that this research is unique in term of the idea and thinking framework which will assess how the influence of a healthy lifestyle in minimizing the work stress influence is. This research also has an advancement from the preceding research by adding an organizational commitment variable which has not been studied in the previous research and concept of thought. This variable needs to be added because the organizational commitment characters can change along from time to time (Ferris, 1981) and have a significant influence in predicting the employee turnover intention (Rohman, 2009).

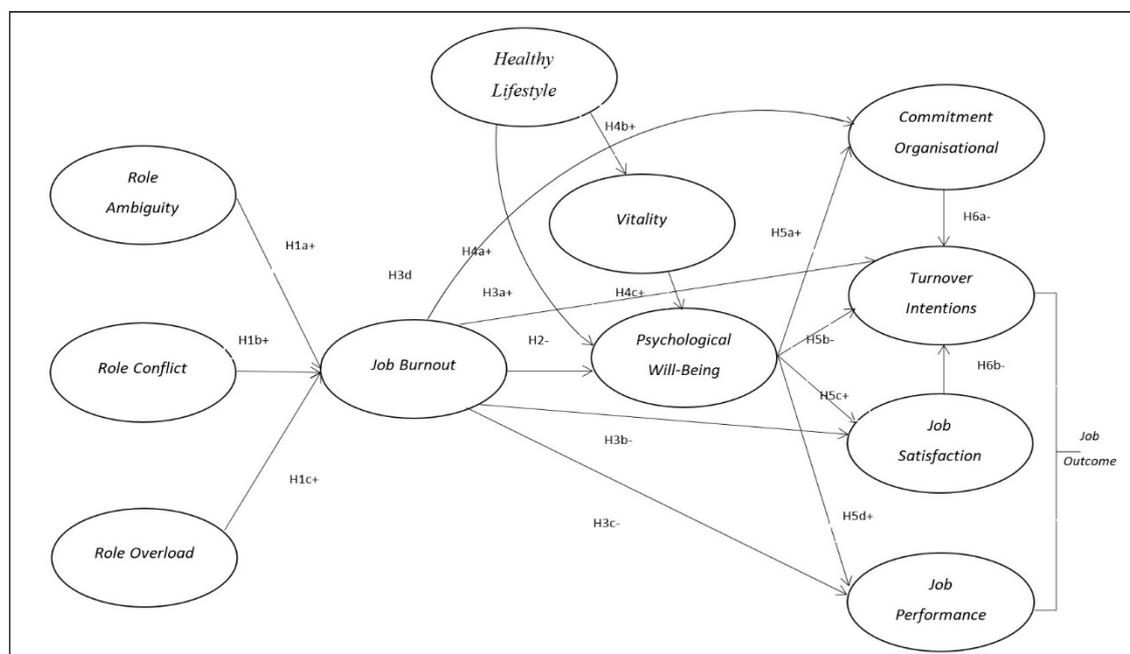
This research also tries to answer limitations which are declared by the previous researchers, Jones, Norman, and Wier (2010). This research was conducted during and after the peak season. The study was done in the Public Accountant Firm in Indonesia, including the Public Accountant Firms which are affiliated with the *big four*, so that the result can represent the actual condition which is experienced by the auditors and the result can generalize more the existing population.

## **LITERATURE REVIEW, FRAMEWORK, AND HYPOTHESIS**

Role theory is a part of the psychology disciplines that consider the routines done by someone is a consequence of the position occupied in the social order. Linton (1936) explains that the role theory is a picture of social interaction in the terminology of the actors who are playing according to what the cultures set. This theory states that the role hopes are a

mutual understanding which leads someone to behave in their daily lives. This statement is supported by Robbins (2008) who defines the term role as a series of behavioral patterns which

concluded that the role theory can be applied to analyze every relationship among individuals, individuals with a group of individuals, or among groups of individuals.



Picture 1

are closely related to someone who is in a certain position in a social unit. Enlarging the concept of role theory, Elder (1975) adds that every human has a hope to his members to have a particular behavior according to the age categories which applied in that society.

Biddle and Thomas (1966) divide the role theory into four groups, the terms that concern people who take parts in the social interaction, behavior that appears in the interaction, people positions in behavior, and the connection between people and behavior. People who take part in social interaction consist of two groups. The first group is an actor, someone who acts according to a particular role. The second group is the target or somebody else, someone who has a relation with the actor and his behavior. The actor or target can be individuals or a group of individuals. Based on this definition, it can be

In conducting their role as the Public Accountant Firm auditors, auditors often experience role stress, either in a form of role ambiguity, role conflict, and role overload. Role stress experienced, affects negatively to the job burnout which is marked by emotional exhaustion, reduced personal accomplishment, and not caring behavior about the career and their own self (depersonalization). At its peak, this thing will affect negatively to the job outcomes which is the decrease of performance and the auditor job satisfaction, and increase the desire to move work (turnover intentions).

This study will examine the mechanism of healthy lifestyle in an effort to minimize the negative impact of stress on work outcomes. A healthy lifestyle will improve vitality and psychological well-being. Through psychological well-being, the negative effects of

stress roles on auditor performance and job satisfaction will be minimized. psychological well-being will increase organizational commitment and employee job satisfaction thereby reducing the auditor's intention to move to work. Based on the explanation, the frame of mind in this research can be visualized in Figure 1.

### **The Relationship Between Role Stress And Job Burnout**

Role theory refers to the role played by an individual. Role theory also explains the existence of a series of behavioral patterns that are closely related to someone who occupies a certain position in a social unit. Furthermore, Linton (1936) states that the role hopes are a mutual understanding which leads individuals to behave in their daily lives. However, in several conditions, the role "played" by individual often turns into role stress for that individual.

Logical thinking that connects between the role stress and job burnout is when an employee experiences difficulty in working because of an excessive workload, there is a role conflict and uncertainty about the job responsibility, then it is predicted that it will affect negatively which is marked by the emergence of saturation and no employee's motivation. Cahyono (2009) explains that role ambiguity, role conflict, and role overload in particular levels can be motivation for the individuals. However, role ambiguity, role conflict, and role overload in the high level often cause job burnout for employees. This statement is similar to the statement of Maslach and Jackson (1981) who

reveal that there are 3 components in burnout definitions; there is emotional fatigue, depersonalized, and the reduction of personal achievement. Based on the description, the relationship between role stressor and job burnout can be formulated into this hypothesis:

H1a: High level of role ambiguity will be positively associated with job burnout

H1b: High level of role conflict will be positively associated with job burnout

H1c: High level of role overload will be positively associated with job burnout

### **The Relationship Between Job Burnout And Psychological Well-Being, Organizational Commitment And Job Outcomes**

Cordes and Dougherty (in Jones, Norman, and Wier 2010) present that there are many negative relationship consequences between role stress and burnout either in the individual himself or in an organization. The burnout consequence on individuals is that there is a physical well-being decline with the characteristics of the emergence of headache syndrome, insomnia, and various digestive problems. The Burnout also brings a consequence on psychological well-being which is marked by the decrease of self-esteem, depression, anxiety, helplessness, and become angry quickly. The dangerous effect of burnout becomes clear in the interpersonal relationship with family, friends, and colleagues.

Maslach and Jackson 1981 asserts that when a labor experience a work saturation, this individual encounters a condition of emotional

fatigue, depreciation, and the reduction of personal achievement, so the logical thinking which connects between job burnout and the organizational commitment is when a labor is having an emotional fatigue and the reduction of personal achievement in working, then his commitment to the organization has been reduced, because the individual achievement in working is one of the forms of employee care for achieving the organizational goals. This statement is supported by Mathis and Jackson 2001, in Nugroho, Iqbal and Susilo, 2016 who explains that the organizational commitment is the level of trust and acceptance of labor on the organizational goals and a desire to stay in that organization.

Jones, Norman, and Wier (2010) reveal that there is a negative relationship between job burnout at a high level with psychological well-being. That research also reveals that there is a negative relationship between job burnout in the high level with the job satisfaction and job performance and a positive relationship between job burnout in the high level with the turnover intentions. Based on the description above, the relationship between job burnout, psychological well-being, and job outcomes can be presented in this hypothesis:

H2: High level of job burnout will be negatively associated with psychological well-being

H3a: High level of job burnout will be negatively associated with job satisfaction.

H3b: High level of job burnout will be negatively associated with job performance.

H3c: High level of job burnout will be positively associated with turnover intentions.

H3d: High level of job burnout will be negatively associated with the organizational commitment.

### **The Relationship Between A Healthy Lifestyle, Vitality, And Psychological Well-Being**

In the Big Indonesian Dictionary, the term vitality means to become the ability to survive. Furthermore, Ryan and Frederick (in Norman, Jones, and Wier, 2010) state that someone's vitality is subjectively connected to somatic issues and physical concern. This research shows that vitality is significantly connected to self-motivation. The self-motivation of each individual will be able to happen if it is facilitated by a healthy body condition because he always exercises regularly.

By seeing the consequence caused by the role stress experienced by individual or organization, Danna and Griffin (in Norman, Jones, and Wier, 2010) underline that intervention is needed to increase the coping mechanism in the individual level. Lazarus and Folkman (in Norman, Jones, and Wier, 2010) define "coping" as an attempt of cognitive change and a constant behavior to manage the internal or external demands that exceed one's resources. Coping can also be seen as a process of managing pressure. The logical thinking in the development of this hypothesis is that these individuals can manage the work stress by

applying a healthy lifestyle such as exercise regularly, eat healthy food, and have a good rest, so it can be predicted that it will increase the employee psychological well-being.

The previous study by Jones, Norman, Wier (2010) also shows that exercise activity is related to the increase of psychological well-being. Based on the description above, the relationship between a healthy lifestyle, vitality, and psychological well-being can be presented in the hypothesis as follows:

H4a: Healthy lifestyle will be positively associated with psychological well-being

H4b: Healthy lifestyle will be positively associated with vitality

H4c: Vitality will be positively associated with psychological well-being

### **The Relationship Between Psychological Well-Being With Organizational Commitment, Turnover Intentions, Job Satisfaction, And Job Performance**

Jones, Norman, and Wier (2010) reveal that there is a positive relationship between psychological well-being with job satisfaction and job performance; moreover, there is a negative relationship between psychological well-being with turnover intentions. Meanwhile, the psychological well-being variable is predicted to increase if the individuals apply a healthy lifestyle. This statement is supported by the previous study of Jones, Norman, and Wier (2010) that a healthy lifestyle has a positive and significant relationship on someone's psychological well-being.

In pursuing professions in an organization, at least auditors will experience stress, but in the different levels depending on the assignment and responsibility given by the organization to the auditors. The stress happened can be a result of no support from the colleagues and pressure from the leader, which then affects the emergence of strain. Paramitha, Novena (2014) explains that strain is a negative response from individuals to stress at work. This research assumes that strain can be shown through job burnout and the low of auditors psychological well-being. To overcome this problem, there must be an attempt to minimize the strain. Therefore, this research tries to test whether the mechanism of a healthy lifestyle is suitable to the outlined framework that has been described yang that can minimize the impact of work stress no the auditor' organizational commitment and job outcome.

Based on the previous paragraph description, then the research hypothesis can be arranged as follows:

H5a: Psychological well-being will be positively associated with organizational commitment.

H5b: Psychological well-being will be negatively associated with turnover intentions.

H5c: Psychological well-being will be positively associated with job satisfaction.

H5d: Psychological well-being will be positively associated with job performance.

### **The Relationship Between Organizational Commitment And Turnover Intentions**

Organizational commitment can be defined as employee emotional interest to continue to grow and to progress with the organization. However, this emotional familiarity is not built necessarily between individuals and organizations, but this attachment, pride, and familiarity can also be built through the relationship between individuals and other individuals who work in that organization. This Organizational commitment also talks about the feeling of caring and belonging of an employee to his company.

Organizational commitment can also be defined as employee loyalty. The employee who has a social bond with the organization will be reluctant to move to work in other organizations or companies. The position which is played by the auditors in the Public Accountant Firm will create a social bond which is built between the Public Accountant Firm with that Auditor which further will persuade the employee to really consider the interest to resign from the company. This condition is supported by Nouri and Parker (2013) who declares that employees who are attached to the organization are less likely to consider leaving the organization

H6a: Organizational commitment will be negatively associated with turnover intentions.

### **The Relationship Between Job Satisfaction And Turnover Intentions**

Generally, an employee who likes and enjoys his job in an organization, it means that the employee is comfortable in working, this is called job satisfaction. If someone satisfies in

working, then he will be reluctant to move to work. This statement is in line with the study of Kalbers and Fogarty (1995) Rohman (2009) who give a finding that the job satisfaction and the turnover intentions have a negative relationship. Being consistent with this statement, Rohman's research (2009) shows a result that job satisfaction affects negatively and significantly on turnover intention.

Job satisfaction also speaks about the employee emotional feeling on how far the level the employee likes his job in the organization. The researchers argue that job satisfaction is closely related to the employee satisfaction of the compensation given by the organization and how the relationship with other colleagues is. Generally, if an employee feels to like his job, even if an employee feels to like his job more than the other colleagues like their job, Then psychologically that employee will think seriously if he wants to move to work in other companies. Such a situation is the one faced by the auditors in Public Accountant Firm. Based on that statement, then the hypothesis used is:

H6b: Job satisfactions will be negatively associated with turnover intentions.

### **RESEARCH METHODOLOGY**

The population in this research was all of the auditors who worked in the Public Accountant Firm in Indonesia, either those who were affiliated with big four Public Accountant Firm or those who were not. After the population was determined, the next procedure to be done was to determine the sample. Until this research was compiled, the total population of auditors in

Indonesia could not be known because of the limitations of data sources. Sampling in this study used the convenience sampling method with consideration of certain criteria. The criteria for sampling in this research are: (1). the sample is the auditors who are still actively working in the Public Accountant Firm, (2). the sample is the permanent employees of Public Accountant Firm, not a freelancer, (3) the sample meets a minimum of work period of 1 year as the auditors in the particular Public Accountant Firm, because the auditor is considered to have work experience and has time to feel stressed. The criteria for determining the respondent are appropriate for measuring the variables to be studied.

The analysis method in this research is Structural Equation Model (SEM) based on component or variance which is better known as Partial Least Square (PLS). The method evaluates two matters, the outer model and inner model. Outer Model is assessed based on three main criteria, convergence validity, composite reliability, and discriminant validity. The Inner Model or structural model is evaluated by using the R-square and T Statistic test to know the significance of the path coefficient (Ghozali, 2006).

In this study, respondents were asked to answer questions with a scale like Likert 1-7 which was used to measure each variable. The Role Ambiguity (RA) variable and Role Conflict (RC) variable were measured by an instrument developed by Rizzo et al., (1970). Especially for the Role Ambiguity (RA)

variable, was measured by a positive sentence which will then be calibrated to the true value in reverse. The Role Overload (RO) variable was measured by an indicator developed by Beehr et al (1976). The Job Burnout (JB) variable was measured by using the Maslach Burnout Inventory which was developed by Maslach in 1982. The Healthy Lifestyle (HL) variable was measured by developing some indicators which had been done previously in the prior research by Yates et al in 1999.

Vitality (V) variable was measured by using an instrument which was previously developed by Ryan and Frederick (1997) and was modified by Bostic et al (2000). The Psychological Well-Being was measured by using Satisfaction With Life Scale (SWLS) which was developed and adjusted to the application of language in Indonesia. The Commitment Organisational (OC) variable used indicators which were developed by Mowday, et al (1974). The Job Satisfaction (JS) variable was measured by using Hoppock's Scale. The Job Performance (JP) was measured by developing instrument which was adapted from Choo (1986) and adjusted to the condition and grammar in Indonesia. The Turnover Intention (TI) variable would be tested by developing the Instrument to be studied.

## **RESULTS AND DISCUSSION**

### **Respondent General Description**

Table 1 shows the profile of respondents gathered on gender, age, years of service and the last position of the auditor at the Public Accounting Office. From the respondent profile

table, it can be seen that 52% of the respondents who participated are male, the rest 48% is female. The majority of the respondents who participated was 20 to 24 years old with a percentage of 40%, age 25 to 29 years old with a percentage of 47%. The rest was 30 to 34 years old as much as 7%, age 35 to 39 years old was 5% and 40 to 44 years old was 1%. Based on these things, it can be concluded that the majority of the respondents in this research is 99% millennial generation.

Table 1  
Respondents Profile

Description	Amount	Percentage
<b>Gender</b>		
- Male	63	52%
- Female	59	48%
<b>Age</b>		
- 20 – 24 y.o.	49	40%
- 25 – 29 y.o.	57	47%
- 30 – 34 y.o.	9	7%
- 35 – 39 y.o.	6	5%
- 40 – 44 y.o.	1	1%
<b>Years of Service in Public Accountant Firm</b>		
- 1 to 2 y.o.	51	42%
- > 2 to 3 y.o.	22	18%
- > 3 to 4 y.o.	19	16%
- > 4 to 5 y.o.	10	8%
- > 5 to 6 y.o.	5	4%
- > 6 to 7 y.o.	7	6%
- > 7 y.o.	8	7%
<b>Career Path</b>		
- Junior Auditors	37	30%
- Senior Auditors	60	49%
- Others	2	2%
- Manager	11	9%
- <i>Quality Control</i>	1	1%
- Supervisor	11	9%
Total Number of Respondents: 122 People		

A millennial generation is a group of individuals who are born in a certain vulnerable time who have similarities in beliefs, behaviors, and events (Montag et al., 2012). A millennial generation is a person born around 1980-2000 (Meier et al, 2010; Ali and Purwandi, 2017:4). It means that at the time this research was conducted (in 2018), the age of respondents categorized as a millennial generation were respondents with ages ranging from 18 to 38 years.

The respondents years of service who work in Public Accountant Firm starting from 1 to 2 years is 42%, The rest is 58%, this is the respondents with the years of service for more than 2 years. Furthermore, based on the career path data collected, it is known that the number of junior auditors is 30%, 49% senior auditors, 9% supervisors, 9% managers, 1% quality control and others 2%. Related to another career path in this research, in the questionnaire form there is no career path whose name is not suitable to the organization structure of Public Accountant Firm.

**Asses the Outer Model**

Based on the test result of convergent validity, it is known that the variable indicator of a healthy lifestyle with the indicator index of HL 1, HL 11 and HL 12 shows a correlation value below 0,5. Meanwhile, for the variable indicator of turnover intention with the index of TI3 also has a correlation value below 0,5. The correlation value of indicator index of HL 1, HL 11, HL 12 and TI3 is 0,343, -0,045, -0,154, and -0,023. This value is below the suggested

number which is 0,5, so this indicator needs to be dropped in the research and needs to do further running to the reset data.

The researchers argue that Indonesia is a country with a majority population who is embracing Islam, so the indicator which declares about the level of consuming alcohol (HL12) is not relevant enough to measure the variables of a healthy lifestyle, meanwhile for the statement of HL11 about the level of tobacco consumption is also irrelevant to be added as an indicator of research because the majority of respondents do not consume tobacco products or smoke. The statement about an active person (HL1) is also invalid in this study because this statement is not specific, that English translations cannot be interpreted in Indonesian directly, this requires a readjustment. The statements with the TI3 index are also invalid. The researchers argue that respondents in the millennial generation do not target time to do a job turnover.

After doing running to the reset data, validity test shows that the measurement indicator has been above the suggested value, which is 0.5, this shows that all question indicators have met the validity assumption and can be tested for the next stage. The research also has fulfilled the assumption of discriminant validity because none of the correlation values of the indicators of latent variables are greater for the blocks of other variables than for the blocks of latent variables.

Based on the reliability test result of table 2, it shows that the value of composite reliability

per variable is above 0,70 and the value of Cronbach's alpha is above 0,6. Therefore, it can be concluded that all the variables are feasible for testing to the next stage. The value of composite reliability and Cronbach's alpha can be shown to table 2.

Furthermore, based on testing on the value of outer loading, each variable has a correlation value above the recommended value which is above 0.50. Correlation values above 0.05 indicate that these variables are worth analyzing in the research model. Meanwhile the value of t-statistic, each indicator has been above the suggested value 1,96 or  $t\text{-count} > t\text{-table}$ . From this result, it can be concluded that all variables have fulfilled the requirements of model adequacy or discriminant validity.

Table 2  
 Composite Reliability and Cronbach's Alpha

	Composite Reliability	Cronbach's Alpha
Organizational Commitment	0.940	0.924
Healthy Lifestyle	0.870	0.852
Job Burnout	0.916	0.897
Job Performance	0.949	0.942
Job Satisfaction	0.891	0.816
Psychological Well-being	0.899	0.856
Role Ambiguity	0.874	0.828
Role Conflict	0.892	0.819
Role Overload	0.874	0.786
Turnover Intention	0.928	0.882
Vitality	0.914	0.887

**Asses the Inner Model and Test Their Hypothesis**

The inner model or structural model is evaluated by looking at the R-square value and the results of the Statistical T test to determine

the significance of the path coefficient (Ghozali, 2006). The results can be shown to table 3 and 4

Table 3  
 R-Square Value

Variable	R Square
Job Burnout	0.671
Vitality	0.294
Psychological Well-being	0.510
Job Performance	0.210
Jobs Satisfaction	0.533
Organizational Commitment	0.414
Turnover Intention	0.287

Based on the R-Square table above, it can be seen that the value of R-Square of Job Burnout variable is 0,671, this means that the antecedent variables of role ambiguity, role conflict, and role overload explain employment variables of 67.1%, while the remainder is determined by other factors outside the model. For the vitality variable has the value of *R-Square* as much as 0,294, this means that the healthy lifestyle variable is able to explain the vitality variable as much as 29,4%, while the rest is influenced by the factors outside the model.

The psychological well-being variable has an R-Square value of 0.510, this shows that the variables of job burnout and vitality are able to predict the auditor's psychological well-being by 51%, while the rest is influenced by other factors outside the model. Furthermore, for the performance/job performance variable has an R-Square value of 0.210, this number shows that the variables of job burnout and psychological well-being are able to predict auditor performance by 21%, while the rest is influenced by other factors outside the model.

The job satisfaction variable has an R-Square value of 0.533, this shows that the

variables of job burnout and psychological well-being are able to predict auditor job satisfaction by 53.3%, while the rest is influenced by other factors outside the model. The organizational commitment variable has R-Square value of 0.414, this number shows that the variables of job burnout and psychological well-being are able to predict auditor performance by 41.4%, while the rest is influenced by other factors outside the model. Furthermore, for the variable of turnover intention has an R-Square value of 0.287, it means that the variables of job burnout, psychological well-being, organizational commitment, and job satisfaction are able to predict the auditor turnover intention by 28.7%, while the rest is influenced by other factors outside.

The testing of the proposed hypothesis can be seen from the original sample value which is interpreted as the path coefficient value of the research model, and test the magnitude of the t-statistic value of the influence or relationship between variables. The limit for rejecting or accepting the hypothesis in this study this time is the value criteria for t-statistic of 1.96. The value of t 1.96 is parallel with the two-tailed measurement with the criterion alpha of 5% ( $\alpha = 5\%$ ). If the value of t is in the range of -1.96 to 1.96, the hypothesis will be rejected. Table 4 shows the estimated output for testing structural models. While the results of testing the full SEM model are presented in Figure 2

Table 4  
 Path Coefficients

Hypothesis	Original Sample	T Statistics

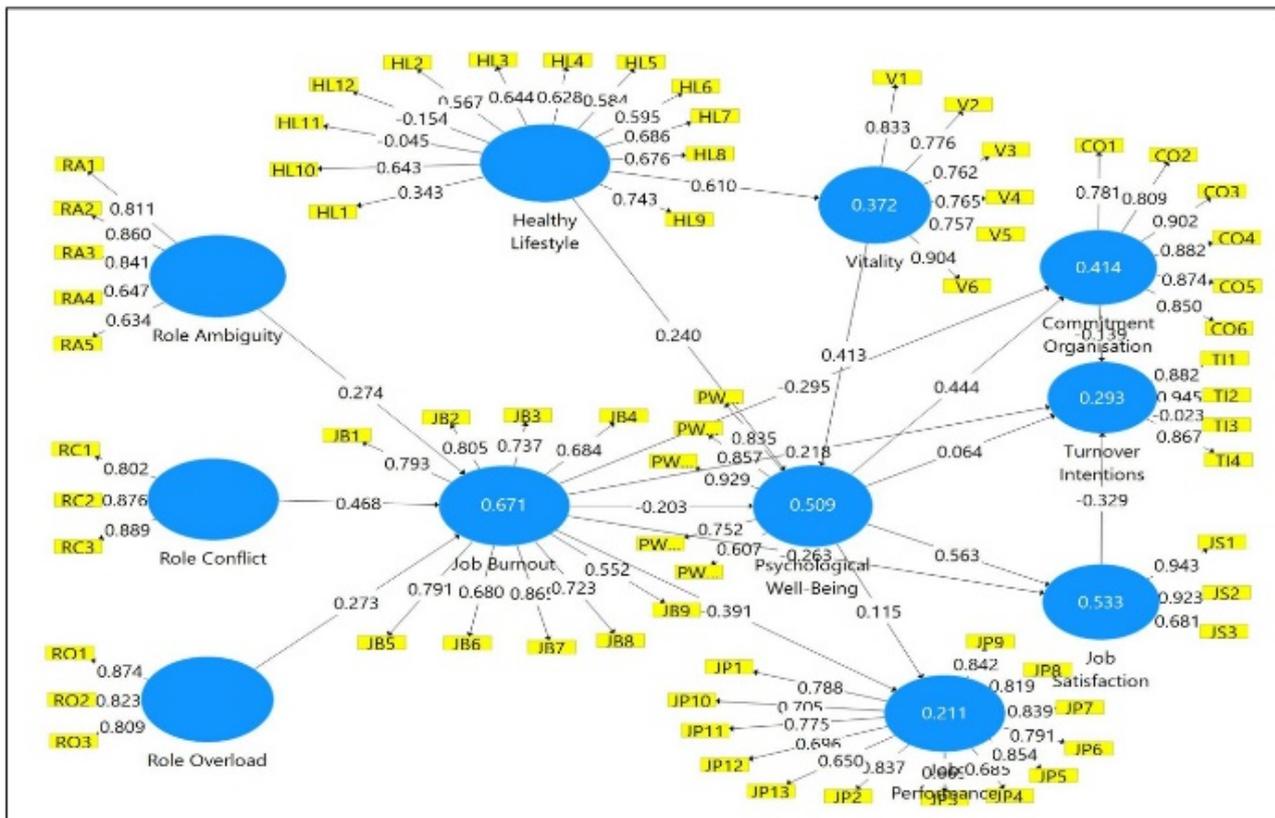


Figure 2

Organizational Commitment-> Turnover Intentions	<b>-0.124</b>	<b>1.122</b>
Healthy Lifestyle -> Psychological Well-Being	0.228	3.020
Healthy Lifestyle -> Vitality	0.542	8.287
Job Burnout -> Organizational Commitment	-0.295	4.009
Job Burnout -> Job Performance	-0.391	4.156
Job Burnout -> Job Satisfaction	-0.264	3.257
Job Burnout -> Psychological Well-Being	-0.207	2.533
Job Burnout -> Turnover Intentions	0.225	2.273
Hypothesis	Original Sample	T Statistics
Job Satisfaction -> Turnover Intentions	-0.322	2.437
Psychological Well-Being -> Commitment Organisational	0.444	5.595

Psychological Well-Being -> Job Performance	<b>0.115</b>	<b>1.051</b>
Psychological Well-Being -> Job Satisfaction	0.563	7.950
Psychological Well-Being -> Turnover Intentions	<b>0.053</b>	<b>0.410</b>
Role Ambiguity -> Job Burnout	0.274	3.943
Role Conflict -> Job Burnout	0.468	6.568
Role Overload -> Job Burnout	0.273	5.374
Vitality -> Psychological Well-Being	0.435	4.897

### The Relationship Between Role Stress And Job Burnout

The previously compiled hypothesis states that there is a positive relationship between role stress which is represented by factors of role ambiguity, role conflict, and role overload on

job burnout. This hypothesis is accepted because it has a statistical t value of 3.943, this value is greater than the cut-off t statistic value criterion of  $\pm 1.96$ . Thus, it can be concluded that the higher the stress level of the auditor, the more it will have an impact on job burnout. This result is consistent and supports the previous study by Jones, Norma, and Wier (2010) which states that there is a positive and significant relationship between role stress and job burnout.

The research result this time is the contrast with the result of the previous research by Gratia (2014) which in his study, she declares that there is no relationship between the role conflict and job burnout. The researchers argue that there are sufficiently logical reasons to explain these findings because the majority of respondents involved in this study were junior auditors and senior auditors with a percentage of 79%. At this career level, auditors generally do not have sufficient experience in carrying out audits, so that the auditor's perception of role conflict and acceptance of conflicting directives has a higher potential and has an impact on job burnout.

### **The Relationship Between Job Burnout And Psychological Well-Being, Organizational Commitment And Job Outcomes**

In analyzing the relationship between job burnout and psychological well-being, organizational commitment and job outcomes, there are five hypotheses which is built; (1) job burnout has a negative relationship with psychological well-being, (2) job burnout has a negative relationship with job satisfaction, (3) job burnout has a negative relationship with job

performance, (4) job burnout has negative relationship with turnover intentions, and (5) job burnout in the high level will have a negative relationship with the organizational commitment. Based on the test result, all of the hypothesis is accepted with the t value of significant statistic above 1,96. The results of this study are consistent with previous studies by Jones, Norman, and Wier (2010) and Gratia (2014).

The research result has proven that a job burnout will decrease the employee psychological well-being, organizational commitment, performance, and jobs satisfaction, and increase the employee turnover intention. The Public Accountant Firm management and leaders need to pay attention to the job burnout factor of their employees to maintain employee work results and as an effort to reduce the turnover intention. The solution that the researchers suggest overcoming this result is by paying attention to the work pattern and apply a healthy lifestyle for all the employees such as exercising, consuming nutritious food, and have enough sleep. Another alternative that can be done and needs further research is recreation (Fogarty et al. 2000).

### **Healthy Lifestyle Mechanism In Overcoming The Effects Of Stress**

### **The Relationship Between A Healthy Lifestyle, Vitality, And Psychological Well-Being**

In analyzing the relationship between a healthy lifestyle, vitality and psychological well-being, there are three hypotheses that are

built, they are (1) healthy lifestyle which connects positively with psychological well-being, (2) healthy lifestyle which connects positively with vitality, and (3) vitality which connects positively with psychological well-being. Based on the test result, all of the hypotheses are accepted with the value of significant statistic above 1.96. The research result this time is consistent with the previous research by Jones, Norman, and Wier (2010) and Gratia (2014).

### **The Relationship Between Psychological Well-Being And Organizational Commitment, Turnover Intentions, Job Satisfaction, And Job Performance**

The concept of thinking about a healthy lifestyle as a mechanism which is able to decrease the effect of stress is when someone has a healthy living behavior, so it will affect positively on the increase of his psychological well-being. Not only that, by implementing healthy living behaviors, it will increase self vitality which will then have a positive effect through increasing psychological well-being. Through personal feelings of an employee who is prosperous, accepts his state of affairs, and has a purpose in life (psychological well-being), it will have a positive impact as indicated by the increase in job outcomes, a decrease in the turnover intention and an increase in commitment to the organization. Because work stress in general and through previous empirical studies, have shown a negative impact of decreasing job outcomes and increasing the turnover intention.

In the analysis of the relationship between psychological well-being and organizational commitment, turnover intentions, job satisfaction, and job performance, there are four hypotheses which are built (1) psychological well-being connects positively with the organizational commitment, (2) psychological well-being connects negatively with turnover intentions, (3) psychological well-being connects positively with job satisfaction, and (4) psychological well-being connects positively with the job performance. The result of statistic test shows that the hypotheses (1) psychological well-being connects positively with the organizational commitment and (3) psychological well-being connects positively with job satisfaction and is accepted because of the t value of significant statistic above 1,96. Meanwhile, the hypotheses of (2) psychological well-being connect negatively with turnover intentions and (4) psychological well-being connects positively with job performance and are rejected, because the t statistic value is below 1,96. The results of this study contradict the results of previous studies by Jones, Norman, and Wier, 2010 which stated that psychological well-being was negatively related to turnover intentions and positively related to job performance.

Based on the results of interviews with several auditors, information was obtained that according to the auditor there were several dominant factors that determined an auditor wanted to stay in the Public Accountant Firm, which is the salary factor and good work culture.

Whereas to improve auditor performance, the factors that need to be considered are the opportunities and effectiveness of the training provided by the company as well as those independently followed by each auditor. Because based on the results of the interviews, several auditors stated that they felt they were lacking in getting education and training. However, these factors have not been studied in this study and need to be added in the next study.

### **The Relationship Between Organizational Commitment And Turnover Intentions**

The hypothesis compiled based on the previous path chart states that the organizational commitment is negatively related to turnover intentions. This hypothesis is rejected because it has a statistical t value of 1,122, this value is smaller than the cut off of criterion t statistic value  $\pm 1.96$ . The results of this study are contrary to the results of previous studies by Rohman (2009) who concluded that organizational commitment has a negative effect on the turnover intention and Nouri and Parker (2013) who concluded that there was a negative relationship between organizational commitment and the auditor turnover intention. The results of this study at the same time support the statement of Ferris (1981) who expressed the opinion that organizational commitment factors need to be investigated in predicting the employee turnover intention because these factors can change over time. The results of this study also prove that in millennial generations auditors, organizational commitment is no

longer a factor that can reduce the turnover intention.

### **The Relationship between *Job Satisfactions* and the *Turnover Intentions***

The hypothesis prepared earlier states that job satisfaction is negatively related to turnover intentions. This hypothesis is accepted because it has a t statistic value of 2.349, this value is greater than the cut-off criteria of t statistic 1.96. The results of this study are consistent with the results of previous studies by Rohman (2009) which states that job satisfaction has a negative effect on the turnover intention. Based on the results of these studies, it can be concluded that the higher the level of job satisfaction of employees will be, the lower the turnover intention will be, so that the current Public Accountant Firm management needs to pay attention to the level of job satisfaction of its employees, because it turns out that job satisfaction is a factor that can control the employees turnover intentions.

### **CONCLUSION**

This research has shown several results:

1. Job stress represented by role ambiguity, role conflict, and role overlap factors is all positively related to work burnout. This means that the higher the level of stress will be, the higher the increase in job burnout will be.
2. Job burnout is negatively related to psychological well-being, job satisfaction, work performance, and organizational commitment. Job burnout also has a positive effect on the turnover intention, so the more

tired an employee is, the greater his desire to resign from the workplace. Thus the factor of employee job burnout is very necessary to be controlled so as not to reduce the job outcomes.

3. This study proves that a healthy lifestyle can improve the vitality and psychological well-being of employees, which in turn is able to improve perceptions of job satisfaction and increase the organizational commitment. However, this healthy lifestyle mechanism has not been able to prove the relationship that psychological well-being can reduce turnover intention and improve employee work performance.
4. Organizational commitment is not related to employee turnover intention.
5. The job satisfaction is negatively related to the employee turnover intention, so that job satisfaction factors need to be considered because it can control the employee turnover intention.

The suggestions for further research are as follows:

1. To get the respondent's most accurate responses, further research can be done during the busy season. However, the next researcher needs to consider several risks, they are, the rejection of the research questionnaire by the Public Accountant Firm with the reason that they are busy, the questionnaire is ignored, and the response is delayed again.
2. The future research is expected to be able to test other factors beyond this research model

to obtain an alternative or other solution in an effort to minimize the negative impact of stress on auditor performance and the turnover intention. Subsequent research can also reexamine the rejected hypothesis in this study to prove the truth of the relationship built on role theory.

3. If further researchers want to confirm the truth of a theory, it is recommended to use a larger sample and use the Structural Equations Modeling (SEM) test with covariance-based AMOS software.

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## Appendix

<b>Variable Indicators of Role Ambiguity:</b>	<b>Index</b>
1. I have a workload that is suitable for me to complete	RA1
2. I know that I have allocated my time appropriately in this organization	RA2
3. There are clear plans and objectives for my work	RA3
4. I know exactly what is expected of me	RA4
5. I know how my work is evaluated	RA5
<b>Variable Indicators of Role Conflict:</b>	
1. I work under conflicting policies and guidelines	RC1
2. I am not passionate about accepting and completing assignments	RC2
3. I work with instructions or orders that are not clear	RC3
<b>Variable Indicators of Role Overload:</b>	
1. I am not given enough time to do the work given to me	RO1
2. I feel the standard of my work is too high	RO2
3. I often feel I have too many jobs if I do it myself	RO3
<b>Variable Indicators of Job Burnout:</b>	
1. I feel my emotions are drained while working	JB1
2. After I finished working, I felt used	JB2
3. I feel bored with my job	JB3
4. I feel less optimal in dealing with my client's problems	JB4
5. I feel, my work negatively affects the lives of others	JB5
6. I find it difficult to understand how my clients feel about various things related to work	JB6
7. I am worried, my job is burdening me emotionally	JB7
8. I feel that I have not cared more about other people since I decided to work as a public accountant in this place	JB8
9. I feel treating clients less humanely	JB9
<b>Variable Indicators of Healthy lifestyle:</b>	
1. I am an active person*	HL1
2. Exercising makes me more controlled	HL2
3. I chose to exercise so that I am free from frustration	HL3
4. I feel better after exercising	HL4
5. Exercise makes my physical condition better	HL5
6. I can manage my mind to be better when I exercise	HL6
7. I maintain my food pattern by eating a balanced food consumption	HL7
8. I feel my food pattern is regular	HL8
9. In general, my night's sleep is quality	HL9
10. In general, I have enough sleep hours	HL10
11. I do not consume tobacco products or cigarettes in excessive quantities *	HL11
12. I do not consume excessive amounts of alcohol *	HL12
<b>Variable Indicators of Vitality:</b>	
1. My life feels powerful	V1
2. Sometimes I feel very alive and fiery	V2
3. I have enthusiasm.	V3
4. I look at the future every day	V4
5. I feel always ready and awake	V5
6. I feel energized / powerful	V6

<b>Variable Indicators of Psychological Well-Being:</b>	
1. Seen from various aspects, my life is ideal	PWB1
2. My living conditions are very good	PWB2
3. I feel satisfied with my life.	PWB3
4. So far I have got the important things I want in life	PWB4
5. If I get long life, I don't want to change anything	PWB5
<b>Variable Indicators of Organizational Commitment:</b>	
1. I communicate the Public Accountant Office where I work to friends as a good organization to work	CO1
2. I will accept almost all types of assignments to continue working in this organization	CO2
3. I am very happy because I chose this Public Accountant Firm as a place to work	CO3
4. I find that the values in myself and values in organizations are very similar	CO4
5. I am willing to do a lot of effort outside which is usually expected to help this organization become successful.	CO5
6. I am very concerned about the fate of this organization	CO6
<b>Variable Indicators of Job Satisfaction:</b>	
1. I like my current job	JS1
2. I feel satisfied with my current job	JS2
3. No one of my coworkers likes his job as I like my job	JS3
<b>Variable Indicators of Job Performance:</b>	
1. I feel satisfied with the quantity of my work	JP1
2. I am satisfied with the quality of the results of my work	JP2
3. I am satisfied with the oral communication skills that I have	JP3
4. I am satisfied with the written communication skills that I have	JP4
5. I feel satisfied with my ability to accept responsibility	JP5
6. I have an initiative at work	JP6
7. I feel satisfied with my ability to use the professional skills that I have	JP7
8. I am satisfied with my ability to comply with policies and procedures	JP8
9. I am satisfied with my ability to plan and organize work	JP9
10. I am satisfied with my ability to connect with other employees in this organization	JP10
11. I am satisfied with my ability to connect with clients	JP11
12. I am satisfied with my ability to adapt to new situations	JP12
13. I am satisfied with my ability to supervise others	JP13
<b>Variable Indicators of Turnover Intentions:</b>	
1. I tend to choose other jobs that are more ideal than my current job	TI1
2. I thought of moving to another place instead of working in this organization	TI2
3. If I have other options, at least I will work for this organization for just 3 years from now *	TI3
4. I don't want to last long to work in this organization	TI4

# The impact analysis of campaign program of the green environmental movement through hydroponic in community

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## ABSTRACT

One of the negative impacts of massive development is that it can affect the physical condition and the deteriorating quality of the environment. This then has implications for an increasingly narrow and densely populated housing environment. The implications of the low green open space certainly result in lower quality of health. This condition also inspired the District Military Command (*Kodim*) of 0503 West Jakarta to organize a green environmental movement through the hydroponic method. For this reason, the aim of this study is to analyze the impact of the green environmental movement campaign program through hydroponic methods for the community. References that support this study are concepts related to campaigns for public relations, environmental communication, and hydroponics. The method used in this study is a qualitative method with a single case study design. The reason for using this method is because of the uniqueness of this program, where the impact of this campaign program can solve environmental problems while encouraging increased food self-sufficiency for the people involved in the campaign. The results of the study show that the impact of the green environment movement program through hydroponic methods can provide benefits to the environment and society. Broadly speaking, the impact of this program is *firstly*, can improve environmental quality such as improving air quality to be fresher and cooler, reducing air pollution, increasing oxygen levels in the air. *Secondly*, this program can increase community productivity. Communities can manage the narrow land to be more productive and produce vegetables that can be consumed. *Thirdly*, it is economically beneficial. Previously, narrow land was not useful, after carrying out farming activities through the hydroponic system, people could obtain vegetables cheaper and easier. The results of this farming activity can certainly be utilized by themselves. Thus, the community does not need to spend too much money to consume vegetables. At harvest time, the community can take the vegetables they harvest themselves. This means that this activity has an impact on saving and helping the economy of the community.

**Keywords:** campaign, environment, hydroponics

## 1. INTRODUCTION

The problem of the low of environmental quality is influenced by various factors including the rapidly increasing world population, unplanned industrialization, pesticides, the use of chemicals, and damage to people's subconscious (Konur & Akyol, 2017: 2109). This is also in accordance with the opinion of McHarg (1971) that urban areas that are densely populated are relatively susceptible to physical, social and mental illness. Increased density also correlates with social pressure, which also increases the risk of heart and kidney disease. Panjaitan et al. (2011) added that other health problems that also arise due to air pollution are respiratory problems, irritation, and even cancer (Shahadat, 2017: 180).

The city development certainly does not only have a positive impact on economic improvement, but also it sometimes leaves a variety of social problems. One of the examples in Jakarta massive development occurs, of course it is positive but the

impact on the massive changes in land use including the massive green open space. This condition affects the physical condition and the deteriorating quality of the environment. One of the drivers of increasing development is the increasing socio-economic needs because of population growth. This then has implications for an increasingly narrow and densely populated housing environment. The implications of the low of the green open space certainly result in lower quality of health.

In addition to causing illness, the densely population in the city also caused a lack of farming activities for people in urban areas, especially in Jakarta. No less than 275 tons of vegetables are supplied to Jakarta per day. The supply of vegetables generally comes from Java and several provinces on the island of Sumatra. Only a small portion of vegetable products are produced by farmers in Jakarta. The small amount of vegetable production in Jakarta Capital City is mainly due to the limited agricultural land and land conversion to meet the needs of housing and non-agricultural services (Sastro & Rokhman, 2016: 1).

To overcome this condition, certainly public participation in creating a green environment is very necessary. Referring to these conditions, the Jakarta Government has launched various policies for the development of clean and environmentally friendly vegetable production, including using a hydroponic technology approach as a performance tool. The advantage of hydroponic cultivation is saving space. The pattern of the approach mentioned above is expected to be able to meet the criteria for urban agriculture that has limited land, but it is effective, productive, quality, high added value, and can increase the availability of food and nutrition in sufficient quantities at affordable prices (Sastro & Rokhman, 2016: 2).

Maintaining environmental sustainability is not a seasonal trend that is only highlighted as short or medium-term goal. Environmental sustainability initiatives are long-term goals, which require direction, champions, financial means and support from stakeholders over a period of time (Hamid et al, 2016: 484). Therefore, it requires a design and campaign strategy that can touch the sensitivity of the community in order to be able to work together and provide real support and participation. Thus the process of identifying audiences is needed, how to arrange campaign messages, how to choose the campaign method, and how to choose the right media to deliver campaign messages.

Various preventive ways to minimize the impact of reducing the quality of the green environment was carried out by various agencies within the government. In addition, all levels of society were involved, including Military District Command of 0503 West Jakarta. *KODIM* 0503 of West Jakarta is very progressive in promoting the green environment movement campaign program through hydroponic methods in the community. The involvement of the Indonesian Army aims to create a green environment, and improve the national food security movement in urban environments that have limited land or green space. This was as stated by Yudo Husodo (2003) that Indonesia was one of the countries with a level of food security that was not very encouraging. This is due to Indonesia's dependence on supply of foreign food which is quite substantial (Armawi, 2009: 78)

Based on these explanations, the writer is interested in examining the impact of the green environmental movement campaign program through the hydroponic method carried out by Military District Command (*KODIM*) of 0503 West Jakarta for the community. The purpose of this study is to analyze and describe the impacts of the program, and how the program will continue. Thus, this study is expected to provide an overview to the District Military Command of 0503 West Jakarta regarding the impact of the program, so that this can be an evaluation of the ongoing implementation of campaign programs.

## 2. LITERATURE REVIEW

### 2.1 Public Relations Campaign

Campaign of public relations (*PR campaign*) is an activity aimed at increasing the awareness and knowledge of the target audience, created the perception or a positive opinion for an activity of an institution or organization (*corporate activities*) for the creation of a trust and a good image of the community through delivering messages intensively in a certain period of time continuously reaches understanding and motivates the community towards a particular activity or program through continuous and planned communication processes and techniques to achieve the positive publicity and image (Libertine, 3: 2014).

Johnson-Cartee and Copeland (1997) stated that campaign activities include: 1) Pre-campaign, it is problem identification, compiling campaign objectives. According to Ostergaard (2002) that needs to be achieved “3A” i.e. awareness, attitude, and actions. These three aspects are interrelated and are the target of influences, 2) Management of the campaign is the management of the campaign starting from the design, implementation, to evaluation. At this stage of management the entire contents of the campaign program are directed at equipping and influencing aspects of the knowledge, attitudes and skills of the target audience. These three aspects are prerequisites for behavior change, 3) The evaluation process is a systematic effort to assess various aspects related to the implementation process and the achievement of campaign goals (Tyas, et al 2017: 59-61).

## 2.2 Environmental Communication

Scientific evidence about the state of global warming shows that the situation is now terrible, and we are very close, or exceeding an irreversible critical climate threshold for more than 1,000 years. This situation demands that various parties need to move to deal with global warming. To overcome this problem, one solution is to design and conduct environmental communication that can build the collective awareness of the world’s citizens in overcoming this problem (Brulle, 2010: 83). Then, Oepen and Hamacher explained that environmental communication is a planned and strategic communication process used by media products to support effective policy making, community participation and project implementation directed at environmental sustainability. An environmental communication involves a two-way interaction of a social process that allows the person concerned to understand certain environmental factors and interdependencies. They also respond to problems in a better way by using this method (Puji Lestari et al: 56: 2016). Environmental communication can be realized with campaign activities aimed at educating the public by expanding public knowledge often relying on asymmetrical public relations tactics. Tactics that can be used are the controlled media use (in the form of advertisements, websites, direct mail, newsletters, and public service announcements) and uncontrolled media (such as media releases, opinion pieces, and publicity from events). (Henderson, 2005: 122).

Furthermore Robert (2010) argues that environmental communication is a pragmatic and constructive media to provide understanding to the public about the environment. Therefore a message packaging strategy is needed in certain communication media, this is so that public awareness and participation grows in environmental management. The main communicator in environmental communication is the government and non-government organizations that are committed to environmental management (Herutomo, 41: 2013). Fatonah (2008) argues that environmental communication is one part of sustainable development communication by using various efforts and methods and techniques for delivering ideas and skills from those who initiated development aimed at the wider community so that the community can understand, receive and participate (Herutomo, 40 : 2013).

## 2.3 Hydroponic

Hydroponic basis literally means *Hydro* = water, and *phonic* = workmanship. So that generally means a system of agricultural cultivation without using land but using water containing nutrient solutions. The cultivation hydroponic usually carried out in a greenhouse so that optimal growth of plant really protected from the influence of elements outside like rain, pest disease, climate and etc. Advantages of several cultivation using hydroponic systems are: 1) the density of plants per unit area can be doubled so it can conserve the land use, 2) then the product quality such as shape, size, flavor, color, cleanliness can be guaranteed because the nutrient needs of plants supplied controlled in a greenhouse, and 3) it does not depend on season/ time and harvest, so it can be adjusted according to market needs (Roidah, 2014: 44).

Hydroponic types can be distinguished from the media used to stand up plants. The media is usually free of nutrients (sterile), while the supply of nutrients needed by plants is flowed into the media through pipes or manually sprayed. The planting media can be in the form of gravel, sand, cork, charcoal, and zeolite or without aggregate media (only water). The most important use of the planting medium is clean of pests that do not grow fungus or other diseases (Roidah, 2014: 44).

The advantages of hydroponics are: 1) the success of plants to grow and produce is more guaranteed, 2) more practical treatments and more controlled pest disorders, 3) the use of fertilizers is more efficient, 4) the plants that die are more easily replaced with new plants, 5) it does not require a lot of brute labor because the work method is more economical and has standardization, 6) plants can grow more rapidly and with conditions that are not dirty and damaged, 7) the production results are more continuous and higher compared to planting, 8) selling prices for hydroponics are higher than non-hydroponic products, 9) some types of plants can be cultivated out of season, 10) there is no risk of flooding, erosion, dryness, or dependence with natural conditions, and 11) the hydroponic plants can be carried out on limited land or space, for example on roofs, kitchens or garages (Roidah, 2014: 44).

### 3. METHOD

The method used in this study was a qualitative method with a single case study design. A single case study has three rationalizations. Firstly, when the case states an important case in testing a well-prepared theory, Secondly, cases present an extreme or unique case, and thirdly is a case of disclosure (Yuliawati & Irawan, 2018: 29). The reason for using this method is because of the uniqueness of this program, where the impact of this campaign program can help environmental problems while at the same time encouraging increased food self-sufficiency for the people involved in the campaign. In addition, this program was initiated by *Kodim* of 0503 West Jakarta which continues to work on media campaigns in stages but has a positive impact on the environment and society. This study was conducted at the Military District Command of 0503 West Jakarta that located at Jl. S. Parman No. 3, RT.3/ RW.8, Tomang, Grogol petamburan, West Jakarta 11440.

To obtain data as the material to be analyzed, the writer used the technique of collecting data through interviews with relevant sources and is involved in the media planning process until the use of the media campaign. In addition, the writer also collected data through field observations. This study was supported by secondary data obtained from offices, books (literature) or reports, media coverage, documentation of campaign activities, websites, photos, etc. Then the technique for selecting speakers was used is purposive technique, where the writer considered the resource person with certain considerations, one of which is involvement in the case under study, or understanding of the conditions under study. Interviewee's members were selected among *Dandim* of 0503 West Jakarta. They were Sertu Rasyidi which served as a field coordinator for the management and aquaponics and hydroponic of *Kodim* of 0503 in West Jakarta, and Letkol Kav Andre Henry Masengi who currently serves as the Commander of *Dandim* of 0503 West Jakarta.

After the data has been collected, the writer conducted a comprehensive analysis process. The data analysis technique used was referring to the stages delivered by Miles and Huberman, which include three activities together: data reduction, data presentation, and conclusion (verification). Then to determine the validity of the data, the writer conducted triangulation techniques. The triangulation is a technique of checking data that uses something else outside the study data for the purposes of checking or as a comparison. Denzin distinguishes four types of triangulation as examination techniques that utilize the use of *resources, methods, investigators* and *theory* (Irawan, 2018: 118). The triangulation technique used in this study is triangulation of data and sources. Through this technique, the writer compared the results of interviews with supporting data, then for source triangulation, the writer compared and checked the degree of trust in information obtained by: (1) comparing observational data with interview data (2) comparing the consistency of the answers of the informants, namely by comparing what the public speaker said, for example, with what was said personally (3) comparing a person's perspective, with other people in his work team.

Referring to this opinion, in this study the writer conducted a process of checking the validity of the data by preparing a technique of comparing and checking the degree of trustworthiness of information obtained by: (1) comparing observational data with interview data (2) comparing the consistency of the answers of the informants that is by comparing what is said by the public speaker for example, with what is said personally (3) comparing one's perspective, with other people in the work team (Kusuma, 2018: 53). Thus, it is expected that the information received is valid and accountable information.

#### 4. DISCUSSION

The campaign of the green environmental movement carried out by Military District Command of 0503 West Jakarta is a commitment to the environment and also an effort to empower people to care more about the environment. The activity of farming is using hydroponic and aquaponic media in a field at the Military District Command of 0503 West Jakarta, and the land is named *Rumah Lestari* (Sustainable House). *Kodim* of 0503 West Jakarta practiced this environmental campaign program so that the area or units in its shade were the Military Regime Command (*Korem*) of 052/ Wijayakrama led by Major General Joni Supriyanto. Jaya Military District Command/ Jayakarta is a Defense Regional Command whose territory includes DKI Jaya, Tangerang and Bekasi and *Kodim* of 0503 Jakarta, one of the units that are in it. Together with *Kodim* of 0502/ North Jakarta, *Kodim* of 0503/ West Jakarta, *Kodim* of 0506/ Tangerang, and *Kodim* 0510/ Tigaraksa can implement similar programs in their respective regions.

In the future this program is expected to be implemented in every region or Military Regiment Command (*Korem*) under the command of District Military Command of 0503 West Jakarta. With the increasingly widespread implementation of the green environmental movement campaign program with the hydroponic method, it is hoped that the Indonesian Armed Forces (*TNI*) can synergize with the community in promoting this program, so that the community and the *TNI* can create a healthy and comfortable environment.

The results of the study show that the campaign program for the green environment movement with the hydroponic method received supports from the community. The community participates in this program. Not a few general public and students to see how the District Military Command of 0503 West Jakarta implements farming with hydroponic techniques. In addition, students are also involved in promoting this program through their social media. With the participation of the community in disseminating this program, of course this program has become widely known by the public, that was covered by various mass media and online media .

Furthermore, this program certainly can minimize a variety of social problems and urban environments at all. This is explained by the fact that in densely populated urban areas it has the potential to cause environmental problems which cause limited land that can be utilized by urban communities to grow crops. This has implications for the low activity of farming for people in urban areas, especially in Jakarta. No less than 275 tons of vegetables are supplied to Jakarta per day. The supply of vegetables generally comes from Java and several provinces on the island of Sumatra. Only a small portion of vegetable products are produced by farmers in Jakarta. The small amount of vegetable production in Jakarta Capital City is mainly due to the limited agricultural land and land conversion to meet the needs of housing and non-agricultural services (Sastro & Rokhman, 2016: 1).

The statement is in accordance with the findings that various health problems have the potential to afflict the population of Jakarta, considering that based on data from the Jakarta Park and Cemetery Office, the number of Green Open Space (*RTH*) in Jakarta reaches 3.3131. These green open spaces are in the form of city parks, environmental parks, interactive parks and also the green path of the road. Central Jakarta is the region with the most *RTH*, which is 913 *RTH*. Although the number has spread widely throughout Jakarta area, the area of open green space in Jakarta is only 9.98% of the total area. This figure is still far from 30% that must be owned by Jakarta. So far, the process of land acquisition and land purchase are still delaying.

One of the steps taken in overcoming this problem is to promote a green environmental movement campaign program using the hydroponic method. Through the implementation of the program, Military District Command of 0503 West Jakarta hoped that the community areas that close to the *Korem* of 052/ Wijayakrama led by Major General Joni Supriyanto. Jaya Military District Command/ Jayakarta is a Defense Regional Command whose territory includes DKI Jaya, Tangerang and Bekasi and *Kodim* of 0503 Jakarta, one of the units that are in it. Together with *Kodim* of 0502/ North Jakarta, *Kodim* of 0503/ West Jakarta, *Kodim* of 0506/ Tangerang, and *Kodim* 0510/ Tigaraksa can be motivated to carry out the same program.

To realize the implementation of the program, the community participation in the program is very important. Lt. Col. Inf Wahyu Yudhayana said that this program was designed so that all members of *KODIM* of 0503 West Jakarta together with the community could spread the spirit of farming with this hydroponic technique, especially in the West Jakarta region. Therefore, this environmental campaign hopes to change the old paradigm that farming and greening can only be done if you have adequate green open space. But in principle, there are many ways that people can do to create green open spaces by cultivating crops that are space-saving but easy to do, which is by farming through hydroponic techniques.

The community participation is a key word for the success of the program. Then self-participation is participation or involvement both physically and non-physically from an individual or community. The statement is in accordance with Santosa that participation can be defined as a person's mental/ mind and emotional/ feeling characteristics in a group situation that encourages someone to contribute to the group in an effort to achieve goals and take responsibility for the business concerned (Sulistiyorini, Darwis, & Gutama, 2015: 73).

According to Sastropetro, the types of participation include: 1) Participation of thought is a participation in the form of contributions of ideas, opinions or constructive thoughts, both to compile programs, and to facilitate the implementation of the program and to make it happen by providing experience and knowledge to develop the activities that are followed, 2) Participation of power is a participation provided in the form of energy for the implementation of businesses that can support the success of a program, 3) participation of skill is to provide encouragement through the skills they have to other community members who need it. With the intention that the person can carry out activities that can improve his social welfare, 4) Participation of goods is a participation in the form of contributing goods or property, usually in the form of work tools, 5) Participation of money is a form of participation to facilitate efforts for achieving people needs who need help (Sulistiyorini, Darwis, & Gutama, 2015: 74).

Participation is proceeding and to differentiate the process steps are made/ levels of participation. This level of participation theory is used as a basis for weighting the benchmarks of the level of community participation. The concept of the level of participation of various theories and experiences are in the field of participatory planning. The opinion expressed by one of the field practitioners in the field of participatory planning in Indonesia was Sumarto (2003: 113). Looking at the practical experience of participatory planning in several regions of Indonesia, Sumarto grouped the level of community participation into 3 parts. They are as follows:

1. High. The initiatives come from the community and are carried out independently starting from the stages of planning, implementation to maintenance of development results. Then the community does not only participate in formulating the program, but also determines the programs that will be implemented
2. Medium. The community has participated, but in its implementation there are still dominated by certain groups. People can voice their aspirations, but are still limited to everyday problems
3. Low. The community only witnessed project activities carried out by the government. The community can provide input either directly or through mass media, but only as a consideration. Communities are still very dependent on funds from other parties so that if the funds stop, stimulant activities will also stop (Sulistiyorini, Darwis, & Gutama, 2015: 75).

Based on the results of the study, the community participation in the green environmental movement campaign program through the hydroponic method is in the moderate category. This is because the public is still in the process of training and mentoring. But from the results of the study, the community participation began to grow to become more independent in implementing the program. This means that this program will soon rise to be a high participation, where the public can receive benefits or results from farming through hydroponic methods.

Moreover, the community has a significant role in this program, where the participation includes: *firstly*, students help disseminate campaign messages by publishing farming activities with hydroponic techniques to social media and youtube, so that many people came to this location. After the publication of this activity, various media slowly and surely reported the campaign

for the green environment movement program in supporting national food security through the activities of farming with this hydroponic technique. *Secondly*, the public visited the Sustainable House, a hydroponic demonstration plot owned by *Kodim* of 0503 West Jakarta. The public learn how to cultivate in a narrow area with hydroponic methods. *Thirdly*, the public participate in farming using hydroponic methods in their respective environments. In this third stage, the public was accompanied by competent instructors prepared by District Military Command of 0503 West Jakarta.

The benefits or direct impacts felt by the public from the green environmental movement campaign program through the hydroponic method are the increasing quality of life of the public, especially in the environmental aspects. The following details are the impacts of implementing this program, as follows:

1. Improving the quality of the environment. Through the application of this hydroponic system, the environment will: a) Make the air cooler. Hydroponics is a plant cultivation system that is able to make the surrounding air environment fresher and cooler. The main reason is that this system does not use chemicals for fertilizing and controlling pests and disease attacks. The type of fertilizer used in hydroponic plants is in the form of nutrients in the form of liquid which is a food source plant. Currently there are many types of nutrients or fertilizers that can be used as fertilizers for hydroponic plants and some of them can be made by farmers themselves, b) Be able to reduce air pollution. The advantages of hydroponics for the next environment are its ability to reduce and minimize air pollution. Everyone must realize that recently the level of air pollution in the surrounding environment continues to increase. This pollution is the result of forest fires, factory smoke, motor vehicle fumes, and cigarette smoke and so on. If the pollution level is not reduced, the air become dirty and polluted. After that it can have an impact on the health of humans and animals, especially livestock. So that this problem can be overcome, then one of the best alternatives is to use hydroponic methods for crop cultivation. Hydroponic systems can be applied in urban areas that have higher air pollution levels. Large land is no longer needed because hydroponic systems can be applied on narrow land, including in the home environment, c) Be able to increase oxygen levels in the air. In additions, to cleaning the air from pollution, the cultivation of hydroponic plants can also be used as a medium to increase oxygen or O<sub>2</sub> levels in the air. The more oxygen content available in an environment, the quality of human health can be improved. Furthermore, when associated with livestock farming, the availability of more abundant oxygen will make the quality of livestock more perfect. The meat or eggs produced are more abundant and multiply. This is certainly a big advantage for farmers. Those are some of the advantages and benefits of hydroponics for the environment. Hopefully this simple info and reviews can add to our knowledge and insight. In addition, it can also be a recommendation for farming on narrow lands as explained in <http://www.sistemhidroponik.com> .
2. Increasing public productivity. Several public environments are not well managed because of the reasons for the limited land so that they cannot be utilized. Through this hydroponic method, the community becomes more productive to use previously unused land to be used and the results can be utilized for daily needs. In addition, through this hydroponic method of farming activities familiarize people to consume organic vegetables which are certainly healthier and safer.
3. Economic benefits. Previously, narrow land was not useful, after carrying out farming activities through the hydroponic system, people could obtain vegetables cheaper and easier. The results of this farming activity can certainly be utilized by themselves. Thus the public does not need to spend too much money to consume vegetables. At harvest time, the public can take the vegetables they harvest themselves. This means that this activity has an impact on saving and helping the economy of the community.

Environmental problems in urban areas can be seen from the high population density so that green open spaces become increasingly limited. Through the program of the environmental movement's green through the hydroponic method, *Kodim* of 0503 West Jakarta create a social movement in the community to be actively involved in preserving the environment through the planting of vegetables through the hydroponic method. Through this program, citizens become more aware of protecting and preserving the environment. Based on the results of this study, it can be explained that the program of green environment

movement through the hydroponic method has many benefits. The benefits are 1) improving the quality of the environment that becomes cleaner, healthier and more comfortable, 2) increasing the productivity of the public, and 3) economically beneficial, which is to minimize costs for vegetable consumption.

## 5. CONCLUSION

From this study it was found that the impact of the green environment movement program through hydroponic methods can provide benefits to the environment and society. Broadly speaking, the impact of this program is *firstly*, can improve environmental quality such as improving air quality to be fresher and cooler, able to reduce air pollution, able to increase oxygen levels in the air. *Secondly*, this program can increase society productivity. The public can manage narrow land to be more productive and produce vegetables that can be consumed. *Thirdly*, economic benefits. Previously, narrow land was not useful, after carrying out farming activities through the hydroponic system, people could obtain vegetables cheaper and easier. The results of this farming activity can certainly be utilized by themselves. Thus the community does not need to spend too much money to consume vegetables. At harvest time, the public can take the vegetables they harvest themselves. This means that this activity has an impact on saving and helping the economy of the society.

Based on the results of the study, the writer suggested that *Kodim* of 0503 West Jakarta should optimize campaign activities by increasing the campaign media in the society. This is aimed at increasing the number of people involved in this program. In addition, *Kodim* of 0503 West Jakarta should involve universities and schools in Jakarta to participate in campaigning this program to the public. To ensure that the green environment movement program through the hydroponic method runs continuously, the assistance process must be carried out intensively.

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# Immoral Acts and their Resultant Effect among the Muslim Society: An Islamic Exposition

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## **Abstract:**

High moral standard is said to be a core pillar which ensures prosperity of individuals and the society generally. Man therefore, is born with a moral sense which clearly enables him to differentiate between right and wrong, good and bad. That is why it is not out of place to say a society, shrouded in immoral acts is certain to breed wayward and unscrupulous elements. In order to actually submit to the good morality, one must speak the truth, keep promises, respect family ties, and help the poor, less privileged and weak ones. This possibly has not been unconnected with the fact that the Muslims took their guidance from the teachings of the Prophet Muhammad (S.A.W<sup>2</sup>). Sadly enough, these moral qualities that ought to be imbibed by all and sundry diminish or were drastically absent among the Muslim society today. In order to get out of the bondage of servitude of one's desire to commit certain immoral acts, everyone in the society desires efficient knowledge and skill, societal norms and values. Having this in mind, it is not contestable that one should not do to others what one does not want to be done to oneself. This perhaps indicates that one must wish others what one wishes for oneself. To contravene the moral principles that guide the affairs of the Muslim society is no doubt a great menace which will not only affect the religious and moral set up of the Muslims but also their economic and social domain. It is not therefore exaggeration to state that many of the problems afflicting the society today could be the result of their undoings either in relation to their Creator or fellow human beings. It is thus in line with this backdrop that this paper intends to discuss immoral acts and their resultant effect among the Muslim society. To achieve the objectives of the research, the paper attempts to answer some basic questions in order to unravel the immoral acts and their resultant effect among the Muslim society generally. What are the causes of immoral acts? What are various forms of immoral acts being perpetrated by Muslims society? What are the effects of these immoral acts? What are the roles of government, teachers and other stakeholders in shaping the behaviour of the Muslims? How the moral standard does ensures prosperity of individuals and the society? What are the factors that help grow the moral faculty of Muslim society in making them religiously inclined to good standard of living? To achieve the objectives of the research, the paper adopts analytical phenomenological methodology.

**Key words: Immoral acts, Effect, Muslim, Youth**

## **Introduction:**

Character moulding is a collective enterprise that involves many people in the society. These include parents, teachers, well-to-do and religious leaders as well as other members of the public. Each of these groups has critical role in ensuring that members of the society become good citizens so as to be able to contribute to meaningful development in their respective areas. The position of parents on this regard is enormous as they are the ones to serve as role models to their children in social and even religious lives, hence the popular adage that charity begins at home. It is not exaggeration to however state that many of the problems associated with immoral acts afflicting the Muslim society today could be the result of their undoings. These infractions, which are numerous, are being committed by virtually all segments of the society. For instance, some parents do not frankly counsel their children on the desirability for them to embrace good norms and values of the society. They fail to understand that such admonition from time to time helps to grow the moral faculty of their children, thereby making them religiously inclined to good standard of living. This is

because; a human being is composed of both spiritual and physical forms and when the spiritual form is well organized, trained and disciplined the physical form will definitely manifest high moral standards in all ramifications. Muslim society should therefore consider the morality to be their guiding principles and their watchword in all spheres of life. This should be done in order to internalize good norms and values which affect their lives positively. It is therefore the intent of this paper to underscore factors that are responsible for the immoral acts among the Muslim society and proffer possible solutions to it.

### Concept of Morality in Islam

The entire Qur'an is full of moral teachings. It tells us the internal and personal mechanism which makes us act or not to act. Islam has recognized the power of morals in all spheres of human life. It is very interesting to note that all of the major world's religions preach morality as an indispensable part of their teachings, but the approach followed in these religions towards morality is what makes the difference. Islam, being the last revealed religion provides the best and most comprehensive moral teachings that are capable of eradicating all forms of social vices in human society. There are no aspects of human actions, psychological conditions, circumstances, rights, excellence and etiquettes which have been left out of the Qur'an moral teachings. Almighty Allah mentions in the Qur'an that:

And there is no creature on [or within] the earth or bird that flies with its wings except [that they are] communities like you. We have not neglected in the Register a thing. Then unto their Lord they will be gathered<sup>3</sup>.

### Scope of Islamic Morality

Morality, as an English word denotes the 'principles concerning right and wrong or good and bad behaviors. But for the proper understanding of its concept, the word must be taken back to its origin. The Arabic equivalent of this word is *Khuluq* (pl. *Akhlaq*) which literally means innate disposition, character, behaviors and nature. Technically it means the science of virtues and the way to acquire them, of vices, and how to guard against them<sup>4</sup>. Morality in Islam therefore has five major basic foundations upon which all other Islamic moral values are attached. These include but not limited to:

- (a) Patience, (*Sabr*) It helps a Muslim to bear and conceal anger and all other undesirable attitudes.
- (b) Temperance (*Iffah*) It enables a Muslim to shun immoral behaviors in words and actions and makes him to be modest and prevents him from bad habits.
- (c) Courage (*Shaja'ah*) It helps one to have self-esteem, uphold noble characters and properly controls himself in love and anger.
- (d) Justice (*'Adl*) It places a Muslim on golden mean. This also helps him to be generous- a quality between miserliness and extravagance. It then helps him to acquire forbearance (*hilm*) – a quality between anger and self disrespect.
- (e) Wisdom (*Al-hikmah*) It is the fifth foundation comes from sound faculty of knowledge. It helps a Muslim to have foresight enabling him to distinguish between true and false in statement, right and wrong in belief and between good and evil in actions. It could be understood from the above that Islamic morality is limitless as far as Muslim life on earth is concerned. Morality in Islam is not a mere theory which is documented in scripture, but rather a practical training for which the Noble Prophet Muhammad (S.A.W.) was sent to train the *Ummah*. This is elucidated in the following verse of the Glorious Qur'an:

And indeed you are of a great moral character<sup>5</sup>

'Aishah, (RA), the beloved wife of the Prophet (S.A.W.) was reported to have said that the character of the Prophet (S.A.W.) was the Qur'an<sup>6</sup>. This interestingly reveals that the Prophet has exemplified all the teachings of the Qur'an. Almighty Allah therefore directed all mankind to emulate him when He says:

There has certainly been for you in the Messenger of Allah an excellent pattern<sup>7</sup>

Muslim should therefore understand that Islamic moralities are divine in origin, human in nature, universal in approach and comprehensive in scope. This is what makes Islam distinct from other world religions.

### Determinants of Islamic Morality

Morality in Islam has many factors that help to initiate, maintain and develop a sense of direction among people in their environment. These determinants are aimed at achieving and fulfillment of Allah's mercy.

**Motive:** This is also divided into two; extrinsic and intrinsic motive. These are attached with the power that causes a person to act and why an action is done. **Extrinsic** refers to doing certain things for the sake of physical reward he/she hopes to get.

**Intrinsic** prompts a person to do certain actions in anticipating spiritual benefit. This is in line with the teaching of the following Hadith:

Motive determines the value of all conduct and a person attains that which he desires<sup>8</sup>.

- a. **Faith:** One of the most significant ingredients of good conduct is faith. Faith has a decisive effect on the spiritual and material lot of a person as well as his social behavior, political conduct and financial life. Faith in Almighty Allah is thus the foundation of good morality.

- b. **Fear of Allah:** One's ability to respond to any stimulus in doing good and abstaining from all evil and selfish desires is best achieved and promoted by the fear of Allah one has. Of all the determinants mentioned, fear of Allah is the most significant determinant of morality.

### **Efficacy of Islamic Morality**

Islamic morality is as important as the teachings of the Glorious Qur'an to the Muslims. This is because it (Qur'an) laid down the moral foundation in the teaching of Islam for it contains verses dealing with and encouraging moral development and discouraging moral lowliness. The Glorious Qur'an referred to those who uphold its teachings as 'prosperous' for been attached to moral qualities of keeping away from all acts Islam frowned at but also fulfilling their promises, keeping trust and establishing their prayers at their specified time. The Prophet (S.A.W.) always invoked Allah to better his character, advising his Companions to practice good morality<sup>9</sup>. He taught the believers that morality attracts more rewards than ritual devotions such as *Salat*, *Zakat*, and *Sawm* among others. The Glorious Qur'an described the Prophet (S.A.W.) in the following verses as merciful and charitable, humble and just yet gives to each his/her due. He has compassion and sympathy for the weak, for the orphan, the deprived and the oppressed.

Now hath come unto you a Messenger from amongst yourselves; it grieves him ye should perish: Ardently anxious is he over you; to the believers he is most kind and merciful<sup>10</sup>.

It is part of the mercy of Allah that thou dost deal gently with them. Wert thou severe or hash-hearted they would have broken away from about thee: So pass over (their faults) and ask for (Allah's) forgiveness for them...<sup>11</sup>

The crux of the matter is that morality is the heaviest deed on the day of requital as it brings a believer closer to the Prophet (S.A.W.) on that day. It is also an integral part of Islam with perfect faith. While immorality destroys good deeds of a Muslim as all Islamic devotional acts are aimed at promoting morality among the Muslims. The aim of Islamic morality is therefore to safeguard the humanity from social, economic, biological and physical mischief and direct them towards the attainment of spiritual uplift. Similarly, the function of moral principles is to foster and protect these values, to prevent their destruction and to encourage their growth and development. For instance, the moral principle which prohibits the killing of human beings is meant to protect the value of human life. The principle which prohibits stealing is meant to protect the right of every person to the ownership of his property. The principle which prohibits telling lies is meant to protect the value of honesty. The principle which prohibits adultery is meant to protect the value of conjugal fidelity among other things<sup>12</sup>. Adversely, the violation of any moral principle means the destruction of a value which ought to be protected or safeguarded. This is enough for one to appreciate the value and significance of Islamic morality.

### **Sources of Good Morals**

The Glorious Qur'an mentioned three sources of moral conduct, and all the three are imbedded in human nature.

1. The commanding self (*Nafs al-Ammaara*) is the self, which incites the human being towards evil. Allah (S.W.T.) says in the Glorious Qur'an:

Yet I do not hold myself to be free from weakness, for the commanding self (-the animal self) is surely prone to enjoin evil, except on whom my Lord has mercy<sup>13</sup>.

The Glorious Qur'an states that the state arising out of the human beings animal self, *Nafs al- Ammaara* (the commanding self) is the first source of morality. The reasoning faculty in the human being is sufficiently well developed to analyze his behavior critically and to perceive the immediate and remote consequences of his actions. The foundation of good morals lies in our natural emotions and instincts, and good morals are nothing more than appropriate and controlled exercise of these naturally endowed powers and instincts. Hunger and sexuality are the basic commanding needs of humans and animals. Now if these basic commanding forces are brought under control through fasting and marriage, they become virtues.

2. The self-accusing spirit (*Nafs al- -Lawwaama*). The second source of morality judges the excellence of morals. It is the voice of the conscience which becomes loud when an act of indecency is being done. Every human being is endowed with this voice. Almighty Allah says:

And I swear by (and bring to witness) the Self-accusing Soul (*Nafs al-Lawwaama* - the innate self reproaching spirit, at the doing of an evil deed as an evidence)<sup>14</sup>.

*Nafs al-Lawwaama* is what we call the living perception of one's psychological condition or the call of the inner voice. One aspect of getting a ruling from the voice of the conscience and from one's heart is that when we are about to commit any action we should first imagine to apply such an action to ourselves. If we are not adversely affected by this action and if it proves to be good and

effective for us, such an action would also be beneficial and good for others. And if we cannot accept it for ourselves, then it must be assumed that it is neither appropriate for others. We should note however that those who act unfairly towards others should put their own persons in place of others and see how they would like such an act to be perpetrated against them. The Noble Prophet (S.A.W.) advised Muslims in the following words:

When wanting to decide whether something is good or bad, ask your heart and innersoles, and take it that the deed, the commission of which gives you a feeling of satisfaction to the heart and innersoles, is a virtuous deed and the deed which rankles in the heart and produces perturbation and hesitancy in the mind is a sinful deed, even though the people may tell you that it is a lawful deed<sup>15</sup>.

The question that arises at this juncture is that if *Nafs al- Lawwaamah*, the self accusing spirit is present in every person, and every person is endowed with a voice of the conscience, why is it that a lot of persons still commit immoral acts? The answer to this is simple. Though our conscience does raise its voice of protest and the commission of such an act people mostly does not pay heed to it. More often, immorality is a poison and that repeated doses of this poison blunts or destroys the conscience.

3. Love and Faith in the All-Mighty is the third and the ultimate source of morals. Once a Muslim scholar was asked, how can we free ourselves from unlawful prohibited things and from afflictions and find peace and tranquility? He replied, through a firm faith in Allah, for one gets free of all weaknesses and calamities through such a faith. It is through this channel the human soul finds its ultimate peace and tranquility which is called in the Glorious Qur'an *Nafs al- Mutma'innah* - the Soul at Peace.

(As for the person who has been blessed with a contented and peaceful mind He will say to him,) 'O you soul at peace! Come back to your Lord well-pleased with Him and He well-pleased with you. Enter the fold of My chosen servants, and enter the Garden made by Me<sup>16</sup>.'

It is wrong to say that a disbelief in Allah does not produce any defect on one's morals, and confirmation of His existence does not strengthen one's moral powers. Among the principles proposed by the Qur'an for faith in Allah is the principle of Retribution and Recompense for one's deeds and this is an important principle in the laws of nature. Almighty Allah states in the Qur'an:

Verily, those who say, "Allah is our Lord," and then remain steadfast (and follow the straight path), the angels will descend upon them (saying), "Have no fear nor grieve rather rejoice at the glad tidings of receiving the Gardens (of Paradise) which you have been promised<sup>17</sup>."

The existence of moral forces within the human personality emanates from and is subservient to the inborn faculties of a human being and there exists a natural impulse towards morality in the human makeup. The human faculties which are inherent in human nature in its inner aspect as opposed to the outer and physical aspect are denoted by the word *Khulq*. *Khulq* is the term which describes that habitual and firm disposition in a human by virtue from which moral actions flow spontaneously and effortlessly. It is understood that all the moral principles that exist are nothing else but a manifestation of natural human emotions and nature is the source of them all. A person becomes laudable only when his natural faculties and personal disposition take on a moral hue through training. If such actions are good and laudable when judged by common sense and the Law, such a disposition is called a virtuous disposition, and if such actions are bad and condemnable, such a disposition is called an evil disposition. The source of all morals therefore is within the nature of a human being - his disposition and his various natural states. The evil in the human beings is something which evolves later as a consequence of their training. Similarly, the Noble Prophet (S.A.W.) was reported to have confirmed that:

No infant is born except with an inborn sense of natural goodness, and then his parents make him into a Jew, Christian or a Muslim<sup>18</sup>.

This is a testimony from the Prophet (S.A.W.) that a human being is born innocent and unblemished in his nature and does not enter this world carrying a load of original sin; a belief upheld by the adherents of other faith. Anyone who thinks that a human being is sinful by birth has indeed erred. That is why in the Glorious Qur'an there is no mention of "original sin", "atonement" or "transmigration of soul" as this is the product of human fantasy with no evidence at all for their backing.

### Causes of Immoral Acts

Vices and all other immoral acts come out of four pillars put together.

(a) Ignorance (*Jahl*) which reflects bad as good and reflects perfection as imperfection and vice-versa. The current economic recession and financial status of majority among the Muslim society has adversely affected their educational development. This perhaps made them unable to take the educational burdens of their children, who at long run become ignorant of their religion as well as other aspects of the mundane. It is not out of place to say that lack of knowledge is the cause of evil. That is why a great emphasis is laid by the Qur'an and Noble Prophet on the acquisition of knowledge and wisdom. Almighty says in the Qur'an:

Verily, Allah undertakes to accept the repentance of only those who do evil through lack of knowledge, then repent soon after. Such are the person towards whom Allah turns with mercy. And Allah is All-Knowing, All-Wise<sup>19</sup>.

(b) Injustice (*Dhulm*) which makes one to place things not in their appropriate positions. This no doubt, makes one to blame when he/she is supposed to praise, disagrees when supposed to agree. This can well be understood considering the current political dispensation in which a political aspirant, though incompetent to occupy any political seat, will be imposed on the electorate by his political Godfathers. For Muslim society to prosper, a drastic measure should be taken in order to curtail this negative trend on our political system. Muslim society should therefore vote a person of proven integrity and who is capable to lead his people diligently.

(c) Desire (*Shahwa*) leads one to greediness, humiliation and all sorts of imperfection. The desire of every Muslims should be controlled so that it may not lull him to commit an immoral; which has an effect on him and the society he lives in. When Muslim society lacks discipline and moral values it has already taken a path of destruction and ruin. One's moral impulse therefore should always be the driving force for Muslim society not to engage in any immoral act. To strengthen the above point, Almighty Allah mentions that:

And I do not acquit myself. Indeed, the soul is a persistent enjoiner of evil, except those upon which my Lord has mercy. Indeed, my Lord is Forgiving and Merciful<sup>20</sup>.

(d) Anger (*Ghadab*) leads one to pride, rancor, envy, transgression among others. We should always, as Muslim society, not allow ourselves to entertain anger or transgress the limit set by Allah in dealing with our fellow human beings. The Prophet (S.A.W.) advised us to be sad for it actually leads to rancor and pride thereby commanding us to do things that are not permissible or which the *Shari'ah* frowned at. These and many other external factors lead to immoral acts and improper behavior. Lack of proper utilization of our human faculties is said to be the igniting force to immoral acts. Imam Al- Ghazali is of the view that it is against the human nature and disposition to be attracted towards evil and blamable actions. The fact is that all the faculties found in a human personality, if utilized properly, are good morals in themselves. If at any time we see a defect in these or a slip is noticed, it is due to our misuse of these faculties. The capability of good morals has been endowed in our nature and this capability can safeguard against slip-ups through will, power and training.

Closely related to the aforementioned is the fact that everything in this universe exerts an influence on its environment and also accepts influence from its environment. A popular saying has it that every action is followed by a reaction. We know how a person's health is influenced by changes in weather, by his food, his dress, and his home. This influence affects even the morals of a person. The influence of peer group has also been identified as one of the causes of immoral acts. Muslim parents should therefore keep their eyes and monitor their children closely to see who their friends are. There are a number of incidents where a person of low moral standards establishes a friendship with a righteous person, who possessed sterling qualities, but only to be influenced by his untruthful friend and finally engulfed in many immoral acts. That is why Muslims were exhorted by Allah in the following verse to be with the truthful:

O You who believe! Keep your duty to Allah and be with the truthful<sup>21</sup>

This companionship with the truthful as elucidated in the above verse can be seen in many ways. This include but not limited to developing friendship with the pious, attending gatherings of such persons, studying the writings of the pious and reading their biographies. Not only that, the use of unclean and lawful food such as pork and alcohol by the society has an effect on one's moral condition. The laws about food, dress, the principles of government and the economic order are not only meant to keep the physical, social and economical side in order, but also to uplift the moral conditions. For instant the use of wisdom underlying the prohibition of certain foods in the Qur'an by Allah is that by using them, one is deprived of certain high moral qualities. Parents, as partners of progress therefore should always insist on lawful means to feed themselves and their families as not doing so will inadvertently affect their moral set up. Commenting on the effect of food on morals, Imam Al-Ghazali opined that:

The child's wet-nurse should be very religious, pious and eating lawful things, for a milk that comes out of unlawful food would not have any good or blessing in it<sup>22</sup>.

Simply deduced here is that since she is involved in the upbringing of the child from the very beginning, this wholesome milk would permeate the child's every fiber and in the long run he would be naturally inclined towards the unlawful and unclean things. Apart from these causes, mental and physical illness was also identified as the cause of certain immoral deeds. Islam has drawn our attention to many aspects of physical and mental hygiene as shown in this verse:

And purify your clothes (and the thoughts). And idol-worship, (spare no pains to) exterminate it and shun all uncleanness<sup>23</sup>.

The pollution of environment can be another source of evil. To rectify this kind of uncleanness, Almighty Allah warned us in this verse:

And guard against an affliction which surely will afflict not only those of you in particular who have acted unjustly (but it will involve others also who are inclined towards them); and know that Allah is Severe in requiting<sup>24</sup>.

Though the warning is against internal discord in the civil wars of early Islam, Ali suggested that it was never necessary than it is now for it affects the innocent and guilty alike<sup>25</sup>. Muslim society should therefore remain faithful in all their dealings and be discouraged from anything that is inimical to their moral development and that of the society generally.

### **Character Building: A Responsibility for All**

Despite the involvement of a cross section of Muslims today in some wrong doings perpetrated they pretend to be innocent whereas they constitute greater percentage of culprits. This is because, some of them engage in slander and sabotage while at work place, unjustifiably accusing their bosses of maladministration and mismanagement of public resources. These are few out of many immoral and anti-social acts, in the society these days. Unless all members of the Muslim society come together to correct the anomaly, then the much needed prosperity and stability cannot be achieved. From the Islamic standpoint, all disasters and calamities in a society could be the handiwork of members of that particular environment. All and sundry particularly Muslims should therefore come in prayers for solution to the myriads of social problems plaguing the society.

Time is now ripe, when we should collectively and individually search our conscience to see whether our behaviours are compatible with the established values of the society. Individual Muslim should contribute meaningfully towards building good moral for a peaceful and a decent society. The extent to which good morals are held not only by the individual Muslims but also some tertiary institutions can simply be noticed. When a student of a particular institution graduates and honor is conferred on him, the university proclaims that the student has been found worthy of learning and character. This is an indication that learning and good character make a good citizen and a good graduate. As was said previously, character moulding is a collective enterprise that involves many people in the society. As parents, the children should have learnt from them all the good ways of living. These include proper way of interaction with neighbors, way of dressing, learning to respect their elders and guarding against unwanted utterances among others. All these are major responsibilities which parents should take into consideration, if only to mould the character of their children, for the good of the society generally.

However, it is sad to note that some parents do not at all motivate their children to internalize good norms and values which affect their lives positively. Certainly, this lackadaisical attitude has the effect to engender many social ills in the society, including area boyism, political thuggery and consumption of intoxicants among others. Looking at the role of teachers in character moulding in the society, there is no any magical difference with that of parents. This is because like parents, teachers should act as good counselors to the children in school. This is by way of making use of subjects, especially in religions, civic education and social studies to achieve the aims of behaviour change in the society. Where teachers fail to discharge this crucial method and responsibility, the dream of having a refined society with good character will no doubt be impossible. Religious leaders who occupy an esteem position in the society have greater role towards character rejuvenation. They, as learned, are expected to always engage in exhortation religiously on the need for Muslim society to strive to live within the confines of the law in all aspects of their lives.

#### **Reasons for Living a Decent Life**

Every Muslim society possesses certain qualities that enable him acquire a lot of experiences that distinguish him from children. According to Omeregbe, a number of reasons as to why we must live a moral life were identified as follows:

1. We must live a moral life because Almighty Allah has commanded us to do so
2. We must live a moral life because we are social beings and also members of society
3. We must live a moral life because we are rational beings
4. We must live a moral life because it is the path to happiness
5. We must live a moral life because of the fear of the law of nemesis
6. We must live a moral life because it is the way of nature<sup>26</sup>.

On ethical reflection, it is a common knowledge that we all came into this world with nothing, and we shall leave it with nothing, no matter how rich we are. Thus, it is better to be poor and morally upright than to be rich and morally filthy. This is so because moral integrity is a higher value than money and material wealth. Those who throw away morality as soon as they see money and sell their moral integrity in exchange for money, are also short-sighted and un-minded people. It is therefore out of foolishness for anyone to enjoy today only to suffer for it tomorrow. Money is not everything. It can only buy pleasure, but it cannot buy happiness. You could be very rich and still be unhappy, especially if you got your wealth through immoral means. Happiness comes from moral integrity, clear conscience, peace of mind, selfless service, and contentment.

The practice of any religion without commitment to moral way of life is an abomination before Allah.

#### **Effects of Immoral acts among Muslim society**

An immoral act among Muslim society is so alarming this day. They engaged in all sorts of immoral behaviours including theft, drug addiction, cultism, smoking and other undoing. Failure to take drastic measures to curtail these vices is said to be one of the causes of immoral acts among the Muslim society. This is largely due to the inability of some parents in giving proper training their children require to become useful members of the society. This adversely affects the youth subjecting them to various nefarious activities in their effort to make ends meet. Moral values give us a sense of understanding issues and enable us to choose between what is right and what is wrong. A man without moral values is like a lost ball in the high weeds. Muslim society are however encouraged to show sense of maturity in all their dealings for this will give them chance to encourage and promote humanity among themselves thereby saving them from becoming criminal, perpetrator/felon etc. Disobedience to parents is another immoral act prevalent among the Muslim. To curtail this bad trend, Islam urges everyone, irrespective of his tribe, location or language to be dutiful to his parents, extending kindest treatment where and when possible. Failing to treat them kindly makes one guilty of disobedience to them and to Allah the Almighty. Disobedience to parents or mistreating them is the second major sin after *Shirk*<sup>27</sup>. The Prophet (S.A.W) was asked about the greatest sins in which he replied:

To join partners in worship with Allah; to kill a soul which Allah has forbidden to kill; and to be undutiful or unkind to one's parents...<sup>28</sup>

He also mentions in another Hadith:

The pleasure of Allah is in the pleasure of one's parents and the wrath of Allah is in the wrath of one's parents<sup>29</sup>.

A simple analysis of these *Ahadith* reveals that respect for the parents and their treatment kindly occupied high position in Islam. All the Prophets were commanded to worship Allah and immediately after the command come the issue of being dutiful to parents. Almighty Allah states in the following verse:

Thy Lord hath decreed that ye worship none but Him and that ye be kind to parents. Whether one or both of them attain old age in thy life say not to them a word of contempt nor repel them but address them in terms of honour<sup>30</sup>.

Kindness to one's parents has been stressed in this verse to show their position as only next to worship of Allah. This clearly indicated that the idea of worshipping Allah is connected to the idea of honoring and respecting one's parents when He commanded good treatment of them. It is however incumbent upon every Muslim society to deal with his parent gently, kindly, politely, as well as respect and appreciation. Giving due respect to one's parents alive or after death earns one admission into Paradise. The Prophet (S.A.W.) once said:

Jibril (A.S.) came to me and said, "O Muhammad, he is doomed who hears you mentioned and does not say peace be upon you." He said, "Say Amin," so I said Amin. Then he said, He is doomed who sees the month of Ramadan come and go, and he has not been forgiven." He said, "Say Amin," so I said Amin. Then he said, "He is doomed who grows up and either his parents or one of them are still alive, and they do not cause him to enter Paradise." He said, "Say Amin," so I said Amin.<sup>31</sup>

Asad, in his commentary, maintained that Almighty Allah is the ultimate cause of man's coming to life and that his parents stood the position of his outward cause which also shows that the worship of Allah is followed by the injunction to honor and cherish one's parents<sup>32</sup>. In an Islamic society, parents are respected for their wisdom and experience. It is a Muslim honored duty to lovingly care for his or her parents in their old age and provide them with all they need on the basis of his/her financial position. The media houses on the other angle would not be spared for most of the time they ignite the fuel of immoral acts among the Muslim society. This is considering serious effects some information being aired has to the public and which have not, most of the times, been censored. Anyone who comes across this information such as war films, pornographic scenes, drug addiction and trafficking scenes, area boyism, political thuggery and consumption of intoxicants among other things usually try to practice them directly or indirectly. It is therefore hoped that media houses should scrutinize, sift and deliver sound information that can only be useful for the moral uplift of the Muslim society. All hands must be on deck to fight against immoral acts among the Muslim society and at the same time drawing their attention on the need to imbibe self discipline. To unveil the status and or position of moral character we must imbibe the idea that 'if wealth is lost nothing is lost, if health is lost something is lost and if character is lost everything is lost'. We therefore understand that the best of all things is good character. Remember also the Chinese proverb which says 'if there is righteousness in the heart, there will be beauty in character, if there is beauty in character, there will be harmony in the home, when there is harmony in the home, there will be order in the nation, when there is order in the nation there will be peace in the world.

#### **Solutions to Immoral Acts among the Muslim society**

The menace of Immoral acts has eaten deep into the fabrics of our society; however, with effective counselling the problem can be tackled through the effort of parents, society, individuals and the government by engaging Muslims and advising them on how best to withdraw from such nefarious acts that are uncalled for. The family as the nucleus of the social organization should give their children appropriate education on danger and effect of immoral acts. They should be encouraged by particularly Muslim scholars to imbibe good morals that will help them become good members of the society. Not only that they should also desist from engaging in all forms of immoral acts which are detrimental to them and the society in general. The fact that some of the immoral acts are normally emanating from a lower social and economic home; where youth are ill prepared to meet the demand of moral values, should not be the reason because it can be remedied through improvement of their environment and the family set up. Prophet Muhammad (S.A.W.) is the best role model for every Muslim. This is because his teachings illuminate the lives of the people with the right virtue and good manners, creates in them brightness of character and fills their laps with the pearls of good conduct.

The value of morality in Islam is very high. In fact, the Prophet (S.A.W.) has once said: 'On the Day of Judgment there will be nothing weightier in their balance than their good moral character'. Take a look, however, at the period of the pre-Islamic days of the Arabs in which they were proud of their ignorance and wickedness. But when Islam was introduced, it removed the intensity of feelings and introduced the practice of pardon and forgiveness in society. In Islam, the better way and the best training of moral values should be explained and clarified in such a way that the heart may be convinced and that people can adopt them for attaining good and righteous qualities.

The most excellent guide for the Muslim's conduct in all spheres of his life is the Glorious Qur'an and the Prophet's example or practice. What is most lacking today among the Muslim society in respect of morality are; charity, chastity, modesty and purity, truthfulness, reliability and honesty, generosity and hospitality, respectfulness, kindness, patience, and perseverance, fear of Allah, self-control and self-discipline, upholding sanctity, obedience and respect, politeness, sincerity and repentance among others. Instead

of imbibing these worthy qualities they engaged themselves in manners forbidden by Islam such as stealing and theft, adultery, fornication and prostitution, dishonesty, cheating and hypocrisy, greediness and miserliness, abuse and misbehavior, suspicion, jealousy and anger, violence, tyranny and oppressions, false oath, consumption of alcohol, gambling, murder, dishonor and harshness toward parents and other members of the society.

These forces of evil and oppression must be fought without any fear or favor so that peace, harmony, tranquility and all other moral conducts can adequately be maintained. Muslim society should be advised and admonished on the need to reform and change their behavior for the better. This can be done via purification of mind as well as the awakening of the conscience of the Muslim society in all spheres of life. They should also return to the vigorous study of the life of the Noble Prophet Muhammad (S.A.W.) in all its different phases with a view to emulating him in all ideal examples embedded in his *Sunnah*. It is not limited to this only, they should equally stand to their feet and see that injustice, corruption, oppression and all sorts of immorality are eradicated from the earth. All hands must be on deck in order to get rid of all acts that usually cause mischief on earth. Righteousness should be developed and maintained among the Muslim society through inculcating good morals in all their dealings. They should also know that Islam has provided a mechanism via which they can check the menace of Immoral acts in order to reform the society for a better cause. This is elucidated in the Glorious Qur'an and the tradition of the Prophet (S.A.W.). In the Glorious Qur'an Allah says:

Let there become of you a community that shall call for righteousness, enjoin justice and forbid evil such men shall surely triumph<sup>33</sup>

While in the Prophetic *Sunnah*, the Prophet (S.A.W.) said:

He who sees an abomination should remove it with his hand, if he is unable to do so, let him use his tongue, if he is unable to do so, let him do it in his heart. This is the weakest form of faith<sup>34</sup>.

Muslim society should therefore strive hard in ensuring that a social order, based on peace, harmony and justice in which everybody is equal before the law is established. Relatively, a human being is composed of both spiritual and physical forms and when the spiritual form is well organized, trained and disciplined the physical form will automatically manifest high moral standards; in all ramifications. On the same vein, they should consider the morality to be their guiding principles and their watchword in all spheres of life. The love of the material world, wanton greed and the desire to amerce wealth should be repudiated seeking the spiritual nearness to Allah as well as other righteous deeds. They should also be steadfast in prayer for it fends away indecency, lewdness and all form of abominations. Almighty Allah mentions in the Qur'an that:

...Indeed, *Salat* fends away indecency, lewdness and other forms of evils...<sup>35</sup>

It also purifies the body and the soul from all evil and then establishes a decent, disciplined and virtuous society free from all evil practice. Since that is the case, we should then check the way and manner we observe our daily obligatory prayers. The Prophet (S.A.W.) was reported to have said that:

He whose *Salat* does not keep him away from indecency and evil has no (reward of) *Salat*'.

## Conclusion

Immoral acts are said to be the problems that cause serious concern to individuals, society and government in almost everywhere in the world. The problem is prevalent among youth who in most cases are ignorant about the dangers inherent in moral decadence. Many of them engaged in immoral acts out of frustration, poverty, lack of parental supervision, peer influence and pleasure<sup>36</sup>. A person who is merely adhering to a moral code only uses his own person or the society at his personal discretion, and by doing so he thinks that he is becoming better civilized and serving the society. He has no motivation of getting any reward. But when the Qur'an motivates us towards higher morals, it simultaneously tells us that by adopting higher morals we not only improve and reform society, but we are also making our next life better. Muslim society should in their part understand that moral values are the essential building blocks of their character and they are the very basis of distinction between a human being and other creatures. A Muslim society must have a religious or moral framework that promotes unity and provides a model for cooperation and social cohesion. The religion of Islam always serves as the anchor for the society's moral guidelines. The position of Islam in this respect has further been corroborated by Will Durant. He emphasized that "There is no significant example in history, before our time, of a society successfully maintaining moral life without the aid of religion<sup>37</sup>. History has shown that when a society becomes morally corrupt, civility is destroyed, the society becomes unstable, and inevitably the nation moves towards collapse. Religion delineates the line between rights and wrong, drawing the line in an indelible ink that cannot be altered as the society matures and grows. We, on the final note, hope that everybody would play his roles proportionately with a view to ensuring a society filled with people whose characters are worthy of note. Man is composed of a material and spiritual components. Unfortunately, Muslims emphasize the material at the expense of the spiritual, the reason Muslims are plagued with a myriad of moral crises. The phenomenon of moral decadence among Muslim society could be effectively tackled by drawing lessons from the Glorious Qur'an, the life of the Sahaba (R.A.) as well as personal experiences pious men. The moral decadence among the Muslim society and the lackadaisical attitudes are social vices that have so far defied all human solutions<sup>38</sup>. Parents should discourage their children, brothers and other Muslims around them from associating with "unknown" gangs or suspicious neighbourhood peer groups. This is aimed at attaining a high moral position worthy of being emulated. Immoral acts are problems that cause serious concern to individuals, society and government all over the world. The problem is prevalent among the younger Muslims who in most cases are ignorant about the dangers inherent in that. Many of them engaged in immoral acts out of frustration, poverty, lack of parental guidance, peer influence and pleasure. However, with effective counselling, the problems can adequately be tackled.

## Notes and References

- <sup>1</sup> Mainiyo is a Lecturer I in the Department of Islamic Studies, Usmanu Danfodiyo University, Sokoto
- <sup>2</sup> S.A.W. means *Sallallahu Alaihi wa Sallam*. Wherever it appears in this work it carries same meaning
- <sup>3</sup> Qur'an 6:38
- <sup>4</sup> Reference is needed
- <sup>5</sup> Qur'an...
- <sup>6</sup> Hadith...
- <sup>7</sup> Qur'an ...
- <sup>8</sup> Hadith...
- <sup>9</sup> Hadith.. (Allahumma kama ahsanta khalqiy fa ahsin khuluqiy)
- <sup>10</sup> Qur'an 9:128
- <sup>11</sup> Qur'an 3:159
- <sup>12</sup> Abbas Mahmud, Philosophy of Adult Education, a Postgraduate Seminar Paper, presented to the Department of Adult Education and Community Services, Bayero University, Kano, P. 6
- <sup>13</sup> Qur'an 12:53
- <sup>14</sup> Qur'an 75:2
- <sup>15</sup> Hadith ...
- <sup>16</sup> Qur'an 89-27-30
- <sup>17</sup> Qur'an 41:30
- <sup>18</sup> Hadith ...
- <sup>19</sup> Qur'an 4:17
- <sup>20</sup> Qur'an 12:53
- <sup>21</sup> Qur'an 9:119
- <sup>22</sup> Reference is needed
- <sup>23</sup> Qur'an 74:4-5
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- <sup>25</sup> A.Y. Ali, The Holy Qur'an, Translation and Commentary, 1999, IPCI, Islamic Vision, England, P. 465, footnote 1198 under Chapter 8:25.
- <sup>26</sup> Omoregbe, I.J. *Ethics: A systematic and Historical Study*, Lagos, 1998, Joja Press.
- <sup>27</sup> Associating other beings with Allah in worship and other religious obligations
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# The Role of the Oedipus Complex on the Perceived Romantic Security of Males

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## ABSTRACT

In Freudian psychoanalysis, Oedipus complex refers to the attachment, usually to the extent of sexual desire, of a son to his mother. It typically occurs during the son's age of three to five years old and is said to be a precursor of future romantic attachment styles. If left unresolved, the Oedipus complex will lead to social interaction defects. With the above premise, this research determined the role of Oedipus complex on the perceived romantic security of male students. Data for this mixed explanatory methodology research were obtained through purposive homogenous sampling design with 51 male students engaged in a romantic relationship as the main respondents of the study. Using descriptive and multiple linear regression analysis, the researchers established the impact of Oedipus complex on perceived romantic security. It was revealed that there existed an adverse effect of Oedipus complex on perceived romantic security such that as they become more attached to their mothers, the more is the tendency for them to develop anxiety concerning their relationship status. The study concluded that the Oedipus complex is one of the factors that affect the perceived romantic insecurity of males. The authors recommend further investigations on the aspect of unresolved Oedipus complex since their data regarding it is limited.

**Keywords:** *attachment style, mother-son relationship, Oedipus complex, perceived romantic security, romantic relationship*

## Introduction

Perceived romantic security in relationships is a crucial factor in determining the psychological health of a person particularly in healthy functioning of emotions. Any insecurity may cause mental insanity and unsoundness. If persons experience insecurity in their romantic relationship, the persons will suffer emotional dysfunctionality. Eventually, the dysfunctional emotions and insecurity will pave psychological disorders such as depression, withdrawal, and suicide (Overbeek et al., 2003). The insecurity felt by a person in a romantic relationship may be explained as a result of the earlier relationships that the person has experienced. Due to the experiential remnants that the more previous relationships have brought about, relational complexities whether positive or negative might be encountered in the current relationship (Overbeek et al., 2003).

According to psychoanalytic theories, current relationships have juvenile roots; thus, past experiences contribute to the present conditions. One of the potential sources that explain the status of existing relationships is the Oedipus complex, a term coined by Sigmund Freud. It refers to the perception of a child on his same-sex parent as a rival towards the opposite sex parent in terms of attention, love, and care (Josephs, 2010).

The relationship established between the son and the mother is classified as positive Oedipus complex, and when resolved as the age of the son increases, will develop into affection without sexual desire for the mother and the son will soon look for his opposite-sex partner. However, the negative Oedipus complex which refers to the unconscious sexual attraction to the same sex parent will potentially result in the child's homosexuality, pedophilia, and neurosis (Freud, 1899 as cited by Haiyan et al., 2016).

Additionally, the signs of the positive Oedipus complex deal with the possessiveness of the child concerning his mother thus prohibiting his father from kissing her. At this stage, the child views the mother as an ideal woman to marry in the future (Cherry, 2018). However, Sigmund Freud believed that the Oedipus complex is resolvable resulting in psychological masculinization of the child where the child finds an identity with his father and develops decent affection to his mother. Accordingly, if Oedipus complex is not resolved, there will be an emergence of the so-called fixation which refers to the psychological imprisonment of the child in his past relational experiences. Consequently, it results in adverse effects in the proper social, romantic interactions of the child when he grows up (Cherry, 2018).

Romantic relationships suffer detrimental conflicts for different reasons. Localizing this issue in the Philippines, adultery caused by romantic insecurity is one of the most common problems that a romantic relationship undergoes (Diola, 2015). Many families are shattered due to this unhealthy conflict which can be explained by the occurrence of past experiences of the persons involved.

The importance of this study lies primarily on assessing the degree of Oedipus complex and its effects on the perceived romantic security of male students, provided that few studies were delving on the concept of Oedipus complex and its impact on perceived romantic security.

The dearth of literature particularly in the domestic setting observed by the researchers regarding the topic on Oedipus complex and how it interplays romantic security during adolescence makes them interested in studying it. Moreover, the results of this study shall encourage the parents, faculties, and staffs in school to develop interventions that will provide understanding to the male students on how they perceived romantic security in their romantic relationships.

Given the potential problems mentioned above that can be explained by childhood roots as supported by psychoanalytic theories, this study must be conducted to provide firsthand information about this rare study on the role of Oedipus complex on the perceived romantic security of males.

### **Framework**

This study anchors on the following theories: Sigmund Freud's Oedipus Complex Theory, Erik Erickson's Psychosocial Theory, and John Bowlby's Attachment Theory.

The Oedipus Complex Theory of Sigmund Freud posits that every person experiences unconscious yet resolvable sexual desire during their childhood years towards their opposite-sex parent. It denotes that even though a child does not know about it during his juvenile growth and mental development, there is the likelihood that he will resolve it through various ways of interaction within his environment which is not limited to the other same-sex parent. In this study, it is proposed that Oedipus complex revolves around the son-to-mother relationship and occurs during the 3-6 years of son's age.

According to Sigmund Freud, conflicts typically occur in a family and mainly revolve on love and competition. The theory about Oedipus complex denotes that a child (son) at the age of three to six perceives the same-sex parent (father) as a competitor or rival in terms of the opposite-sex parent's (mother's) attention, love, and care. Similarly, Oedipus complex also means as "the medley of strivings, feelings, and unconscious ideas" which connects to the desire towards the opposite sex parent (Josephs, 2010).

There are two major types of Oedipus complex: the positive Oedipus complex and the negative one. The two differs in terms of who is the parent in which the child is more attached.

The positive Oedipus complex deals with the hostility and rivalry felt by the young boy towards his father when it comes to his mother's attention. These feelings will eventually lead to the "masculinization" of the young boy if the Oedipus complex is resolved when the boy finds an identity with his father. Sigmund Freud believed that this resolution of the child is brought about by the "castration anxiety" in which the father will castrate him if he continues to have sexual desire towards his mother.

Moreover, this envy felt by the boy due to his father's intimacy with the mother will lead him to focus on his father's traits of character. It is then where the resolution is achieved when the boy acquires the masculine characteristics. And knowing that it is immoral to find sexual satisfaction in his mother, the boy will divert his desire to other female or females, and this happens in the child's later age.

Putting these concepts into a more psychologically legal manner, the signs of the positive Oedipus complex deal with the possessiveness of the child concerning his mother thus prohibit his father from kissing her. At this stage, the child views the mother as an ideal woman to marry in the future (Cherry, 2018). However, when this perception is resolved as the age of the young boy increases, the young boy will develop affection for his mother without sexual desire and will soon look for his appropriate opposite-sex partner (Freud, 1899 as cited by Haiyan et al., 2016).

Moreover, with this positive Oedipus complex, the son will have a psychological registration concerning his perspective about his mother as a human avenue of secure attachment, provided that the son finds trust in his mother in the early stage of psychosocial development. This psychological registration of emotional functioning is supported by the psychosocial theory of Erik Erickson since this theory posits that the caregiver or mother is the first source of the son's enduring trust which serves as a foundation for the success of the next stage. Thus, the trust-inspired perspective of the child about his mother will be unconsciously used by him in dealing with future romantic partners.

On the contrary, the negative Oedipus complex shows the development of affection and feminine characteristics of the young boy towards his father, thus leading to homosexuality (Cherry, 2018). It has a potential threat concerning the child in his later relationships due to the unnatural way of establishing romantic relationships. However, if asked about the conditions regarding secure relationships of gays and lesbians, it is a right answer to say that the secure homosexual relationship may be explained by the stability of the chosen gender identity of the persons involved in the homosexual relationships.

Complementing with the first theory, the Erik Erickson's psychosocial theory postulates that every person throughout his life undergoes different stages which are incremental, and in which one person must succeed in the preceding stage before proceeding to the next. It is to ensure the healthy functioning of the next stage.

Concerning the Oedipus complex, psychosocial stages describe the experiences that a person must undergo throughout his life. Without the successful undergoing of the preceding stages, there is a tendency that a person will develop negative consequences in his later life stages. The psychosocial theory of development by Erik Erikson tackles the stages of a person in developing his personality. Erikson believes that a person undergoes a series of stages and conflicts as it serves as a turning point of development.

The first stage of psychosocial development is "Trust vs. Mistrust." It happens during infancy where the child develops trust to his caregiver when the caregiver is highly dependable and continuously by his side. It connects to the Attachment theory of John Bowlby where the infant develops a sense of security towards his constant caregiver, and this wonderfully predicts future attachment style of romantic relationship. From this stage, the child undergoes the Oedipus complex until the age of 6 years old.

The child develops an unconscious sexual desire for his opposite-sex parent until he reaches the stage of "Industry vs. Inferiority" where the Oedipus complex is slowly resolved as the child develops the industry to copy the traits of character from his father. This stage has a positive effect on the resolution of the Oedipus complex.

If the resolution of the Oedipus complex is successful, the fifth stage of psychosocial development of Erik Erikson will be achieved. The child will know his own identity as a son towards his mother and a guy towards his opposite-sex romantic partner. It is then where he will develop the sixth stage of psychosocial development, the "Intimacy vs. Isolation," where people explore personal relationships. This stage will pave the way for a committed and secure relationship. The child will now look for his romantic partner where he will develop fidelity to his romantic partner.

Putting the two theories in context, the researchers deduced that the Oedipus complex by the son would result in a condition by which he experiences romantic security with his romantic partner.

The third theory utilized in this study is John Bowlby's attachment theory. This theory suggests that a young child needs to develop a relationship with at least one primary caregiver for social and emotional development to occur normally.

The theory further explains the emotional bond between infants and their caregivers and projects this child-caregiver relationship as an essential aspect of human experience (Bowlby, 1979 as cited by Fraley and Shaver, 2000). Many researchers have utilized Bowlby's theory as a framework for love and romantic relationships.

Results of recent studies showed that most lonely adults who experienced conflicts with romantic partners have problems with their parents during childhood. It suggests that the history of attachment affects the frequency and form of adult loneliness (Rubenstein & Shaver, 1982; Shaver & Hazan, 1987; Weiss, 1973 as cited by Fraley and Shaver, 2000).

In Hazan and Shaver's paper, they made use of Bowlby's attachment style in adult romantic relationships. They observed that the concepts of the theory apply to the ideas of adult romantic relationship, and this consequently urge them to generate the four categories of attachment: Secure, Anxious-Preoccupied, Dismissive-Avoidant and Fearful-Avoidant.

(1) The *secure attachment* refers to the style of securely attached adults who are satisfied with their relationship. They feel security and connection but still allow freedom in their relationship. Secure adult tends to offer support when their partner is distressed and also seek comfort towards their partner when they are troubled. This attachment has an open and independent and loving relationship.

(2) *Anxious-preoccupied attachment* exhibits desperation in forming a fantasy bond. They view their partner as a missing puzzle that will complete their being. However, the constant need for security towards their partner does not prohibit them from pushing them away. Their behavior reflects their fears.

(3) *Fearful-avoidant* exhibits the fear of being too close or too distant from their partners. They undergo overwhelming reactions and emotional storms. The person they considered as their partner is the same person they fear (Firestone, 2013).

(4) *Dismissive-avoidant attachment* exhibits selfishness and lack of interdependence. They think that they do not need anyone (Gonzales, 2018).

The next paragraphs explain the definitions of the variables in this study. These variables are extracted from the theories mentioned above.

#### *Oedipus Complex.*

It is also known as the parent-child relationship which refers to the attachment of the child to the parent of the opposite sex. Freud believed that the completion of this stage leads to the development of a mature sexual identity of the child.

The *Oedipus complex* of the respondents can be attributed to the *perceived romantic security* since results from studies showed that the conflicts within a relationship were due to the parent-child relationship initially experienced by lovers. These findings are supported by the *Attachment Theory* of Bowlby which is an essential evolutionary theory concerning human relationships. This theory explains that the behavior of infants seeking comfort and security from his responsive caregiver acts as a causing aspect of future conditions of relationship (Bowlby, 1979 as cited by Fraley and Shaver, 2000).

#### *Perceived Romantic Security.*

This concept is deduced from the theory of Bowlby concerning attachment styles. It refers to the security of a person towards his or her romantic partner and is theorized by Bowlby as affected by the person's past relationship with his or her parents (*Oedipus complex*).

As a final point, the experiences of a person can affect the current romantic relationship. Fraley and Shaver emphasized in 2000 that most of the lonely adults experiencing conflict with their romantic partners had problems with their parents during their childhood specifically during the stage of infancy. Therefore, it is vital in the aspect parenthood to have a good parental response towards infants because it will develop the child's working models in guiding his individual's feelings, thoughts and expectations in his later relationships.

With the discussions of the theories above, the researchers deduced from these theories that the resolution of Oedipus complex leads to a sense of individual mature sexual identity and fidelity which consequently results to security in relating with romantic partners.

Given the conceptions of different authors, experts and practitioners in the psychoanalytic field regarding the dynamics of *Oedipus complex* and *Perceived Romantic Security*, Figure 1, summarily explains the intent of this study.



***Figure 1. Schematic Presentation Showing the Interplay of Variables in the Study***

### **Materials and Methods**

This study utilized a mixed explanatory method research design. The researchers used both qualitative and quantitative data in a single study to have a more unobstructed view and understanding of the research problems (Creswell & Clark, 2011). Quantitative data are gathered through a researcher-made questionnaire in determining the level of Oedipus complex of the respondents and a modified questionnaire entitled "The Experiences in Close Relationships- revised Questionnaire" made by Fraley et al. (2000) in determining the level of perceived romantic security.

The validity of the instruments was carefully looked into by experts in the field of Psychology and the simplest, understandable and contextual vocabulary was utilized in the instructions and questions. The questionnaires were floated to five Grade 9 students to assess the instruments' vocabulary.

The reliability coefficients of the instruments in this study were determined after they were all pilot-tested. All survey questionnaires were subjected to a reliability test using SPSS 14 software. The reliability coefficient resulted in 0.880 for Oedipus complex and 0.886 for perceived romantic security.

The study employed the homogenous purposive sampling method where the target respondents under study share the same characteristics and are of the same nature (Crossman, 2016). The respondents of this study were the 51 Grade 12 male students from the Gingoog City Comprehensive National High School who currently have romantic partners and live with their two parents during their childhood ages of 3-6 years old.

The following procedures guided the organization of data in the study.

A. Level of Oedipus Complex

Range	Point Value	Description
1.00 – 1.75	1	Strongly Disagree
1.76 – 2.50	2	Disagree
2.51 – 3.25	3	Agree
3.26 – 4.00	4	Strongly Agree

B. Perceived Romantic Security

Range	Point Value	Description
1.00 – 1.75	1	Strongly Agree
1.76 – 2.50	2	Agree
2.51 – 3.25	3	Disagree
3.26 – 4.00	4	Strongly Disagree

Descriptive statistical analysis such as percentage, frequency, mean and standard deviation, Pearson Product Moment Correlation and the linear regression analysis were used to treat the data gathered.

**Results and Discussion**

Table 1 shows the frequency, percentage, and mean distribution of the level of Oedipus complex of male students in Gingoog City Comprehensive National High School.

Table 1: Frequency, Percentage and Mean Distribution of the Level of Oedipus Complex of Male Students

Indicators	Mean	SD	Description
1. When I was young, I viewed my father as a competitor of my mother's attention, love, and care.	2.29	.965	Disagree
2. Before seven years old, I am closer to my mother than to my father.	3.08	.977	Agree
3. During my childhood, I spend more time with my mother than my father.	3.08	.997	Agree
4. At a young age, I liked to be with my mother more than my father.	2.96	.848	Agree
5. I am uncomfortable when I see my mother with my father during my childhood.	2.31	1.122	Disagree
6. When I was young, I loved the personality of my mother compared to my father's.	2.88	.887	Agree
7. I am jealous when my mother gives more attention to my father than to me when I was young.	1.94	.705	Disagree
8. At a young age, I felt like I was competing for my mother's attention when my father was present.	2.08	.956	Disagree
9. Before seven years old, I viewed my father as a rival to my mother's attention, love, and care.	2.18	1.014	Disagree
10. When I was young, I prefer to ask something to my mother than to my father.	3.16	.784	Agree
11. During childhood, I didn't want other people to be around my mother.	2.25	.956	Disagree
12. When I was a child, I see my mother as an ideal wife.	2.92	1.163	Agree
13. When I was young, I hated seeing my mother hugging my father.	1.78	.856	Disagree
14. When I was a child, I felt angry towards my father for getting the attention of my mother.	1.94	.925	Disagree
15. I felt intimidated or afraid of my father when I was young.	2.41	1.004	Disagree
<b>Overall Mean</b>	2.485		
<b>SD</b>	.564		
<b>Interpretation</b>	Mildly Experienced		

Description	Interpretation	Frequency	Percentage
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Range		Positive Oedipus Complex:		(%)
1.00-1.75	Strongly Disagree	Not Experienced	4	7.8
1.76-2.50	Disagree	Mildly Experienced	25	49.0
2.51-3.25	Agree	Experienced	15	29.4
3.26-4.00	Strongly Agree	Highly Experienced	7	13.7
		<b>TOTAL</b>	<b>51</b>	<b>100.0</b>

Forty-nine percent (49%) of the respondents answered *they disagree* from the floated questionnaire of Oedipus complex which means that they mildly experienced the Oedipus complex when they were still at the age of 3 to 6 years old.

Per individual indicators, the fifteenth indicator *Feeling intimidated or afraid to my father* (M=2.41, disagree) was mildly experienced by the male respondents. This result was supported by the interview conducted by the researchers where the respondents were asked about the reason for disagreeing with the statement. The respondents reasoned out *"I do not feel intimidated with my father because as a son, I should respect him having an intimate relationship with my mother."* This finding was supported by the study of Hickey (2013) in his exploratory research entitled *"The Phenomenal Characteristics of the Son-Father Relationship Experience"* in which he found out that in a good relationship, a father is someone that you respect and someone that you might fear.

The small value of the mean spread (SD=.564) indicates that the responses are comparable.

The indicator with the highest mean was the tenth; *when I was young, I prefer to ask something to my mother than to my father* (M= 3.16, SD= .784, Agree) wherein a respondent reasoned out *"Yes because I feel comfortable to ask something to my mother than to my father."* It can be explained by the concepts formulated by Ainsworth (1973) and Bowlby (1969) as cited by Mallers (2010) stating that mothers traditionally serve as a primary caregiver from whom the initial parent-child bond is established, one that provides physical safety and comfort to both girls and boys. With this, the present research postulates that the strong bond between the mother and the child will develop to trust and comfort felt by the son particularly when he asks something to his mother.

Another indicator which garnered the highest mean is the second indicator *Before seven years old, I am closer to my mother than to my father* (M=3.08, SD= .977, Agree) in which most of the respondents reasoned out *"I am closer to my mother than my father because my father is always at work and my mother is the only one left at home."* This closer attachment to the mother could be attributed to the experience of the child where there is the existence of mothers feeding them as a baby, also the care and preparation for life that created love and feeling of trust (Sahin, 2014).

The last indicator with the highest mean is the third indicator, *during my childhood, I spend more time with my mother than my father* (M=3.08, SD= .977, Agree). The tendency for a child to spend more time with his mother particularly during the time of stress is caused by the characteristics of the mother who attempts to calm and reassure children (Paquette, 2004 as cited by Maller, 2010). Thus, the mother-child relationship serves as a salient foundation from which both men and women develop their secure base and therefore, their general emotional well-being (Maller et al., 2010).

On the other hand, three indicators got the least mean in this study, particularly the thirteenth indicator *When I was young, I hated seeing my mother hugging my father* (M=1.78, SD= .856, Disagree) where the respondent answered that *"It is normal because they are husband and wife. And as a son, I think they had a long time of bonding compared to the time that I had with my mother."* The current researchers interpreted this as a good sign that the son received from the parents in which it would secure them that their parents are not having relationship problems and that it would not result to divorce and such.

Another indicator, the number fourteen, in the items, *When I was a child, I felt angry towards my father for getting the attention of my mother* (M=1.94, SD= .925, Disagree), got the least mean. It can also be explained by the discussions in the preceding paragraph.

The last indicator, the seventh one, *I am jealous when my mother gives more attention to my father than to me when I was young* (M=1.94, SD= .705, Disagree) also got the least mean in this study. This could mean high-quality relationships of the son with their parents and would tend to cause better overall mental health (Mallers et al., 2010; Moore et al., 2011). The current researchers interpret this as a good sign of the relationship of both parents to their child which could lead to better development of the child.

However, the overall mean of the male respondents for the Oedipus complex is 2.485. The overall mean imply that they mildly experienced the Oedipus complex when they were still at the age of 3 to 6 years old.

Another variable that plays a vital role in this study is the *perceived romantic security*. *Perceived romantic security* is deduced from the theory of Bowlby concerning attachment styles. This term refers to the state of being free from anxiety and fear that the male

respondents feel with the partners of their current romantic relationship. Table 2 shows the frequency, percentage and mean distribution of the male students' perceived romantic security.

Table 2: Frequency, Percentage and Mean Distribution of the Male Students' Perceived Romantic Security

Indicators	Mean	SD	Description
1. I'm afraid that I will lose my girlfriend's love.	2.63	.958	Disagree
2. I often worry that my girlfriend will not want to stay with me.	2.41	.983	Agree
3. I often worry that my girlfriend doesn't love me.	2.53	.809	Disagree
4. I worry that my girlfriend won't care about me as much as I care about them.	2.41	.920	Agree
5. I often wish that my girlfriend's feelings for me were as strong as my feelings for him or her.	2.59	.753	Disagree
6. I worry a lot about my relationship.	2.31	.927	Agree
7. When my girlfriend is out of sight, I worry that he or she might become interested in someone else.	2.41	.853	Agree
8. When I show my feelings for my romantic partner, I'm afraid she will not feel the same about me.	2.65	.844	Disagree
9. I worry about my partner leaving me.	2.31	.883	Agree
10. My romantic partner makes me doubt myself.	2.53	1.007	Disagree
11. I often worry about being abandoned.	2.65	.820	Disagree
12. I find that my girlfriend doesn't want to get as close as I would like.	2.71	.965	Disagree
13. Sometimes my girlfriend changes her feelings about me for no apparent reason.	2.69	.883	Disagree
14. My desire to be very close to my girlfriend sometimes scares her away.	2.67	.909	Disagree
15. I'm afraid that once my girlfriend gets to know me, she won't like who I am.	2.86	.775	Disagree
16. It makes me worry that I don't get the love and support I need from my partner.	2.75	.845	Disagree
17. My girlfriend only seems to notice me when I'm angry.	2.92	.771	Disagree
18. I prefer not to show my partner how I feel deep down.	2.73	.874	Disagree
19. I feel uncomfortable sharing my private thoughts and feelings with my partner.	2.63	.958	Disagree
20. I find it hard to depend on my romantic partner.	2.41	.983	Agree
21. I am very uncomfortable being close to my romantic partner.	2.53	.809	Disagree
22. I find it uneasy about getting close to my partner.	2.41	.920	Agree
23. I don't usually discuss my problems and concerns with my partner.	2.59	.753	Disagree
24. It does not help me to run to my romantic partner in times of need.	2.31	.927	Agree
25. I do not tell my partner just about everything.	2.41	.853	Agree
26. I do not talk things over with my partner.	2.65	.844	Disagree
27. It's not easy for me to be loving with my partner.	2.31	.883	Agree

**Overall Mean** 2.4713

**SD** .507

**Interpretation** Insecure

Range	Description	Interpretation Security:	Frequency	Percentage (%)
1.00-1.75	Strongly Agree	Highly Insecure	5	9.8
1.76-2.50	Agree	Insecure	22	43.1
2.51-3.25	Disagree	Secure	21	41.2
3.26-4.00	Strongly Disagree	Highly Secure	3	5.9
		<b>TOTAL</b>	<b>51</b>	<b>100.0</b>

More than 43% of the respondents answered *they agree* which implies that the perceived romantic security of the male respondents is interpreted to be insecure. This result means that the majority of the male students feel anxious and worried about the status of their relationship especially on tendencies and possibilities of breakups.

The fifth indicator, *I often wish that my partner's feelings for me were as strong as my feelings for him or her* (M=2.59, SD=.753, Strongly Disagree) is one of the indicators which got the highest mean. It indicates that respondents felt secure with his romantic partner since he trusted his partner's feelings. This concept is deduced from the study of Du Plessis et al. (2007).

Another indicator with the highest mean is the twenty-third indicator, *I don't usually discuss my problems and concerns with my partner* (M=2.59, SD=.753, Strongly Disagree), which can be explained by the study of Sommer (2004) wherein he found that the quality and quantity of communication were dimmed significant predictors of both intimacy and relational satisfaction. It means that communication significantly affects the increase of intimacy and satisfaction of romantic partners.

The indicators mentioned above were highly observed from the male respondents implying their security with their romantic partners in terms of these questions.

However, five indicators were identified to have the least mean in this study. First was the sixth indicator; *I worry a lot about my relationship* (M=2.31, SD=.927, Agree). These findings are in congruence with the result of Kamenov and Jelic (2005) in which their results showed that people form a more insecure attachment in relation with their romantic partners compared to members of their families and friends. Based on the concept, the current researchers postulated that the occurrence of *worrying a lot about a relationship* is since compared to romantic relationships, relationship with friends and family does not undergo breakups.

Another indicator that got the least mean is the ninth indicator *I worry about my partner leaving me* (M=2.31, SD=.883, Agree), the interview conducted by the researchers resulted to respondents stating that *"Yes because I am afraid that she will have a relationship with another guy."* This result can be supported by the study of Faber (2010) entitled *"The Role of Anxious Relationship Beliefs in Relationship Satisfaction and Relational Maintenance Behavior"* where he stated that people who endorse more anxious relationship beliefs are indeed less satisfied with their relationship. His findings suggest that anxious cognitions towards intimacy are associated with lower relationship stability and could, therefore, predict relationship dissolution.

The twenty-fourth indicator *It does not help me to run to my romantic partner in times of need* (M=2.31, SD=.927, Agree) is also included in the list of lowest means. It means that the relationship lacks mutual trust which is necessary for revealing the inner thoughts and emotions of the persons involved in a particular romantic relationship (Lewicki and Bunker, 1995).

The last indicator to have the least mean is the twenty-seventh indicator *It's not easy for me to be loving with my partner* (M=2.31, SD=.883, Agree), this result can be supported by Bartholomew (1990) as cited by Overbeek (2003), where he proposed that the adult avoidance of intimacy results from early attachment experiences in which emotional vulnerability has become associated with parental rejection. In turn, such an insecure working model of self-and-other may cause individuals to interpret losses and disappointments as personal failures, which contributes to the development of distress (Kenny & Rice, 1995 as cited by Overbeek, 20013).

Nevertheless, the overall mean of 2.47 suggests that the male respondents are insecure when it comes to their romantic partners, which implies that they worry about their relationship's susceptibility to breaking up.

One prerequisite test before the researchers can conduct correlation analysis is the conduct of a normality test. Normality assumption means that the distribution of the test is normally distributed (or bell-shaped) with 0 means, with one standard deviation and a symmetric bell-shaped curve (Statistic Solutions, 2019).

Table 3 below shows the Reliability and Normality Measures of the data and the constructs in the study.

Table 3. Reliability and Normality Measures

Variable	Shapiro-Wilk's Test	Skewness	Kurtosis	Cronbach's Alpha
<b>1. Level of Oedipus Complex</b>	.141 NS	.219	-.684	0.880
<b>2. Perceived Romantic Security</b>	.949 NS	.189	.179	0.886

The different parts of the scale indicating the various constructs had the following Cronbach's Alpha Coefficient (R). The R values of the scale show a very high internal consistency considering that the acceptable range is from 0.7 to 0.9 (George et al., 2003). The variables are normally distributed as shown by their Skewness (S) and Kurtosis (K) values where the limit of S is from -0.5 to 0.5 and

K is from -2 to 2. Likewise, the Shapiro-Wilk Test showed no significant results for Oedipus complex level ( $p=.141$ ) and perceived romantic security ( $p=.949$ ) suggesting that the data are normally distributed.

The reliability and normality values assure that the confidence level or the significance level (p-value) in the multiple linear regressions is valid even with a sample of 51 male students. It also means that the indicators used in the constructs are highly reliable. Thus, it can be inferred that the indicators consistently represent the constructs of the study.

Table 4 shows the Pearson R-values showing the relationship of the Oedipus Complex with perceived romantic security.

Table 4. Pearson R-values Showing the Relationship of Oedipus Complex with Perceived Romantic Security

Variables	Mean	Pearson R-value	p-value
Oedipus Complex	2.485	-.455(**)	.001 S
Perceived Romantic Security	2.4713		

\*\*Correlation is significant at the 0.01 level (2-tailed).

The table disclosed that there is a significant relationship between the level of Oedipus complex and perceived romantic security with the p-value at .001. Thus, the null hypothesis is rejected. Furthermore, table 4 shows the negative correlation between the two variables ( $R= -.455$ ). It implies that with the increase of Oedipus complex, the perceived romantic security of the male respondents' decreases.

With an increase of more attachment to the mother, there is a tendency that the child will develop negative consequences in his future romantic relationship such as insecurity in particular. However, this research theorizes that these negative consequences can be explained not only by the Oedipus complex but also by the inexistence of Oedipus complex resolution.

According to the theory of John Bowlby on different attachment styles, the Oedipus complex of the respondents is exacerbated by the absence of the father. This social working model is instilled in the respondents and is used when relating to romantic partners. In other words, the lack of the father and the child's closeness to the mother cause the attachment style which is anxious-preoccupied.

As explained by anxious-preoccupied attachment style, the fear of being abandoned is present in the male's romantic relationship. These people who experienced anxious-preoccupied attachment styles are emotionally deprived and continuously fears rejection. According to Robert Karen, as cited by Gonzales (2018), anxious-preoccupied people are hypervigilant about separations. People with this kind of attachment possibly had troubled parents such as having parents who are always away or when the child has needs.

Moreover, results showed that there is perceived romantic insecurity among them implying that these respondents experienced "role confusion" in which they did not acquire the virtue of fidelity which is crucial in forming intimacy in the romantic relationship. It can be illustrated by the lack of industry induced by the absence of the father. This claim is supported by the qualitative data gathered during the interview where some of the respondents admitted that their "father needs to work" and that their "mother is the only person left at home" to take care of them.

It merely means that there was no resolution of the Oedipus complex among the respondents. This absence of resolution may be attributed to the argument that the respondents did not acquire the industry necessary to copy their father's identity which later on did not give them a sense of fidelity that is necessary to develop healthy relationship and thus would result to a secure relationship.

Since the correlation value between the predictor and the criterion variables was significant, a linear regression was done to determine the degree of variation that the Oedipus complex can contribute to the respondents' perceived romantic relationship.

Table 5 shows the linear regression analysis of the influence of Oedipus complex on the perceived romantic security.

The  $R^2$  value suggests that the independent variable Oedipus complex explains 20.7% of the variation of the perceived romantic security. With the f-value of 12.820, the model is highly significant at (P) 0.001. Thus, the null hypothesis is rejected; the independent variable can explain and or predict the perceived romantic security of males.

Table 5. Simple Linear Regression Analysis of the Influence of the Oedipus Complex on the Perceived Romantic Security

Independent Variable	Beta	T-value	Sig.
<i>Oedipus Complex (OC)</i>	-.409	-3.581	.001 S

Dependent Variable	Perceived Romantic Security
Constant	3.488
R <sup>2</sup>	.207
F-value	12.820
Significance	.001

The final model is represented as:

$$\text{Perceived romantic security} = 3.488 - .409 \text{ OC}$$

The regression coefficient of the independent variable of -.409 shows the direction of the influence of Oedipus complex phenomenon on the perceived romantic security. The negative regression coefficient demonstrates the opposite effect of the independent variable on the dependent variable which means that an increase of the Oedipus complex will lead to the decrease of the perceived romantic security.

Based on the three theories mentioned above, as the attachment to the mother increases, a possibility of negative consequences on the romantic relationship of the child will develop. Moreover, the current study theorizes that not only can Oedipus complex affect but also other variables such as unresolved status caused by the father's absence can directly affect the perceived romantic security (Gonzales, 2018).

In the theory of psychosocial development, an individual should undergo varying "psychosocial crisis" to achieve the virtues, such as fidelity and individuality, present in it. With this, the researchers of this study postulate that the respondents had an unresolved Oedipus complex during the age of 5-13 years old which is the required stage for them to possess industry to copy the masculine identity of their fathers. Moreover, the unresolved Oedipus complex is caused by the absence of the father exacerbating the lack of industry to copy the father's masculine identity.

However, the results showed that there was insecurity among respondents indicating that the respondents experience "role confusion." It can be clarified by the absence of the father in which the son did not copy the identity of the father. This claim is supported by the qualitative data gathered during the interview where some of the respondents admitted that their "father needs to work" and that their "mother is the only person left at home" to take care of them. It implies that among the respondents, there was no resolution of the Oedipus complex.

## Conclusion

The role of the Oedipus complex experienced by the male respondents is a contributory factor on their perceived romantic security. There was a negative relationship between the Oedipus complex and the perceived romantic security of males.

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# Hepatocellular Carcinoma Preventive Vaccines and Clinical Trials

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**Abstract** - Hepatocellular Carcinoma is the most common liver malignancy in the world and accounts for the most number of cancer related deaths worldwide. Larger incidences of HCC cases are reported from developing countries and much lesser in developed countries. According to many studies men are at more risk of getting HCC than females. Hepatitis B virus remains as the most important risk factor while Hepatitis C virus, alcoholism, diabetes mellitus and obesity play a major role in HCC. Cirrhosis remains as an additional important risk factor specially in the United States. Although HCC is a very aggressive malignancy, prevention of HCC can be achieved by carefully examined measurements. Hepatitis B vaccination, anti viral therapy, immunotherapy and DNA analogs are used to prevent and control the tumor aggression. Continued improvements in vaccines have demonstrated positive outlooks in overall survival. Researches on molecular targeted vaccines are being conducted and are on the rising. With the advancements of these vaccines, the future of preventing HCC seems brighter.

**Key Words** – Hepatocellular Carcinoma, Vaccine, Clinical Trial, Prevention

## 1. Introduction

Primary liver cancer is the third major reason in cancer mortality in the world (Altekruse, Henley, Cucinelli, & McGlynn, 2014). Among them hepatocellular carcinoma (HCC) is the fifth most recurrent malignancy in the world and is estimated to result approximately half a million deaths yearly. Because of its excessive fatality rates, the incidence and mortality rates are almost equal (Hashem B El-Serag, 2002). Hepatocellular carcinoma (HCC) also accounts for more than 90% of liver cancers in the world and there has been a significant increase in HCC related annual mortality rates during the past two decades (Omata et al., 2017). Despite all the advances in prevention techniques, screening, and recent technologies in both diagnosis and treatment, mortality continues to rise (Omata et al., 2017). In order to prevent hepatocellular carcinoma, vaccines against the risk factors have been produced and thus far

they have been playing an important role worldwide in preventing hepatocellular carcinoma. The aim of this literature review to assess these vaccines and their clinical significance in terms of preventing hepatocellular carcinoma.

## 2. Epidemiology

HCC occurs more often in males than females with a larger incidence in Southern and Eastern Asia, Western and Middle Africa, Melanesia, Micronesia and Polynesia. The age adjusted incidence of HCC has increased from 1.6 per 100,000 to 4.6 per 100,000 individuals among Alaskan natives and American Indians followed by Whites, blacks and Hispanics (Balogh et al., 2016) The biggest age adjusted incidence rates (>20/100,000) are reported in East Asia which includes North and South Korea, Vietnam, and China and sub Saharan Africa. Approximately 75% of liver cancers occur in Asia, with China being responsible for more than 50% of the world's cases. The incidence of HCC is probably to increase over the next 10 to 20 years and to reach around 2030 (Manuscript, 2014a) In the contrary, the incidence of HCC is much lesser in developed countries in North America resulting in 6.8 cases per 100,000 person per year for men and 2.2 cases per 100,000 person per year for women, Europe (except the southern Europe), South and Central America, Australia and New Zealand (Manuscript, 2014a) Although, the overall 5 year survival rate is less than 12%, making HCC the most rapid rising cause of cancer related death in United States. Both male and females showed a 3 fold increase in incidence of HCC from 1975 to 2007 (Manuscript, 2014b) Intermediate rate HCC locations, where the incidence rates are normally between 10/100,000 and 20/100,000, are ideally located in central Europe which includes Italy, France, Switzerland, Greece. Regardless of the magnitude of the incidence rate, almost all areas report rates in males that are two to three fold higher than rates in females. Significant exceptions to this gender relation are the relatively equal incidence rates reported by registries in Harare, Zimbabwe, Costa Rica, Cali, Colombia and South Karachi, Pakistan (McGlynn & London, 2011)

In addition to variability by gender, many areas record incidence rate varies by race and ethnicity. As for an example in the United States HCC incidence is the largest among Asians and Pacific islanders resulting 11.7/100,000 and lowest among white people resulting 3.9/100,000. In between to these rates are those of Hispanics resulting 8.0/100,000, black people resulting 7.0/100,000 and American Indians and Alaska Natives resulting 6.6/100,000. Just as different as the rates among various ethnic groups inhabiting in one area are the rates among members of a single ethnic group living in various areas. For example, incidence rates among Chinese people are significantly lower in the U.S. than they are in either China or in Singapore. As with gender divergent and race and ethnic differences in risk are likely to be related to the prevalence of major risk factors in each groups (McGlynn & London, 2011)

### 3. Risk factors

#### **3.1 Hepatitis B Virus**

HBV is the major leading risk factor for HCC globally and is responsible for at least 50% cases of HCC (Parkin, n.d.) and virtually all child cases (Bedossa & Paradis, 2011) The role of chronic infection with hepatitis B virus in the etiology of hepatocellular carcinoma is well identified (Parkin, n.d.) In a population based cohort study which carried out in 1980s involved 22,708 Taiwanese men who were followed up for 8-9 years, the occurrence of HCC was 98.4 times higher in HBV carriers than non-carriers (Manuscript, 2014a) Presently, about 5% of the world's population (350 million people) is chronically infected with HBV. The evidence supporting the causal association of HBV with HCC is rather common (McGlynn & London, 2011) In endemic areas in Asia and Africa, where HBV infection is transmitted from mother to infants, up to 90% of infected persons have a chronic course, with recurrent integration of HBV into host DNA. Even though HBV can end up with hepatocellular carcinoma in the absence of cirrhosis, the majority (70 to 80%) of patients with HBV related hepatocellular carcinoma end up having cirrhosis. The risk of hepatocellular carcinoma among people with chronic HBV infection (those who are positive for hepatitis B surface antigen [HBsAg]) (T. Tseng et al., 2012) is further expanded if they are male or elderly, have been infected for a long period of time, have a family record of hepatocellular carcinoma, have been introduced to the mycotoxin aflatoxin, have consumed alcohol or tobacco, are co infected with HCV, have increased levels of HBV hepatocellular replication (Chen, Yang, & Iloeje, 2009) or are infected with HBV. HBV DNA can also be detected in persons who are HBsAg negative, but the association with risk of hepatocellular carcinoma is unclear in these cases (Bedossa & Paradis, 2011) The lifetime risk of HCC among chronic HBV-infected patients is known to be around 10–25%. Risks of HCC among HBV infected patients vary by several factors, the major one being serum HBV-DNA levels although there is no exact cutoff level (Chen, Iloeje, & Yang, 2007)

The risk and the presence of HCC in hepatitis B carriers seems to be related to ethnicity. White hepatitis B carriers are most likely to develop HCC at a later age after a period of progressive liver cirrhosis, whereas African and Asian individuals are likely to develop HCC in the young adulthood and in the middle age and might show fewer signs of cirrhotic liver disease than white hepatitis B carriers. Genetic variation might be the reason for the differences between these ethnic groups. Alternatively, these differences might be explained by disparities in the age at which HBV infection is acquired in different ethnicity group populations. Vertical transmission is the major mode of acquisition of HBV in Asia, whereas horizontal transmission in early life is the most dominant mode of transmission in Africa. By contrast, in Western countries HBV is mostly transmitted in adolescence and adulthood through high risk behaviors, such as intravenous drug use, sexual exposure or iatrogenic causes including blood transfusion, unsafe needle practices, invasive procedures, hemodialysis or organ transplantation (Manuscript, 2014a)

### **3.2 Hepatitis C Virus**

Chronic HCV infection is one of the well-known causes of chronic liver diseases and hepatocellular carcinoma both in patients with histories of exposure to viral diseases which are transmitted from parents and in patients who have no noticeable source of infection. (Fattovich et al., 1997) More importantly, HCCs developing after HCV infection have occurred in elderly patients with more severe liver diseases than tumors developing after HBV infection.(Fasani et al., 1999) It is reported that Hepatitis C is the leading cause for both chronic liver disease and HCC in most Western countries, including the USA (Manuscript, 2014b) In a community based prospective study in Taiwan which focused on effects of hepatitis C virus (HCV) infection on the incidence of hepatocellular carcinoma (HCC), it was suggested that HCV plays a significant role in hepatocarcinogenesis in an area endemic for chronic HBV infection resulting a 20 fold increased risk of developing HCC with HCV than people who didn't have HCV (Sun et al., 2003) Hepatitis C virus (HCV) is normally transmitted from mother to child during pregnancy and childbirth although the timing and the precise biological mechanisms that are involved in this process are not utterly understood yet (Utero, 2017) A meta-analysis of case control in USA showed that from 178 HCC patients 163 patients were diagnosed for liver diseases with HCC being the dominant one (Fasani et al., 1999) Many meta analyses and case control studies have shown that patients with both HBV and HCC infections have more risk of getting HCC(Cho et al., 2011)

### **3.3 Alcohol and tobacco**

Most of the HCC cases occur in cirrhotic livers but not all. Cirrhosis is a pathogenic step in liver carcinogenesis which results in hepatocellular carcinoma and in alcoholics, prolonged and excessive alcohol consumption ends up in alcoholic cirrhosis. Moreover, alcohol may intensify and/or speed up hepatocarcinogenesis in patients with HBV and/or HCV infection, genome alterations, or non-alcoholic fatty liver disease (Turati et al., 2018) A meta-analysis carried out in Taiwan showed that risk of HCC was higher in users of alcohol than non-users (Loomba et al., 2010) Women are more prone to liver injury than men from alcohol intake and women are more likely to develop cirrhosis at equivalent alcohol intakes than men mostly because of the sex differences in alcohol metabolism (Frezza et al., 1990) A meta-analysis which consisted of 19 cohorts, including a total of 5550 deaths and 4445 incident cases from liver cancer, noted a significant 16% increased risk of hepatocellular carcinoma among alcohol drinkers of 3 or more drinks per day, compared with non-drinkers. Proof for a positive connection between heavy alcohol drinking and hepatocellular carcinoma derived mainly from embedded case control studies. The increased risk for those who drink 6 or more drinks per day, compared with non-drinkers, was 22%. Moderate drinkers who take less than 3 drinks per day, were not at risk of liver cancer. The dose risk curve provided evidence that a linear relationship with rising alcohol intake in drinkers with approximate potential risk of 46% per 50g of ethanol per day and 66% for 100g per day (Turati et al., 2018) Effects of alcohol use and extreme obesity (BMI, >30) together showed that the risk of HCC was accelerated synergistically in alcohol users who had excessive obesity compared to those without extreme

obesity and nonusers of alcohol (Loomba et al., 2010) Although there are sufficient evidence that prove tobacco smoking increased the risk of hepatocellular carcinoma, not persistent findings in studies of the same populations and the inter relation of smoking with other risk factors, such as HBV, HCV infection, and alcohol consumption, have made the relationship between tobacco and HCC difficult to identify and understand (Omata et al., 2017)

### **3.4 Aflatoxin**

Aflatoxin is a mycotoxin produced by molds of the *Aspergillus* species which are *Aspergillus flavus* and *Aspergillus parasiticus*. These molds contaminates maize, groundnuts and tree nuts in warm, high moisture environments and is a well-known hepatic carcinogen (McGlynn & London, 2011) Aflatoxins contaminate dietary staple foods and are sound animal hepatocarcinogens and are cancerous in humans with exceptional high risks in individuals who have developed a concomitant infection with HBV. Exposure can be reduced at community levels by either before or after the harvest by limiting fungal contamination of crops. Technical approaches may suggest low technology post-harvest measures to terminate fungal growth or genetic engineering of plants to be resistant to fungal infection or toxin production (Wild & Hall, 2000) A meta-analysis carried out in China provided sufficient evidence that Aflatoxin is one of the major carcinogens in HCC by a follow up study of urinary markers of aflatoxin exposure (Qian et al., 1994) There are four major Aflatoxins as B<sub>1</sub>, B<sub>2</sub>, G<sub>1</sub> and G<sub>2</sub> (McGlynn & London, 2011) and evidence shows that there is a synergistic between aflatoxin B<sub>1</sub> and HCV towards HCC (Kuang et al., 2005)

### **3.5 Diabetes Mellitus and Obesity**

In the past couple of years, many evidence has suggested a strong link between diabetes mellitus (DM) and hepatocellular carcinoma. Many cohort studies and meta-analysis have been carried through out to statistically quantify the association of diabetes mellitus with hepatocellular carcinoma. A meta-analysis which involved 823 patients suggested that DM increased the risk of hepatocellular carcinoma only in the presence of other risk factors such as hepatitis B or C or alcoholic cirrhosis. Hepatitis C infection and alcoholic cirrhosis is known to be responsible for most of HCC among veterans (H B El-Serag, Richardson, & Everhart, 2001) Another quantitative assessment of this association between DM and HCC has provided string evidences that there is a positive relationship between DM and increased risk of HCC in both males and females (C. Wang et al., 2012) Obesity also has been identified as one of the risk factors for several malignancies, including hepatocellular carcinoma (Larsson & Wolk, 2007) A meta-analysis on overweight and obesity in relation to liver cancer risk provided enough evidences that excess body weight can potentially increase the risk of HCC and the results indicated that the risk was 89% higher among people who were overweight and obese, respectively, compared with those of weight considered normal. (Larsson & Wolk, 2007)

### **3.6 Genetic Factors**

The host genetic makeup known to be an important factor but to what extent it effects is still not fully discovered. A very small amount of HCC cases are associated with genetic disorders of mendelian inheritance, such as hereditary hemochromatosis or alpha 1 antitrypsin deficiency. Currently, the most widely studied inherited genetic risk factor in HCC are forms of glutathione S-transferases. They are responsible for detoxifying a variety of electrophilic molecules, including oxidized lipid and DNA compounds generated by reactive oxygen species damage to intracellular molecules (White, Li, Nurgalieva, & El-Serag, 2008) Also tumor necrosis factor  $\alpha$  (TNF- $\alpha$ ) has been identified to play a significantly important role in the progression and development of hepatocellular carcinoma. A meta-analysis proved that the TNF  $\alpha$  polymorphism is closely associated with increased susceptibility to HCC (Q. Hu, Lou, Liu, Qian, & Lv, 2014)

## **4. Materials and methods**

This study includes information from published review articles from 1990 to 2018 and Medline database from 2000 to 2018 to identify cases regarding hepatocellular carcinoma and the clinical trials of the vaccines to understand how management and prevention of hepatocellular carcinoma is done by administering vaccines against the risk factors. This study also includes a full manual search from bibliographies of selected papers to have a better idea how each individual has responded to these vaccines.

### **4.1 Study criteria**

- 1) Each case study was necessitated to have published information of the number of clinical participants and age-adjusted details. Also it was taken in to consideration that each and every case study possesses 95% confidentiality.
- 2) This literature includes only the studies that used preventive vaccines for following risk factors of hepatocellular carcinoma: Hepatitis B Virus (HBV) and Hepatitis C Virus (HCV). And following vaccines which play a major role in preventing hepatocellular carcinoma: interferon vaccines, nucleotide analog treatment and immunotherapy.
- 3) Studies with less than 100 individuals were disbarred as it was not enough to determine positive or negative results.
- 4) When more than one volume from the same study was accessible only the final publication was utilized.

### **4.2 Data extraction**

Data were individually procured from each study using predetermined forms. The information for this literature was extracted in terms of: the number of cases, mean age of the individuals, the area where the studies were carried out, the number of cases for each category. After collecting all the data and information from each study they were carefully examined and analyzed to determine the actions of these vaccines inside the body

## 5. Prevention

Cancer prevention can be attempted in three steps (Kew, 2010)

1. Primary prevention is preventing the etiological agent from commencing the carcinogenic process. This is the first strategy and is achieved by eliminating, avoiding, or neutralizing the carcinogenic agent, or by disturbing the *in vivo* conversion of a precarcinogen into a carcinogen.
2. Secondary prevention is dealing with the metabolism of a carcinogen, or stopping it from reaching its target or interacting with nucleophiles, especially DNA.
3. Tertiary prevention is preventing precarcinogenic lesions from progressing to cancer.

### **5.1 Prevention of HBV related HCC and clinical trials**

HBV is responsible for 80% of the HCC cases worldwide (Parkin, n.d.) The first ever HBV vaccine was developed from human serum in 1981 in the united states (Wong & Chan, 2012) The goal and strategy of universal administering of hepatitis B vaccination is to prevent HBV related HCC to reduce new infection as primary prevention (Omata et al., 2017) HBV vaccination is carried out globally to prevent new HBV infection in healthy individuals. There are more than 250 million people chronically infected with HBV and these chronic bearers are at high risk of developing adverse liver diseases and hepatocellular carcinoma (T.-C. Tseng & Huang, 2017) There are multiple etiologies of HCC, the most critical one is chronic viral hepatitis B which account for 80% to 90% of all HCC cases globally (Xie, Ma, Feng, & Wei, 2017). Despite the accessibility of highly effective vaccines over 20 years, hepatitis B virus (HBV) infection is still the major cause of liver-related morbidity and mortality being hepatocellular carcinoma one of them (Xie et al., 2017). Efficacy trials have proved that antiviral therapy improves the outcomes of patients with chronic hepatitis B virus (HBV) infection regarding hepatocellular carcinoma. However, potential data regarding the effect of antiviral therapy on the incidence of hepatocellular carcinoma (HCC) are limited (Kim et al., 2015). A safe and effective HBV vaccine is available and should be given to all newborns and persons without immunity who are at high risk for infection. National HBV vaccination programs have dramatically reduced the prevalence of HBV infection, and there has been a concomitant decrease in the incidence of hepatocellular carcinoma (Bedossa & Paradis, 2011)

Many clinical trials have been carried out to determine the results of HBV vaccination. In Taiwan the first universal HBV vaccination program in newborns started 20 years ago, with infants of mothers who were at high risk for HBV infection (HBsAg-positive) administering both the injection of hepatitis B immune globulin and the vaccine. Since the program started, the incidence of hepatocellular carcinoma in children between 6 and 14 years of age has drastically fallen by 65 to 75% (Bedossa & Paradis, 2011) A

reduction in the average annual as follow in the incidence of HCC from 0.70 per 100,000 children between 1981 and 1986 to 0.57 and 0.36 for the time periods of 1986 to 1990 and 1990 to 1994 was shown (Chang et al., 1997) A randomized controlled clinical trial was carried out in Qidong China administering HBV vaccine to 75000 infants with the purpose of making them immunized. After an average of about 25 years of follow-up, the incidence ratio of primary liver cancer in the vaccination at birth group to the control group (68% of whom received catch-up vaccinations at ages 10–14 years) was 0.16 (Qu et al., 2014) Another interventional randomized clinical trial was carried out in symptomatic adult men which a total of 549 subjects were collected and treated with highly purified formalin inactivated virus particles derived from the plasma of chronic carriers of hepatitis B. A total of 534 were gathered to the placebo group. Both groups were given vaccinations at 0, 1 month, and 6 months to determine the efficacy of a hepatitis vaccine in preventing hepatitis B. Within two months, 77% of the vaccinated persons had higher levels of antibody against the hepatitis B surface antigen. This rate increased to 96% after the booster dose and remained essentially unchanged for the duration of the trial. For the first 18 months of follow-up, hepatitis B or subclinical infection developed in only 1.4 to 3.4% of the vaccine recipients as compared with 18 to 27% of placebo recipients. The reduction of incidence in the vaccines was as high as 92.3. A significant reduction of incidence was already seen within 75 days after randomization this observation suggests that the vaccine may be efficacious even when given after exposure (Szmuness et al., 1980)

## **5.2 Prevention of HCV related HCC**

The incidence of hepatocellular carcinoma (HCC) due to HCV infection is increasing in several Western countries, being responsible for approximately one-third of HCC cases in the USA (Armstrong et al., 2006) Despite of the long years of experiments still there is no HCV vaccine that can be used clinically (Naderi et al., 2014) Despite the number of research over many years into the development of a vaccine against HCV, there seems to be little likelihood of such a vaccine being available in the near future. Difficulties hindering the development of this vaccine include the excessive variabilities of the genomic structure of the virus, mostly in the hypervariable region, the huge number of quasispecies (which is a group of viruses linked by the similar mutation or mutations, competing against each other within a highly mutagenic environment in the blood of infected people, and the lack of proof for an effective neutralizing antibody against the virus (Kew, 2010) But in order to prevent complications after being infected with Hepatitis C Virus following vaccinations are administered by medical practitioners; Hepatitis A, Hepatitis B, Haemophilus influenza type b, Human papillomavirus vaccine, Influenza, Pneumococcal, Tetanus, diphtheria, whooping cough (“Vaccinations for Adults with Hepatitis C Infection,” n.d.) Although there is no exact vaccine that has been developed to prevent HCV related HCC following vaccines are used as substitutes; recombinant viral vaccine vectors to trigger cell mediated and humoral responses against multiple epitopes. Types of viruses that are used as vectors include adenovirus, vaccinia virus and canarypox (Siler et al., 2002) Recombinant protein subunit vaccines are also used which are subunit vaccines containing recombinant HCV protein molecules. These different

proteins act against different HCV genotypes to prevent the harmful effects by the infection or chronic infection (Naderi et al., 2014)

Peptide vaccine is another type of vaccination that is used against HCV, Small peptides are incorporated which they can bind directly to MHC class I or II molecules without affecting the antigen processing pathways (C.-T. Hu, 2005)

### **5.3 Anti-viral therapy and clinical trials**

Antiviral treatment is known to decrease the risk of HCC in patients with viral hepatitis. Considering the extraordinary progress made in antibacterial therapy in the past couple of decades, the advances made in specific treatment for viral disease have been disappointingly low. Until now there are only a very small number of antiviral agents which are utilized in a restricted number of clinical situations. Furthermore, most of the antiviral drugs do not selectively inhibit virus replication without injuring and damaging the host cell simultaneously, and therefore these agents are often accompanied by serious side effects. Thus, potential beneficial effects of antiviral drugs must be balanced against possible immunosuppressive and other unpredictable side effects (Stalder, 1977) A clinical trial which investigated whether perioperative antiviral therapy is guaranteed for resection of HBV infections related hepatocellular carcinoma. Patients with large HBV-related HCC from January 2012 to December 2012, were retroactively allocated to one of two groups based on the fact that they received perioperative antiviral therapy (antiviral group) or did not receive (control group). Patients were consecutively recruited to address potential source of influence. Eliminations from these criteria included: other concurrent hepatitis (e.g. Hepatitis A Virus (HAV), Hepatitis C Virus (HCV), Hepatitis D Virus (HDV), Hepatitis E Virus (HEV), and autoimmune hepatitis) patients with ongoing major surgical procedures, such as bowel resection, bile duct resection etc. The findings of this study suggested that perioperative antiviral treatment enhances patient safety by decreasing morbidity and speeding up the recovery of postoperative liver function for HBV-related major HCC resection (Zhang et al., 2015) Another meta-analysis which was aimed to characterize HCC recurrence patterns after anti-viral therapy suggested that HCC recurrence rates after anti-viral therapy was rather promising and improving (Yopp, Odewole, & Singal, 2018) A clinical trial which was aimed to scrutinize the reactivation hepatitis B virus in primary hepatocellular carcinoma and to determine the effects of trans arterial chemoembolization (TACE) together with antiviral therapy. This prospective study involved 98 patients with HBV related HCC underwent TACE procedures with serial HBV DNA tests. Patients were separated into the antiviral treatment group and the no-antiviral group. The antiviral group was treated entecavir antiviral therapy and the other group received no antiviral therapy. Two groups of patients were compared in levels of HBV reactivation and liver function before and after only 1 session of TACE in average 1 month follow up after operation. The clinical trial concluded that antiviral therapy can minimize the risk of reactivation and help improve liver function after TACE (K. Wang, Jiang, Jia, Zhu, & Ni, 2018)

#### **5.4 Interferon therapy and clinical trials**

Interferons are cytokines which possess a variety of biologic properties such as antiviral, immunomodulatory, anti proliferative, and antiangiogenic effects (von Marschall et al., 2003) Interferon is very effective in suppressing the replication of HBV and is the first method approved for the treatment of chronic HBV infection which can ultimately result in HCC. Response to interferon treatment is associated with improved clinical outcome and less cirrhosis-related complications and long-term studies suggested that it may decrease the rate of HCC in patients with HBV-related cirrhosis (Q. Hu et al., 2014) A clinical trial was carried out to explain the influence of long term interferon administration on the level of occurrence of hepatocellular carcinoma (HCC) in patients with hepatitis B virus (HBV) related cirrhosis. 313 patients with HBV related HCC were gathered and 94 of them were treated with interferon for a little over 6 months and the remaining 219 individuals were administered with no interferon or any other antiviral drug. The results showed that interferon therapy for individuals with HBV related cirrhosis remarkably decreased the HCC rate, especially in patients with a bigger amount of serum HBV DNA. If interferon is administered properly for a selected group of individuals, a successful strategy of cancer prevention can be accomplished, even in patients with cirrhosis (Saitoh et al., n.d.) Another randomized controlled trial was conducted to investigate whether the prognosis after hepatic resection could be improved in patients with predominantly hepatitis B related hepatocellular carcinoma (HCC) with adjuvant interferon therapy. Since February 1999, patients with no post-surgical disease after hepatic resection for HCC were randomly allocated and administered with interferon (IFN-I group and IFN-II group) three times weekly for 16 weeks. Enrollment to the IFN II group was discontinued from January 2000 because adverse effects resulted in treatment termination in the first 6 patients. By June 2002, 40 patients each had been assigned into the control group and IFN I group. The baseline clinical, laboratory, and tumor characteristics of both groups were comparable. The results sophisticated that in a group of patients with predominantly hepatitis B related HCC complement interferon therapy showed a trend for survival benefit, primarily in tumors (Lo et al., 2007) A randomized clinical trial from Hong Kong suggested that IFN was associated with better overall survival in HCC patients (von Marschall et al., 2003) Another clinical study provided evidences that IFN inhibit the tumor growth and reduced micro vessel density (Zhuang, Zeng, Yang, & Meng, 2013)

#### **5.5 DNA vaccine and DNA analogues**

DNA based immunization is one of the latest version of vaccination methods and now is on the rise. Nucleotide analogs may be potent in minimizing the risk of recurrent HBV related HCC after curative treatment (Omata et al., 2017) Administration of massively expressed HCV core gene, as one huge dose or repeated injections of lesser doses, may suppress core specific immune response. Then, the latter is induced by a heterologous DNA prime or protein boost particle that eludes the negative effects of intracellular core expression (Alekseeva et al., 2009) Given the structural proteins of HCV-like particles (HCV-LPs) are presented in a native, virion

like conformation, the HCV LP is superior in eliciting a protective immune response compared with the recombinant subunit-based vaccine (Naderi et al., 2014) A DNA vaccine consisting AFP and HSP70 could generate antitumor immunity. Such effective AFP specific T cells response and explicit antitumor effects on AFP producing tumors induce clinical testing of this approach as a therapeutic vaccine for HCC (Rinaldi, Iurescia, Fioretti, Ponzetto, & Carloni, 2009) Alpha-fetoprotein (AFP) is generated principally in fetal liver, gastrointestinal tract and the yolk sac which temporarily exists during embryonic development. AFP is overexpressed in almost all of hepatocellular carcinoma (HCC) cases and thus offers an appealing target for immunotherapy against this neoplasm. Anti HCC effects were created in a therapeutic setting with a DNA vaccine encoding mouse AFP and co-expressing heat shock protein 70 (HSP70) gene. The vaccine prompted a marked and massively effectual AFP specific CTL reaction against AFP positive target cells. This vaccine also induced the elongation of life span in mice bearing the tumor and the HCC eradication. It is forecasted that vaccine strategies such as this may largely contribute to the future treatment of hepatocellular carcinoma effectively in clinical practice (Lan et al., 2007)

## **6. Overview of HCC vaccination strategies**

The main strategy of vaccination in HBV related HCC is to make individuals immunized. Especially in newborns whose mothers carry the HBV infection are at high risk of getting the virus. Administrating the HBV vaccine at birth trigger the acquired immunity passively and make the individuals fight against the virus if they encounter, preventing them from getting the virus and ultimately lessening the chances of acquiring HBV related HCC. Although there is no exact vaccine against HCC, many other vaccines are administered to minimize the side effects and avoid complications. Interferon therapy is mainly used to boost the immune system and potentially decrease the mutagenic environment inside the body and the effectiveness of interferon along with anti-viral therapy have showed promising results through many clinical trials.

Specific response for HCC was activated by strategies using tumor associated self-antigens. Gene array and proteomics studies have joined to the list of HCC specific gene outcomes that can be aimed (Vaccines, Bioscience, & Surgery, 2014) A DNA vaccine encoding AFP and HSP70 could trigger anti-tumor immunity. Very recently, the scientist Lan and his colleagues found out anti HCC effects in a therapeutic environment with a DNA vaccine encoding mouse AFP plus HSP70 genes. Therefore this vaccination strategy may contribute to successful treatments for human HCC in near future (Lan et al., 2007) Molecular chaperones, as for an example, heat shock protein 70 combined with other antigens can strongly elicit immunogenicity presumably through improved processing and presenting of antigens to their APCs (Lan et al., 2007) DNA vaccines act to an especially promising methodology against allergens, pathogens and cancer. Indeed, DNA based immunization induces very strong and powerful cellular and humoral immune response

against a variety of antigens, including tumor derived ones such as melanoma, breast cancer, ovarian carcinoma, prostate carcinoma, neuroblastoma, small cell lung cancer, etc. Gene based vaccines were evaluated either as preventative or therapeutic treatment for infectious illnesses, allergies and cancer including HCC (Ulmer, Wahren, & Liu, 2006) Uncharacterized, non-specific and mutated antigens also can be targeted with complete tumor cell or tumor lysate based immunization strategies, as well as using vectors carrying genes making tumor cells immunogenic. The immune system in these instances shall develop specificity against these new immunogenic target antigens (Rinaldi et al., 2009)

## **7. Future of HCC preventive vaccines**

There is a continuing need for innovative, alternative therapies for hepatocellular carcinoma (HCC). Molecular targeted vaccines and Immunotherapy of cancer is attractive because of the exquisite specificity of the immune responses.

### **7.1 Molecular targeted vaccines**

A number of molecular targeted agents have been methodically investigated including angiogenesis inhibitors such as ramucirumab and mTOR inhibitors such as everolimus. All of these molecular targeted vaccine trials were conducted in biomarker unselected HCC patients. However most of the ongoing trials have not shown survival benefits, many of the results are yet to be revealed.

### **7.2 Immunotherapy**

The concept of immunotherapy is the systemic and specific elimination of tumor, based on the expression of certain proteins by the tumor. To date, few different strategies of immune activation studies have demonstrated that biological activity in HCC individuals and a subset of those have demonstrated clinical efficacy. The published data provides evidence that adoptive transfer of activated effector cells and complex tumor derived vaccines can make an impact on the recurrence and survival of HCC subjects. Novel vaccines and combinations of vaccines with many more standard therapies are just initiating and hold a promising future for improvement in impact of immunotherapy for HCC (Vaccines et al., 2014)

## **8. Conclusion**

HCC is a very antagonistic cancer which affects majority of the people around the world. While Hepatitis B and Hepatitis C virus being the major two risk factors, chronic liver disease and cirrhosis also play a major role in hepatocellular carcinoma. HCC, of all liver cancers can be, prevented by appropriate methods such as HBV vaccination, anti-viral therapies, immunotherapies and advanced molecular methods. Universal screening and public education on alcoholism and intravenous drug using can also aid in preventing HCC.

Significant improvement in vaccines that are administered to prevent HCC, is shown throughout the time. DNA vaccines and immunotherapy are the main two fields scientists are working on in preventing vaccines and the future seems brighter. A vaccine against hepatitis C virus also can be expected within the next couple of years thanks to the major findings advances in clinical research. But more studies and research should be conducted in understanding how bio markers contribute to these instances. In order to prevent tumor regression and to modify the vaccines, studies should be carried out nonetheless.

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# Energy Optimization in Wireless Rechargeable Sensor Networks

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**Abstract**—Wireless sensor network is made up to detection stations. Wireless sensor networks give flexibility of communication in real world. From multiple nodes data is forwarded and connected with different networks via gateway. It improves the work performance in the field of industry and daily life. Charging duration of wireless rechargeable sensor networks (WRSN) is nothing less than a challenge. If we overcome this problem, these WRSNs would be acceptable at high rate worldwide. The problem that often comes while charging the wireless networks is the prior knowledge of the whole network and the power levels of each node. We are proposing a scalable solution where we don't need any prior knowledge of the network. We are using fuzzy inference system where we don't need to explore the full network as this is time consuming. An unmanned device will be used for this purpose that transfer the power wirelessly to the nodes and extends the wireless network's life. Fuzzy inference system is simple and flexible. Moreover, it covers wide range of operating situations.

## INTRODUCTION

A wireless sensor network (WSN) is a network consisting of partially distributed self-governing devices using sensors to guide the physical or environmental circumstances. A WSN system integrates a gateway that gives wireless connectivity back to the wired world and distributed nodes (see Figure 1). The wireless protocol that you are selected depends upon your application needs. Some of the valuable standards have 2.4 GHz radios based on either IEEE 802.15.4 or IEEE 802.11 (Wi-Fi) standards or proprietary radios, which are usually 900 MHz



Figure 1

With the development in fame of Wireless Sensor Networks (WSN), the essentials for appropriate systems swing out to be increasingly distinct. We can recover low cost sensors with sensor nodes when their power is getting low. But it's not a good approach. Because replacing through sensor nodes is dangerous and costly. However idea of charging the nodes is fine and demanding at the same time. The parameters that we used are capacity of nodes, voltage and distance. [2].

There are many methods to negotiate with increasing the life of a WSN (Wireless Sensor Networks) like communication protocols, smarter energy management, energy harvesting, reclamation and replacement. But we are going ahead to use a machine. That we can say will be unmanned and will fly. It is basically a vehicle type hardware that helps to charge WRSN. This has advantages, for example, the ability to reach areas that are difficult to get to but since it will fly so it needs more energy. Here is another solution with Mobile Charging Robot used for charging but it creates a problem of optimal path for the whole network as they can be large too. Also it needs a preceding knowledge of full network. Whereas in our proposed solution we don't need any preceding knowledge nor the power levels of nodes in the network and this is a best approach so far by using an algorithm and fuzzy system. This is a tractable solution also. Hence it reduces the computational cost, because of the reduction of data collection.

We are taking nodes capacity, network lifetime, their distance, residual energy, and charge power as the input and fuzzy inference system will diagnose the energy level of the nodes at high, medium and low scale. There are some constraints as well that are Resource limits, Coverage and connectivity, Mobility, Communication medium, fault tolerance and self-organization.

WSN nodes are locally configured in some network topology. The line topology is also proper equally when we use a UAV as the MCR, which has ability to rapidly cross the area. This layout is also very practical and used to cover, operate, or maintain line based systems such as power lines, oil lines, and bridges.

We assume the definition of WRSN life as the time a percentage of the network dies.

The main problem that we discuss in this paper is the stopping point in an exploration path, and the amount of power to charge every node. The problem is following: we have given a set of sensor nodes on a line graph with each node at an unknown power level, and a UAV as an MCR with limited power. We are trying to increase the life of the WRSN as close to optimal as it is possible. The network dies once  $k$  nodes reach zero residual energy. There is no knowledge of the exact power level of any node prior to the UAV visiting the node, making it only possible to distinguish the nodes that need to be charged after they are visited. On the other hand, we consider the nodes have a known discharge rate and a known power level at a previous time instance. The network size is such a way that if the UAV visits the entire network, it will only be able to charge a single node. The UAV can charge one node at a time, but may be possible to charge several nodes in a single round-trip. It needs to determine the farthest point. One of the key challenges connects with charging WRSN is deciding which node to charge if not all nodes can be charged. Deciding the power level of nodes in a WRSN is very important to completely charge the network. Charging and exploring a WRSN is based on the effectively collected power information, at the time of exploration. It enables the conservation of power and scalability of efficient WRSN charging.

#### RELATED WORK

Work done in past days holding to WRSN have different aspects. Some code the power replacement using different techniques. While other work addresses different network types. Some author's code scalability of WRSN, others address the levels of power knowledge needed through charging algorithm. We now discuss these efforts and how they associate to our work.

Firstly, Replacement of sensor nodes in WRSNs is studied extensively. There are different power replacements techniques are presented in literature. Energy harvesting techniques are discussed to recharge WRSN using solar cells, wind, vibration, temperature

difference, human blood pressure. Since all distant sources for power replacement are temporary. It is uncertain and hard to control energy harvesting. An inevitable source for energy replacement is presented, a battery-based power source. There are different methods to charge wireless nodes using radio frequency (RF) harvester and strong coupled magnetic resonance (SCMR). It is discussed that both are energy distant sources and devoted energy sources can be used to replace the wireless nodes using RF harvester. Since in our work, we used the unmanned aerial robot for wireless power transfer, so to come through the energy risks and limitations, and diminishing energy efficiency transfer with increasing distance in RF harvester technique, we choose the SCMR technique.

Nonmoving charging stations with partly coverage area is used to increase the lifetime of nonmoving sensor based WRSN where a single MCR or many MCRs are used to charge all nodes of the network periodically. In our work, we presented a single MCR to charge as we do not need to travel each node or visiting the whole network exhaustively.

Secondly, to optimize an expanding network, scalability of the network is also very important to detect, as defined in. An optimal solution is presented for optimal moving progress of MCR. Scalability in WRSN has been addressed using various MCR units for charging, by defining their synchronization and recharging activities. Using minimal number of MCR units with effective charging quality decreased an NP-Hard problem to a vehicular routing problem because of distance constraints. To modify scalability, an estimation algorithm is presented to cut off linear constraint, in a MCR is used to charge another MCR. Various nodes are charged at a same time. In our work, we presented a solution with a single MCR for a large area tied WRSN.

When the size of WRSN is increased, the cost for data propagation also increases. Several effective algorithms have been presented to decrease the sensors' energy to account data towards sink and modify data collection and refill of sensors both at same time, in two phases. Integrating both phases also cause an NP-Hard problem, demands full knowledge of power levels of nodes. A battery-aware mobile energy replacement and data collection method is presented which needs incomplete knowledge of sensor's power levels while differentiating the WRSN arbitrary. In our work, our proposed solution decreases the data propagation amount does not require any prior knowledge for charging using a single MCR.

When WRSNs size is increased, it is impossible to pile up the cost of power information. A power observance protocol is defined to solve this problem, however various MCR units are used and prior knowledge of nodes also needed. Most charging solutions needs full knowledge of all sensor nodes' power levels. Full knowledge is also necessary when addressing the charging problem as an optimization problem, where the ratio between the MCR leisure times over cycle time is increased. While sensor nodes are less energy exacting, most of the energy is swelled by the transceivers, and more power can be saved by decreasing energy information organization. This needs for energy information in moving limits the scalability of WRSN. We try to code WRSN scalability by destructing the need for a priori energy information.

Most of the solutions for WRSN need full knowledge of power levels. In an incomplete knowledge adaptive approach, power level information from negotiate of a subset of nodes was used to increase the lifetime of a WRSN. They choose a single MCR that update its path based on the energy redundant rate of the selected sight, consider they indicate the activity of nodes in their neighborhood. While this approach needs less information, it still requires a priori knowledge. Zero knowledge-based algorithms using several MCR units were existing for charging WRSN. The authors examine different charging algorithms, two of which were zero knowledge algorithms: (1) centralized charging (CC) and (2) distributed charging (DC). In both DC and CC, the MCR cautiously visits all the nodes in its denominating or discussing region, respectively. They reported that the no knowledge algorithms had lower performance when analyzing to other full or incomplete knowledge based progress when assuming network life. In this work, we present both a no-knowledge and a full-knowledge based progress using a single MCR. We did not examine our work to other zero-based knowledge approaches, since we use a single MCR while others use several. We also did not compare our work to other single MCR algorithms, since they need full sensor nodes' power knowledge. A full-knowledge progress imagine a priori knowledge of all sensor nodes' power levels, while a no-knowledge progress needs only the discharge rates and power levels at the last time of network skiing. Our no-knowledge progress renders close to the full-knowledge of network progress.

ANFIS DEFINED

The proposed architecture is to keep all the nodes in the network alive and moderate. Fuzzy logic is one of the

most efficient qualitative computer methods initially developed in the 1960s by Dr. Lotfi Zadeh of the University of California in Berkeley. It is a computer approach based on “degrees of truth, “i.e. membership, rather than the usual” true or false” logic (1 or 0), on which the modern computer is based.

An Adaptive Neuro fuzzy Inference System (ANFIS) is an Artificial Neural Network (ANN) approach that is functionally equivalent to a first-order Sugeno-style Fuzzy Inference System (FIS). Before using fuzzy logic, Boolean values have been used to represent the input feature, whereas in ANFIS, membership functions have been used. As in the car speed case

<i>Slow</i>	<i>medium</i>	<i>fast</i>	...	...	<i>output</i>
0	0	1			C
1	0	0			A

These are Boolean values to represent the speed of car, but with membership functions it will look like this

$\mu_{slow}$	$\mu_{medium}$	$\mu_{fast}$	<i>output</i>
0	0.25	0.75	C
0.9	0.1	0	A

The adaptive fuzzy rule based system is used to keep the wireless sensor network in moderate condition so that all nodes in the network remain active. Figuring out the problem area the expert system is meant to establish to define certain inputs as per the factors of sensor nodes. The fuzzy based solution analysis the condition of nodes and network and using the Sugeno model of ANFIS. The fuzzy expert system detect the node first that needs charging by the health of the node.

An architecture of energy optimization in wireless sensor networks is proposed by the input values on sensing nodes. There are various parameters that are responsible for the energy loss and with some other symptoms charging of network nodes can be optimized. Figure 2 shows the diagrammatical representation of wireless sensor network symptoms taken as inputs and their linkage with the ANFIS Sugeno model that produces the analytical risk quotient of node as output.

Based on the above parameters using Sugeno model, we designed certain predefined rules for the knowledge based fuzzy inference system for analyzing the charging

level of nodes in a sensor network. Following are some rules summed up:

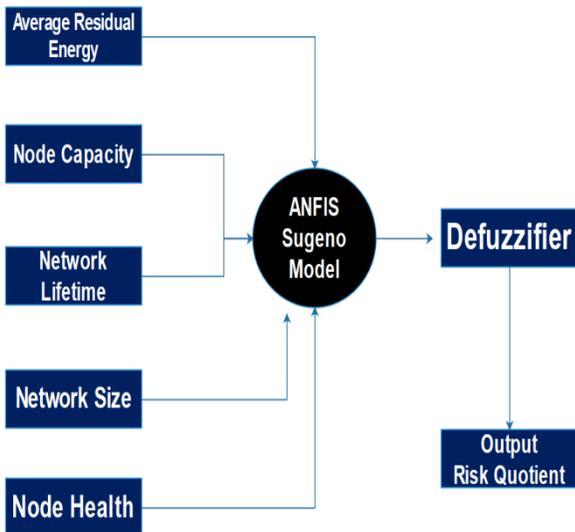


Figure 2

- If average residual energy = low and node capacity = small and network lifetime = low and network size = large and node health = weak then node condition = Weak
- If average residual energy = low and node capacity = medium and network lifetime = medium and network size = medium and node health = medium then node condition = Moderate
- If average residual energy = medium and node capacity = High and network lifetime = High and network size = small and node health = good then node condition = Active
- If average residual energy = high and node capacity = small and network lifetime = medium

and network size = medium and node health = good then node condition = Active

- If average residual energy = medium and node capacity = small and network lifetime = low and network size = large and node health = weak then node condition = Weak
- If average residual energy = medium and node capacity = medium and network lifetime = high and network size = small and node health = good then node condition = Active.
- If node capacity = small and network lifetime = low and network size = large and node health = normal then node condition = Weak
- If average residual energy = low and node capacity = small and network lifetime = low and network size = large and node health = weak then node condition = Weak
- If average residual energy = high and node capacity = small and network lifetime = low and network size = large and node health = weak then node condition = Weak
- If average residual energy = medium and node capacity = small and network lifetime = medium and network size = normal and node health = good then node condition = Active

#### PROPOSED SYSTEM

Charging the wireless network is nothing less than a challenge. There are several techniques to charge the wireless sensor network like communication protocols, energy harvesting, and periodic recharging etc. All of the techniques requires prior knowledge of the whole network before recharge them. Prior knowledge needs more cost and it takes extra time. We proposed a solution that saves the cost and it doesn't require any prior knowledge before charging.

Basically, an unmanned device is used that charges the sensor network wirelessly. Our charging solution doesn't require power levels of the nodes initially. It not only reduces the cost but also reduces the complexity, data collection and transmission power. However, charging the nodes without prior knowledge can be challenging.

Our device will start exploring the network with zero knowledge, at first it charge only one node. After exploring the whole network, it can charge multiple nodes at a time. After simulations, it can be found that any node in weak condition is charged at the top priority when the device completes its roundtrip as shown in the figure 3.

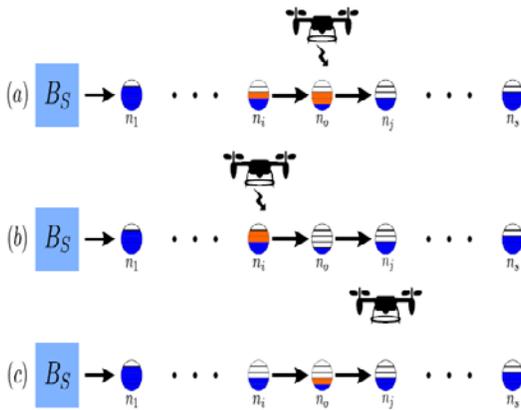


Figure 3

These are the nodes with energy levels. The general problem that is usually faced is the stopping point of the device. This can be overcome by the simulations. In this way it can easily identify which nodes to charge. The blue color indicates residual energy and orange indicates energy transmitted by the device. It can be done on a limited network but if the network limit or size exceeds then the limited size then a strategy of lithium ion batteries are used. Basically sensor nodes have same power capacity. We can assume that all nodes starts from the same power level. The main idea is to keep the network and nodes alive and in moderate condition so that the network doesn't die.

### SIMULATION BASED RESULT AND DISCUSSION

#### A. Fuzzy Inference System using Sugeno Model

In fuzzy inference system, Sugeno model is developed by defining average residual energy, node capacity, network lifetime, network size and node health as inputs and Node condition risk quotient as output as shown in figure 4.

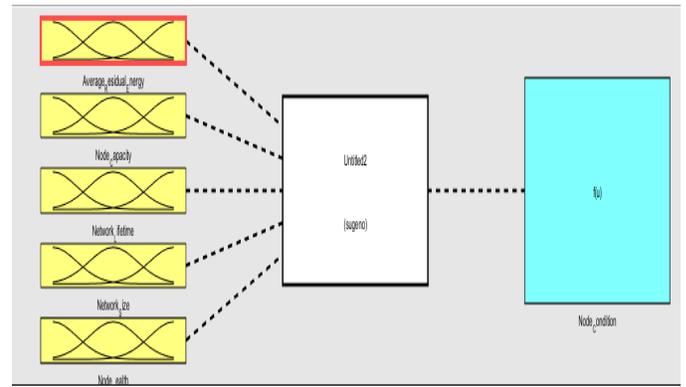


Figure 4

#### B. Membership Function Plot:

The major symptoms are taken as inputs and then according to the suitable ranges membership functions have been define that determines the condition of node ( Weak, Moderate, High) as shown in the figure 5.

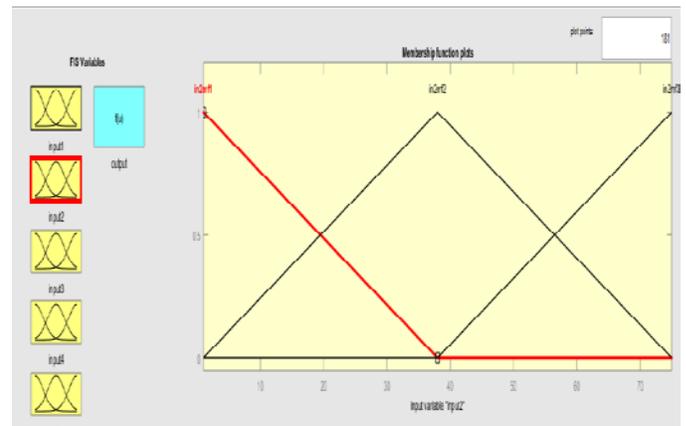


Figure 5

#### C. Rule Viewer:

On the basis of the if-then rules defined, a set of values are obtained and processed using rule viewer. The Rule Viewer presents the on sight view of the fuzzy inference system's process. The Rule Viewer also depicts how the shape of certain membership functions influences the final result. Each rule is a row of plots, and each column is a variable. The system has a single output (risk quotient), obtained using weighted average defuzzification process. In this research paper, linear type membership functions are used as shown in figure 6.

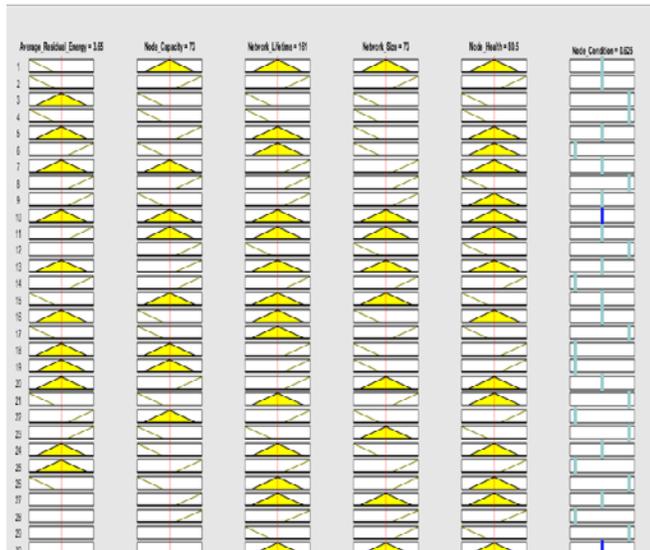


Figure 6

D. NFIS Training and Testing performance

70% of the processed data is used for training while 30% of the same data is utilized for testing purpose that represents the following data.

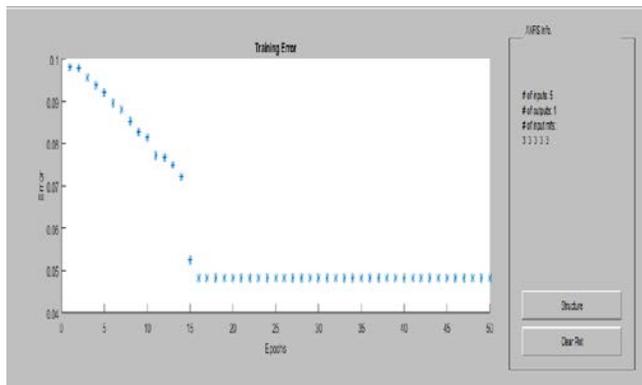


Figure 7

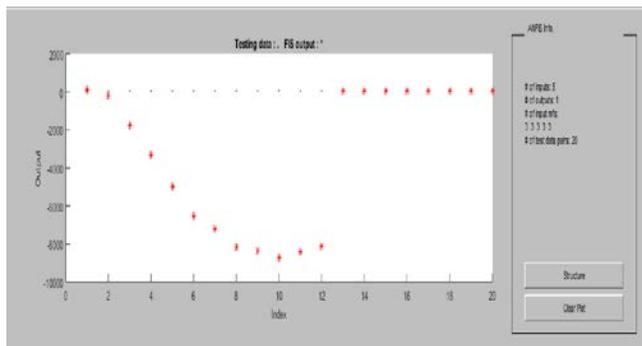


Figure 8

F. Surface Viewer for Node Condition:

After training and testing of the processed data, a 3-D surface plot is obtained as shown in Figure with any two input variables on the horizontal & vertical axis and the output variable on the third axis. The surface viewer provides the facility of examining it at different angles for any further corrections.

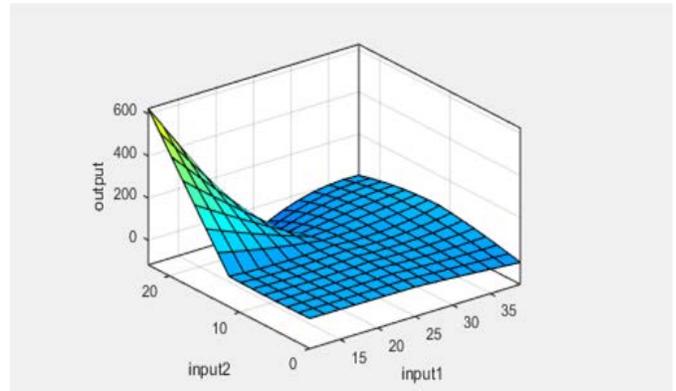


Figure 9

G. Neuro fuzzy Inference system model:

After the training of the system is completed using NFIS, the final neuro-fuzzy inference system model is obtained as shown in figure , indicating the five inputs and output as per their different combinations.

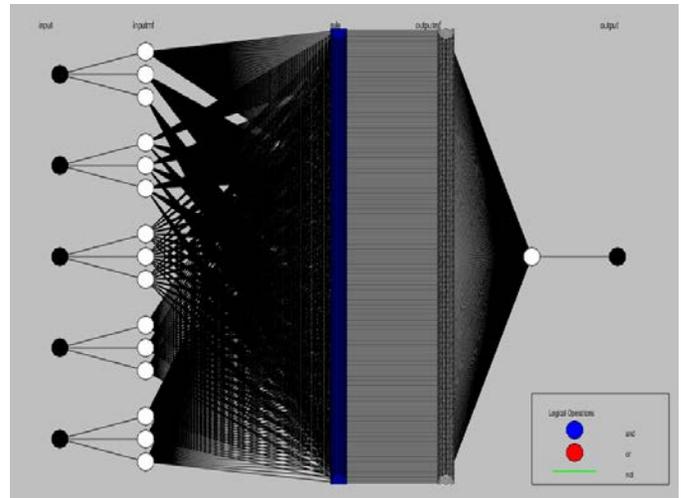


Figure 10

## CONCLUSION

In this paper we presented adaptive neuro fuzzy inference system to recharge the wireless sensor networks with a vehicle (mobile charging bot). This approach doesn't need any prior knowledge of the network that reduces the complexity and cost. The charging problem is no more a challenge by disjointing path planning. It enables the scalability in the charging procedure. The proposed solution is adjustable with the wireless sensor networks protocols. Through simulations we showed that minimal charging level of each node keep the network alive and in moderate condition. The research work is under consideration to cope with larger distances and different parameters.

In *Wireless Power Transfer Algorithms, Technologies and Applications in Ad Hoc Communication Networks*; Nikolettseas, S., Yang, Y., Georgiadis, A., Eds.; Springer

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# Calculation of Energy Levels and B(E2) for $^{20}\text{Ne}$ Isotope by Using Nuclear Shell Model

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**Abstract-** In this study, the energy levels and the probability of electric transition B(E2) of the  $^{20}\text{Ne}$  nucleus were calculated using the OXBASH code within the sd shell and the use of the effective interaction KUOSD. OXBASH is a computing code to perform a nuclear installation calculation based on a shell mode, Energy levels and the probability of electric transition is acceptable agreement with available experimental data.

**Index Terms-** OXBASH Code,  $^{20}\text{Ne}$  nucleus , Energy Levels, B(E2), sd shell

## I. INTRODUCTION

One of the criteria to improve investigations of nuclei properties is obtaining the energy levels and nuclear structure of nuclei ,nuclear models have the property to help us to better understanding of nuclear structure which includes main physical properties of nuclei, shell model is one of the most featured and successful nuclear models this model can be compared to the atomic shell model Atomic behaviors and properties can also be described with valence electrons that are outside of a closed shell similarly, nucleon valence (protons or neutrons) in a nucleus is placed outside the closed shell with magic numbers (2,8,20,28,50,82 and 126) play important roles in determining nuclear properties the nucleus with magic numbers is very stable and has completely different properties compared to their neighbors[1]. This model assumes that the nucleons are distributed at separate energy levels according to the Pauli principle, this nucleons move inside a mean field potential produced by the other nucleons[2]. Shell model calculations are performed out within a model space in which the nucleons are limited to a few orbits, when using suitable effective operators, taking into account the effect of the bigger model space ,this model offers a meaningful description of this observable[3].A study of nuclei in the sd shell thus leads to the best understanding between a macroscopic (collective) description and a microscopic description of the nucleus (shell model)[4]. The sd-shell core is considered to be an inert  $^{16}\text{O}$  core, on which the valence nucleus is distributed  $1d5/2$ ,  $2s1/2$  and  $1d3/2$  status[5].

## II. THEORY

The calculations of the shell model include single-particle energies (SPE) and two-body interaction matrix elements or called two-body matrix elements (TBME), recently this group was

named (effective interaction) or (model space Hamiltonian). This model space Hamiltonian can be described in two ways: one method is a "realistic" which is created for a particular shell model space of known data on the free nucleon-nucleon force. The second method is "experimental" which is found in the parameters whose values are specified by agreement between measured level energies and shell model eigenvalue [6].For calculations can be written the shell model Hamiltonian as follows[7].

$$H = \sum_i \varepsilon_i n_i + \sum_{ijkl} V_{ijkl} a_i^\dagger a_j^\dagger a_i a_j$$

Where:

$\varepsilon_i$  : single particle energy of orbit i, -: the single

$n_i$  : stands for the number operator of the orbit i

$V_{ijkl}$  : the two body matrix elements for the nucleon-nucleon interaction of orbits(i,j,k,l)

$a_i^\dagger$  :  $a_j^\dagger$  , Creation operators

$a_i$  Annihilation operators :  $a_j$  ,

It is important to know that there are residual interactions between each of the particles in each case (secondary shells) and that the remaining interactions are observed in the secondary shell if they are partially full, and the angular momentum and parity of the ground state of the nucleus can be determined by the remaining interactions, the nucleic levels of the nucleus have a momentum equal to zero and their positive parity. The nucleons in the secondary shell give double energy in which the values of  $M_j$  are inverse and the number of magnetic quantities takes the following values:[8]

$$M_j = j, (j-1), \dots, 1/2, -1/2, \dots, -(j-1), -j$$

The probability of electric transition can be calculated by equation:[9]

$$B(EL: J_i \rightarrow J_f) = \frac{1}{(2J_i + 1)} \sum_{M_i M_f} \left| \langle \psi_{J_f M_f} | T_{LM}^{(E)} | \psi_{J_i M_i} \rangle \right|^2$$

$$\left( \frac{2J_f + 1}{2J_i + 1} \right) \left| \langle \psi_{J_f} | T_L^{(E)} | \psi_{J_i} \rangle \right|^2 =$$

Where  $T_L^{(E)}$  is the electric multipole operator ,  $J_i$  and  $J_f$  are the spin of the initial and final states, respectively

### III. SHELL MODEL CALCULATION

Calculations of energy levels and B(E2) were made with the code OXBASH[10]. OXBASH is using an m-scheme Slater determinant basis with wave functions and good angular momentum J, isospin T is constructed, this program is the only version that uses the projection technology, the sd model spaces contain (0d5/2, 1s1/2, and 0d3/2) above the N = 8 and Z = 8 closed shells for neutrons and protons [11]. Considering the number of valence nucleons for Neon isotopes, the sd model space is the appropriate area for our calculations, Where it is calculated energy level and B(E2) for 20Ne employing harmonic oscillator potential (HO, b), b<0 for Ne isotope within this space . In this work, we focus our attention on the description of energy levels and B(E2) of sd shell of 20Ne isotopes which have configurations( 0d5/2, 1s1/2 and 0d3/2) ,the sd model space with KUOSD interaction

#### 3.1 Energy levels of <sup>20</sup>Ne nucleus

According to the shell model, the ground state of <sup>20</sup>Ne nucleus is a closed <sup>16</sup>O core , with J =0+ and T=0,the excited states consist of the configuration of the nucleons in the sd-shell .in this work we use KUOSD interaction and single-particle energies (SPEs) are {1d5/2=-4.150,2s1/2=-3.280 and 1d3/2=0.930} respectively.The table(1) shows a comparison between theoretical results and available experimental results[12] for Neon isotopes by using KUOSD interaction. From the down table KUOSD Hamiltonians agree reasonably well with experimental data .

The ground state was confirmed 0<sup>+</sup>.The agreement is good for the states of with experimental values.

The agreement is good for the states (3<sub>1</sub><sup>+</sup>, 1<sub>1</sub><sup>+</sup>, 2<sub>6</sub><sup>+</sup>, 2<sub>8</sub><sup>+</sup>, 6<sub>3</sub><sup>+</sup>, 2<sub>1</sub><sup>+</sup>, 4<sub>1</sub><sup>+</sup>, 0<sub>2</sub><sup>+</sup>, 6<sub>1</sub><sup>+</sup>, 2<sub>2</sub><sup>+</sup>, 4<sub>2</sub><sup>+</sup>, 2<sub>3</sub><sup>+</sup>, 2<sub>4</sub><sup>+</sup>, 4<sub>3</sub><sup>+</sup>, 1<sub>2</sub><sup>+</sup>, 8<sub>1</sub><sup>+</sup>, 0<sub>3</sub><sup>+</sup>, 4<sub>4</sub><sup>+</sup>, 2<sub>5</sub><sup>+</sup>, 6<sub>2</sub><sup>+</sup>, 4<sub>5</sub><sup>+</sup>, 4<sub>7</sub><sup>+</sup>, 6<sub>3</sub><sup>+</sup>, 4<sub>8</sub><sup>+</sup>, 8<sub>2</sub><sup>+</sup>, 4<sub>9</sub><sup>+</sup>, 0<sub>5</sub><sup>+</sup>, 6<sub>5</sub><sup>+</sup>, 4<sub>10</sub><sup>+</sup>, 6<sub>6</sub><sup>+</sup>, 6<sub>7</sub><sup>+</sup>, 6<sub>8</sub><sup>+</sup>, 8<sub>3</sub><sup>+</sup>) as compared with the experimental data. This study also confirmed the angular momentum and parity for energies (11.653,14.455,14,731,14.653,16.010,15.970,17.910)MeV with states (3<sub>2</sub><sup>+</sup>, 2<sub>7</sub><sup>+</sup>, 4<sub>6</sub><sup>+</sup>, 0<sub>4</sub><sup>+</sup>, 2<sub>9</sub><sup>+</sup>, 6<sub>4</sub><sup>+</sup>, 0<sub>6</sub><sup>+</sup>) after comparing them with our theoretical values. The total angular momentum values were confirmed without parity for level 2<sub>10</sub><sup>+</sup>.

The values of experimental energies ( 13.426,14.313,15.436) MeV were confirmed for angular momentum ( 5<sub>2</sub><sup>+</sup>, 3<sub>5</sub><sup>+</sup>, 3<sub>6</sub><sup>+</sup>) with positive parity.

The agreement is good for angular momentum without parity for state

(5<sub>4</sub><sup>+</sup>, 3<sub>3</sub><sup>+</sup>, 5<sub>3</sub><sup>+</sup>, 7<sub>1</sub><sup>+</sup>, 3<sub>7</sub><sup>+</sup>, 3<sub>8</sub><sup>+</sup>, 3<sub>9</sub><sup>+</sup>, 5<sub>7</sub><sup>+</sup>, 7<sub>3</sub><sup>+</sup>, 5<sub>8</sub><sup>+</sup>, 7<sub>4</sub><sup>+</sup>, 7<sub>5</sub><sup>+</sup>, 3<sub>4</sub><sup>+</sup>, 5<sub>5</sub><sup>+</sup>, 5<sub>6</sub><sup>+</sup>, 7<sub>2</sub><sup>+</sup>, 5<sub>10</sub><sup>+</sup>).

The levels of for which the angular momentum and parity are yet unknown at the states

(5<sub>4</sub><sup>+</sup>, 1<sub>5</sub><sup>+</sup>, 1<sub>6</sub><sup>+</sup>, 1<sub>7</sub><sup>+</sup>, 0<sub>7</sub><sup>+</sup>, 1<sub>8</sub><sup>+</sup>, 5<sub>9</sub><sup>+</sup>, 1<sub>9</sub><sup>+</sup>, 0<sub>8</sub><sup>+</sup>, 1<sub>10</sub><sup>+</sup>, 0<sub>9</sub><sup>+</sup>, 6<sub>10</sub><sup>+</sup>, 0<sub>10</sub><sup>+</sup>, 3<sub>10</sub><sup>+</sup>)

And through our calculations we noticed that the highest energy value is (24.25)MeV for angular momentum and parity 7<sub>5</sub><sup>+</sup> of reaction KUOSD, while the highest experimental value is (28.20)MeV.

**Table1.Comparison of the experimental excitation energies[12] and excitation energies predictions for <sup>20</sup>Ne nucleus by using KUOSD interactions**

J <sup>+</sup> (OXBASH)	Energy (OXBASH) KUOSD(ME)	Energy(exp) (MeV)	J(exp)
0 <sub>1</sub>	0.0	0.0	0 <sup>+</sup>
2 <sub>1</sub>	1.455	1.633	2 <sup>+</sup>
4 <sub>1</sub>	3.861	4.247	4 <sup>+</sup>
0 <sub>2</sub>	6.81	6.725	0 <sup>+</sup>
6 <sub>1</sub>	8.188	8.777	6 <sup>+</sup>
2 <sub>2</sub>	8.434	7.833	2 <sup>+</sup>
4 <sub>2</sub>	10.181	9.990	4 <sup>+</sup>
2 <sub>3</sub>	10.374	10.273	2 <sup>+</sup>
3 <sub>1</sub>	10.692	10.694	4,3 <sup>+</sup>
2 <sub>4</sub>	11.097	10.940	2 <sup>+</sup>
4 <sub>3</sub>	11.188	11.090	4 <sup>+</sup>
1 <sub>1</sub>	11.781	11.262	1 <sup>+</sup>
3 <sub>2</sub>	11.904	11.653	(3 <sup>+</sup> )
8 <sub>1</sub>	12.358	11.951	8 <sup>+</sup>
5 <sub>1</sub>	12.482	12.713	5 <sup>-</sup>
0 <sub>3</sub>	12.812	12.436	0 <sup>+</sup>
4 <sub>4</sub>	12.842	13.048	4 <sup>+</sup>
2 <sub>5</sub>	13.185	13.095	2 <sup>+</sup>
5 <sub>2</sub>	13.204	13.426	(5 <sup>-</sup> )
3 <sub>3</sub>	13.332	13.226	3 <sup>-</sup>
1 <sub>2</sub>	13.379	13.307	1 <sup>+</sup>
6 <sub>2</sub>	13.412	13.105	6 <sup>+</sup>
3 <sub>4</sub>	13.427	13.414	3 <sup>-</sup>
2 <sub>6</sub>	13.55	13.592	2 <sup>+</sup>

1 <sub>3</sub>	13.629	13.736	1 <sup>+</sup>
1 <sub>4</sub>	13.942	14.200	1 <sup>+</sup>
4 <sub>5</sub>	14.12	14.270	4 <sup>+</sup>
2 <sub>7</sub>	14.382	14.455	0 <sup>+</sup> ,2 <sup>+</sup> )
5 <sub>3</sub>	14.649	14.816	5 <sup>-</sup>
4 <sub>6</sub>	14.733	14.731	(4 <sup>+</sup> )
0 <sub>4</sub>	14.865	14.653	(0 <sup>+</sup> )
3 <sub>5</sub>	14.931	14.313	(3 <sup>-</sup> )
7 <sub>1</sub>	14.972	15.366	7 <sup>-</sup>
2 <sub>8</sub>	15.04	15.047	2 <sup>+</sup>
4 <sub>7</sub>	15.2	15.330	4 <sup>+</sup>
6 <sub>3</sub>	15.235	15.159	6 <sup>+</sup>
3 <sub>6</sub>	15.490	15.436	(3 <sup>-</sup> )
4 <sub>8</sub>	15.856	16.329	4 <sup>+</sup>
5 <sub>4</sub>	15.888	-----	-----
3 <sub>7</sub>	15.952	16.136	3 <sup>-</sup>
2 <sub>9</sub>	15.977	16.010	(2 <sup>+</sup> )
6 <sub>4</sub>	16.138	15.970	(6 <sup>+</sup> )
2 <sub>10</sub>	16.324	16.437	(0,2,4) <sup>+</sup>
8 <sub>2</sub>	16.374	16.746	8 <sup>+</sup>
3 <sub>8</sub>	16.46	16.628	3 <sup>-</sup>
5 <sub>5</sub>	16.566	16.559	5 <sup>-</sup>
4 <sub>9</sub>	16.592	16.667	4 <sup>+</sup>
1 <sub>5</sub>	16.829	-----	-----
3 <sub>9</sub>	17.041	17.284	3 <sup>-</sup>
0 <sub>5</sub>	17.155	16.732	0 <sup>+</sup>
6 <sub>5</sub>	17.383	17.541	6 <sup>+</sup>
0 <sub>6</sub>	17.568	17.910	(0 <sup>+</sup> )
4 <sub>10</sub>	17.624	17.769	4 <sup>+</sup>
5 <sub>6</sub>	17.895	17.851	5 <sup>-</sup>
1 <sub>6</sub>	17.941	-----	-----
7 <sub>2</sub>	18.037	18.005	7 <sup>-</sup>
3 <sub>10</sub>	18.038	-----	-----
6 <sub>6</sub>	18.174	18.286	6 <sup>+</sup>
5 <sub>7</sub>	18.733	18.494	5 <sup>-</sup>
7 <sub>3</sub>	18.848	18.768	7 <sup>-</sup>
1 <sub>7</sub>	18.873	-----	-----
0 <sub>7</sub>	18.94	-----	-----
6 <sub>7</sub>	18.988	18.745	6 <sup>+</sup>
1 <sub>8</sub>	19.332	-----	-----
5 <sub>8</sub>	19.412	19.859	5 <sup>-</sup>
5 <sub>9</sub>	19.624	-----	-----
6 <sub>8</sub>	19.736	19.655	6 <sup>+</sup>
1 <sub>9</sub>	20.264	-----	-----
0 <sub>8</sub>	20.45	-----	-----
6 <sub>9</sub>	20.466	20.445	6 <sup>+</sup>
5 <sup>10</sup>	20.476	20.468	5 <sup>-</sup>
7 <sub>4</sub>	20.78	20.760	7 <sup>-</sup>
1 <sub>10</sub>	21.023	-----	-----
0 <sub>9</sub>	21.075	-----	-----
6 <sub>10</sub>	21.802	-----	-----
0 <sub>10</sub>	22.144	-----	-----
8 <sub>3</sub>	22.771	23.40	8 <sup>+</sup>
7 <sub>5</sub>	24.254	22.30	7 <sup>-</sup>

### 3.2 Reduced electric quadrupole transition probability B(E2) Calculation:

The B(E2) has been predicted for the  $^{20}\text{Ne}$  isotope nuclei within the nuclear shell model, by using KUOSD interactions. With the harmonic oscillator potential (HO,  $b$ ), the transition probabilities were calculated for  $b < 0$  [13]. The comparison between experimental B (E2) and theoretical shows an advantage for KUOSD calculations for many levels. The primary polarization effect was included by selecting the effective charge for proton and neutrons  $e_p = e_n = 0.350$  respectively. Comparison of calculated values with available experiment data [12] is shown in Table.2 ,New electric B(E2) transitions were expected in our results by using (KUOSD) interaction of the studied isotope. transition probabilities B(E2) gives agreeable agreement comparing with experimental data.

**Table2.Comparison of the B(E2) results for  $^{20}\text{Ne}$  nucleus with the experimental data[12]**

$J_j^+ \rightarrow J_i^+$	B(E2) our.Results ( $e^2 \text{ fm}^4$ ) $e_n=0.350, e_p=0.350$	B(E2) Exp.Results ( $e^2 \text{ fm}^4$ )
$2_1 \rightarrow 0_1$	59.04	65.46
$2_2 \rightarrow 0_1$	0.0098	2.35
$4_1 \rightarrow 2_1$	73.53	70.94
$2_2 \rightarrow 2_1$	2.612	5.48
$0_2 \rightarrow 2_1$	13.98	11.60
$3_1 \rightarrow 2_1$	0.0297	
$4_2 \rightarrow 2_1$	3.447	26.76
$1_1 \rightarrow 2_1$	0.3683	
$3_2 \rightarrow 2_1$	0.3011	
$1_2 \rightarrow 2_1$	0.2690	
$2_2 \rightarrow 4_1$	1.186	
$6_1 \rightarrow 4_1$	59.99	64.49
$3_1 \rightarrow 4_1$	0.5387	
$4_2 \rightarrow 4_1$	0.2108	
$3_2 \rightarrow 4_1$	0.1390	
$5_1 \rightarrow 4_1$	0.3331	
$5_2 \rightarrow 4_1$	0.8671	
$6_2 \rightarrow 4_1$	0.7837	
$2_2 \rightarrow 0_2$	18.76	
$4_2 \rightarrow 6_1$	10.49	
$8_1 \rightarrow 6_1$	38.35	29.02
$5_1 \rightarrow 6_1$	2.560	
$5_2 \rightarrow 6_1$	0.04356	
$6_2 \rightarrow 6_1$	0.9021	
$7_1 \rightarrow 6_1$	0.0006437	
$7_2 \rightarrow 6_1$	0.1091	
$8_2 \rightarrow 6_1$	1.464	
$3_1 \rightarrow 2_2$	10.31	
$4_2 \rightarrow 2_2$	0.1504	
$1_1 \rightarrow 2_2$	0.6821	
$3_2 \rightarrow 2_2$	0.8443	
$1_2 \rightarrow 2_2$	0.7005	
$1_1 \rightarrow 3_1$	20.57	
$3_2 \rightarrow 3_1$	8.108	
$1_2 \rightarrow 3_1$	0.04564	
$5_1 \rightarrow 3_1$	26.23	
$5_2 \rightarrow 3_1$	0.2754	
$1_1 \rightarrow 3_2$	28.82	
$1_2 \rightarrow 3_2$	0.007264	
$5_1 \rightarrow 3_2$	0.1324	
$5_2 \rightarrow 3_2$	11.96	
$3_1 \rightarrow 4_2$	3.177	
$3_2 \rightarrow 4_2$	5.354	
$5_1 \rightarrow 4_2$	7.665	

$5_2 \rightarrow 4_2$	13.90	
$6_2 \rightarrow 4_2$	0.07915	
$5_2 \rightarrow 5_1$	1.578	
$6_2 \rightarrow 5_1$	17.20	
$7_1 \rightarrow 5_1$	18.72	
$7_2 \rightarrow 5_1$	1.740	
$6_2 \rightarrow 8_1$	0.8867	
$7_1 \rightarrow 8_1$	4.244	
$7_2 \rightarrow 8_1$	0.4456	
$8_2 \rightarrow 8_1$	2.637	
$6_2 \rightarrow 5_2$	1.162	
$7_1 \rightarrow 5_2$	3.502	
$7_2 \rightarrow 5_2$	0.6213	
$7_1 \rightarrow 6_2$	3.252	
$7_2 \rightarrow 6_2$	0.02658	
$8_2 \rightarrow 6_2$	26.69	
$7_2 \rightarrow 7_1$	5.588	
$8_2 \rightarrow 7_1$	13.41	
$8_2 \rightarrow 7_2$	1.940	
$1_2 \rightarrow 1_1$	9.675	

#### IV. CONCLUSIONS

The calculations were performed using the OXBASH code. The study demonstrated that the interaction files are consistent with the experimental data available newly. Calculations of energy levels and reduced probabilities of the  $B(E2)$  transitions for  $^{20}\text{Ne}$  were carried out within the sd shell by using effective interaction KUOSD. We deduce the shell model configuration mixing are very successful in this model space. In our calculations, new energy levels have been predicted and many levels that are not experimentally confirmed have been confirmed.

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# Strategic Planning Analysis of Information System Technology Using SWOT Method

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**Abstract-** Based on the results of planning analysis conducted, based on the 4 main aspects of SWOT namely Strengths, Weaknesses, Opportunities, and Threats, then obtained that are identified by priority category. Planning to allocate resources from those found, can be controlled by the suggested controls of the SWOT method based on the process undertaken by the researcher, in the hope of developing an effective and efficient business. Planning has weaknesses and advantages of information technology, especially infrastructure can be anticipated processes that can be planned advantage. risks that arise in companies with high workloads related to information technology infrastructure and complex problems, but lack of personnel so How the results of identification of effective and efficient infrastructure planning can support the business and economy of a company using the SWOT method (Strengths, Weaknesses, Opportunities, Threats) and how well an efficient and effective strategy in building a technology in a company helps businesses grow. The goal is to produce an overview of priorities and the risk of the use of information technology, to produce a strategy and implement the strategic planning of the use of information technology.

**Index Terms-** Planning, Infrastructure, Opportunity, Strategis, SWOT

## I. INTRODUCTION

Along with the rapid development of information and Business technology has brought various positive impacts to the growth of a company. Utilization of Technology as a progress and the importance of business to carry out various interaction, communication, transaction, or cooperation have shifted paradigm conventional (traditional) for society in carrying out its daily activity. Information technology currently has a big effect on the company's performance in running its business process, the more advanced and sophisticated information technology in a company, it will put the company at the forefront in today's business competition. The company has plans and strategies to meet the needs of hardware and software infrastructure that can support the company's business that can control the changes that occur to the infrastructure or services within the company so that the planning process is conducted in a controlled manner and allows the changes to be carried out with minimum and effective risk. With the development of technology today the needs of technology in a company becomes very important in determining the progress of a company. Information technology is a major requirement in the design of infrastructure that will affect the development of the

company. Besides, the company also needs an infrastructure system that can manage well data and Application. This strategic plan aims to identify the factors found on the use of information technology. Using the method of analysis is the method of Strengths, Weaknesses, Opportunities, Threats (SWOT), SOWT SWOT Method is a strategic planning method used to evaluate strengths, weaknesses, opportunities (opportunities), and threats in a project or a business speculation. The four factors that make up the SWOT (strengths, weaknesses, opportunities, and threats). SWOT will be better discussed using tables made in large paper, so it can be well analyzed relationship of every aspect.

This process involves determining the specific objectives of business or project speculation and identifying internal and external factors that support and which are not in achieving that goal. The SWOT analysis can be applied by analyzing and sorting things that affect the four factors, then applying them in SWOT matrix images, where the application is how strengths are able to take advantage of existing opportunities, how to overcome weaknesses (weaknesses) that prevent the advantages of existing opportunities, then how strengths are able to deal with existing threats, and the last is how to overcome weaknesses that can make threats real or create a new threat. SWOT focuses on business needs and focuses on the time spent analyzing technology within an organization. In the process of strategic analysis using the SWOT method, will be generated documents that include data threats, prioritize the threats and create a list of controls.

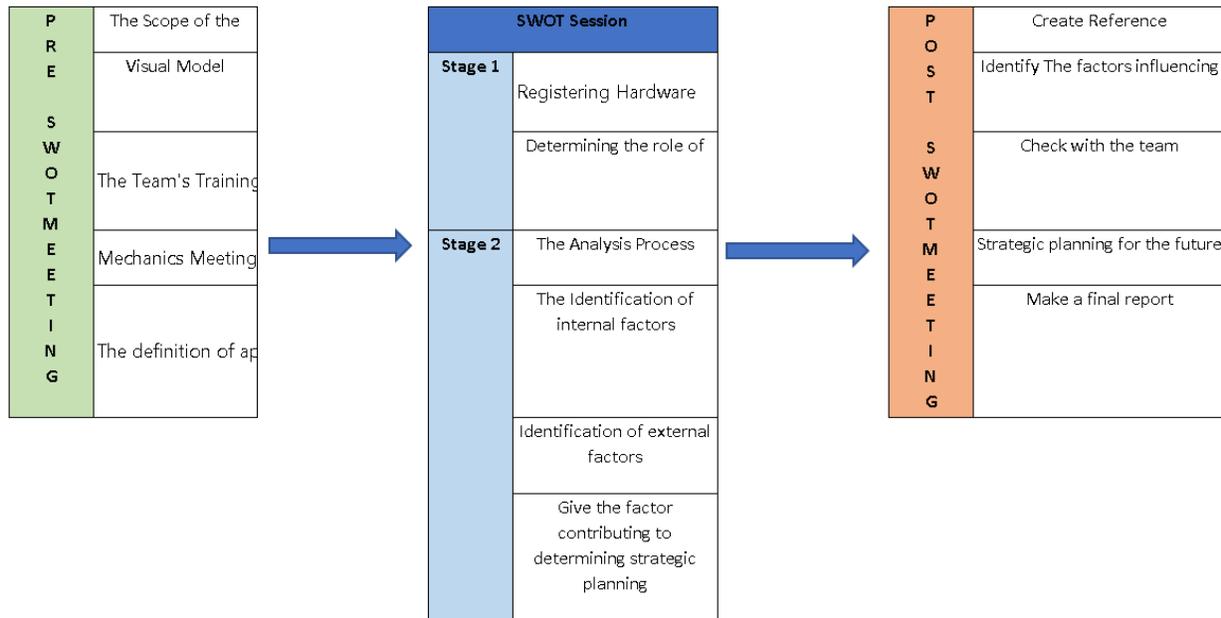
## II. MATERIAL AND METHODOLOGY

SWOT analysis is a systematic identification of various factors for formulating a firm's strategy based on logic that maximizes strength and opportunity, while simultaneously minimizing weaknesses and threats. Strategic decision-making is always concerned with the development of corporate mission, goals, strategies and policies. Thus, strategic planning should analyze the company's strategic factors (strengths, weaknesses, opportunities and threats) in the current situation called Situation Analysis. The SWOT analysis will be mapped from the environmental analysis results. Strengths are identified with the aim of knowing what organizational strengths can be to continue and sustain business. Knowing the strengths of an organization will be able to maintain and even increase its strength as a capital to compete. Identifying weaknesses aims to be able to know what weaknesses are still there, and by knowing those weaknesses, then the company can strive to improve in order to get better. Weaknesses that are not or late identified will be detrimental to the

company. Therefore, with the sooner know the weakness, then the company can also as soon as possible find a solution to be able to cover these weaknesses. By knowing the opportunities, both current opportunities and opportunities in the future, the company can prepare to be able to achieve these opportunities. Strategies can be prepared early and better planned so that identified opportunities can be realized. Various avenues to be able to realize opportunities / opportunities and maintain the continuity of

business organizations will certainly experience many threats. Threats that can be identified can be resolved so that the organization can minimize the threat.

SWOT analysis is the systematic identification of various factors to formulate a company strategy, this analysis is based on logic that can maximize strength and opportunities, while simultaneously minimizing weaknesses and threats.



**Major Components in SWOT**

This analysis is based on the assumption that an effective strategy will maximize the strengths and opportunities and minimize the weaknesses and threats. When applied accurately, these simple assumptions have enormous impact on the design of a successful strategy and an environmental analysis of the industry presents the information needed to identify opportunities and threats that exist within the enterprise environment.

**a. SO Strategy**

This strategy is based on the company's way of thinking, that is by Utilizing all the power to seize and take advantage of opportunities as much as possible

**b. Strategy ST**

This is a strategy in using the power the company has to deal with threats

**c. WO Strategy**

This strategy is implemented based on the utilization of existing opportunities by How to minimize existing weaknesses

**d. WT Strategy**

This strategy is based on defensive activities and trying to minimize existing weaknesses and avoid threats with the SWOT can then make strategic planning that can support Internal and External.

Application of strengths, weaknesses, opportunities threats.

In conducting an analysis of SWOT conducted at, the author uses descriptive qualitative methods that produce descriptive data (not numbers), in the form of speech or writing and behavior that can be observed through the Strengths, Weaknesses, Opportunities and Threats (SWOT) approach. The process of taking data through the interview stage, and field observations accompanied by those responsible in their respective Stage 1 SWOT Session

**a. Introducing the Self Identity of the SWOT Team**

In this initial session, the author opens the discussion process, first asking each team member to introduce themselves and their positions,

**b. Determining the Role of the SWOT Team**

During this phase, the SWOT team will be given an overview of the process they will take part in in accordance with their respective areas of work focus. They will also be asked for statements about the scope, and then the author will provide an overview of the process under review (visual model).

**Stage 2 SWOT Session**

**a. Brainstorming process**

The brainstorming process explains that the author will display the definitions and some examples of risky threats to the SWOT team according to the scope specified in the Pre-SWOT session. Then the SWOT team wrote threats based on 3 types of integrity, confidentiality, and availability in each field. The results of the brainstorming stages are the collection of factors identified and used to determine planning priorities.

The following are examples of definitions and threats displayed:

Topic factor: Confidentiality

Definition: Information that is on that confidential and only authorized parties can access this information.

Point factor: a. Planning in the future

b. Technology planning

fields until the final report making process is obtained primary data and secondary data which are supporting research data obtained through searching using intermediary media which will be processed by researchers. Through qualitative methods, the author can get to know the subject's environment and see them develop definitions and give opinions about aspects studied. In addition, learning can also be done about experiences or risks that may have never been known before. In this qualitative method, it is possible for the writer to investigate the concepts that are actually encountered in daily operations. Adjusting to the limited number of organizational structures, this research is not taken from a particular population to get a representative sample, but rather refers to the term participant, which is data taken from the organization by referring to local experts or key individuals who understand their respective fields -that. They are interested parties and viewed from the responsibilities and positions within the organizational structure. Broadly speaking, the stages of the method of work in the preparation of this research are divided into 7 stages:

1. Introduction
2. Data Collection Phase
3. Stage of Understanding the Current Situation
4. Estimating Phase of Future Needs
5. Determination stage of infrastructure portfolio
6. Infrastructure Mapping Phase
7. Final stage

1. Introduction

In this preliminary stage, it contains literature studies and survey objects. This activity begins by gathering all existing literature and is related to supporting research, reviewing other topics related to and linking all existing variables. Object surveys were conducted to find out the vision, mission, and matters relating to research needs.

2. Data Collection Phase

At this stage, information about the suitability and relevance of the existing strategies and the things needed to make improvements with the new strategy, how they integrate with others (including business unit plans, IS / IT strategies and application interfaces, coordination, scheduling and time scales), management, control and resources, studying the problems that

have existed to be resolved. The data collection process is carried out by means of, among others:

- a. Fill out questionnaires from the director level to the section head level in the organizational structure.
- b. Conduct interviews directly with directors, division heads, service heads, and section heads.
- c. Study the work documents of the Technology Services Company

3 phases of understanding the current situation

This stage is a stage for analyzing and understanding the current conditions and interpreting the Construction Services Company business needs to find out the strengths, weaknesses, opportunities and threats currently being faced by the Current Internal / External Business environment. This analysis is conducted to understand the internal / external environment of IS / IT in the Construction Services Company, which later serves to identify the current IS / IT in the technology service company, maturity, business contribution, resource expertise, technology infrastructure, applications used, and technology trend. The goal is not only to implement the latest technology, but also to find ways to use existing technology / have been used more economically, effectively and efficiently. SWOT Analysis This analysis is conducted to determine the current situation such as the strengths, weaknesses, opportunities, and threats that exist in PT. Sapta Tunas. This analysis illustrates how the strengths and weaknesses of a company or organization can exploit opportunities and minimize the impact of external threats faced by Technology Services Companies

4 Stages Estimating Future Needs

At this stage an analysis is carried out to determine the potential business needs and future IS / IT by identifying several factors that can influence business strategy and can improve performance. In this preliminary stage, it contains literature studies and survey objects. This activity begins by gathering all existing literature and is related to supporting research, reviewing other topics related to and linking all existing variables. Object surveys were conducted to find out the vision, mission, and matters relating to research needs.

5. Determination stage of technology portfolio

At this stage, mapping applications is needed based on the functions of each part of the organization in the four quadrants in the McFarlan application portfolio model, namely Support, Key Operational, Strategic or High Potential. Based on the mapping, it will be able to find out the three components of the application, namely the existing application, the application needed and the potential application in the future.

6. Technology Mapping Stage

At this stage, grouping applications into the application system map is based on the levels in the application system. The system application map classifies the system to be different. The top level is a strategic application and the level below includes operational, transactional, monitoring and control support applications, and planning and analysis.

7. Final stage

This stage is the final stage which contains conclusions and suggestions obtained from the study are expected to provide recommendations for the Construction Services Company.

To identify port strengths and weaknesses as internal factors, plan-makers need to consider three elements: inputs, process and performance (outputs). Consideration of the strengths and weaknesses of the organization is nothing but to identify the company's excellence, competitiveness, the sharpness of the strategy to win the fight and to manage the right resources to ensure business continuity.

Opportunities and threats are identified by the political, economic, social, technological, educational, and external stakeholders as well as resources (directly or indirectly). The focus of the team's attention should not only be addressed to the negative aspects of the threat, but the opportunity should be attentive. It is also regarded as an external stakeholder: service users, customers, users, taxpayers, regulators, and related agencies. Included in the external category are competitors, strengths, competition, the potential to increase important strengths, as well as all of their accomplishments or networks.

In the context of formulating competitive advantage strategy, there are some things to note that is

1. Strength is an internal condition that encourages success in achieving superior position in competition, such as human resources (professional, expertise, morality and high loyalty), financial resources (performance and availability of investment funds), information resources (technology superior information, own network)

2. Weakness is an internal condition that hampers the success of achieving company goals eg for example human

Definitions on the type of elements that appear at risk, namely: H  
 M : Average Priority  
 The : Low Priority

resource management (spoil system, rigid organizational behavior)

3. Opportunities are external conditions that encourage the success of the company to create a mission, such as government (deregulation, debirokratisasi), private investors / pendants (Tax Holiday)

4. Threats are external conditions that impede the success of corporate goals, such as economics (global recession, high inflation), social (moral decline, drug use), technology (mismanagement)

Analyzing the mapping of internal strengths and weaknesses, as well as opportunities and external threats to the ports industry is certainly not free from missions expressed to stakeholders and mandates received from the government as a shareholder.

External and Internal Factors Strategies Issues

Strategic issues are fundamental questions or critical challenges that affect the mandate, mission, value, product, and quality of service. Strategic planning is focused on the relationship between the company and the environment. Understanding the mandate and external environment means accommodating in the outsourced input plan, and understanding the values of togetherness with the internal environment means input from within to planning. A company that does not respond to strategic issues will bring something that is unwanted in the form of threats, losing opportunities or both. Appendix 1. A list of 64 factor SWOT method

: High Priority

**LIST OF PRIORITY FACTORS**

Not.	Statement	H	M	L
1.	Business	X		
2.	PRODUCT KNOWLEDGE		X	
3.	SDM		X	
4.	TRANSPORT AND DELIVERY			X
5.	Finance		X	
6.	RESEARCH & DEPLOYMENT		X	
7.	Sales	X		

**List THE CURRENT EXTERNAL ENVIRONMENT**

Not.	Statement	H	M	L
1	The Current Business development provides a solution	X		
2	User/client capacity To pay for the solutions offered at this time		X	
3	The availability of means of transport is necessary to reach the user's site/client is currently		X	
4	The budget form is issued to the user/client Against the current solution			X
5	The availability of Warranty provides services to the user/client in the development of today's business		X	
6	Current state aid in business development			X
7	Current business circumstances help in business competence			X
8.	Current business circumstances may develop	X		
9.	The Status of the source An educated man For the development of the user/client service is currently		X	
10.	Indicate the number of employees who are in the development of a user/customer service			X
11.	The State of work force in the field of technology and BDM (Consultan, Marketing, technician) against the user/client service is currently			X
12.	Currently, the State of technological development for the development of user/Client service		X	
13.	The State of science development in the field of technology for the development of service to the user/client is currently		X	
14.	The State of communication technologies development for the development of the user/client service			X
15.	The State of technology in price and according to the needs Currently	X		
16	Reference Availability and documentation required by the user/client Currently		X	

**List THE CURRENT INTERNAL ENVIRONMENT**

Not.	Statement	H	M	L
1.	The Current Business development provides a solution		X	
2.	User/client capacity To pay for the solutions offered at this time			X
3.	The availability of means of transport is necessary to reach the user's site/client is currently			X
4.	The budget form is issued to the user/client Against the current solution			X
5.	The availability of Warranty provides services to the user/client in the development of today's business			

6.	Current state aid in business development		X	
7.	Current business circumstances help in business competence			X
8.	Current business circumstances may develop			X
9.	The Status of the sourceAn educated man Aya For the development of the user/client service is currently	X		
10.	Indicate the number of employees who are in the development of a user/customer service	X		
11.	The State of work force in the field of technology and BDM (Consultan, Marketing, technician) against the user/client service is currently	X		
12.	Currently, the State of technological development for the development of user/Client service		X	
13.	The State of science development in the field of technology for the development of service to the user/client is currently		X	
14.	The State of communication technologies development for the development of the user/client service			X
15.	The State of technology in price and according to the needs Currently	X		
16.	Reference Availability and documentation required by the user/client Currently			X

**List THE EXTERNAL ENVIRONMENT IN THE FUTURE**

Not.	Statement	H	M	L
1.	The Current Business development provides a solution	X		
2.	User/client capacity To pay for the solutions offered at this time		X	
3.	The availability of means of transport is necessary to reach the user's site/client is currently			X
4.	The budget form is issued to the user/client Against the current solution		X	
5.	The availability of Waranty provides services to the user/client in the development of today's business	X		
6.	Current state aid in business development		X	
7.	Current business circumstances help in business competence		X	
8.	Current business circumstances may develop		X	
9.	The Status of the sourceAn educated man Aya For the development of the user/client service is currently		X	
10.	Indicate the number of employees who are in the development of a user/customer service	X		

11.	The State of work force in the field of technology and BDM (Consultan, Marketing, technician) against the user/client service is currently	X		
12.	Currently, the State of technological development for the development of user/Client service	X		
13.	The State of science development in the field of technology for the development of service to the user/client is currently	X		
14.	The State of communication technologies development for the development of the user/client service		X	
15.	The State of technology in price and according to the needs Currently	X		
16.	Reference Availability and documentation required by the user/client Currently	X		

**List THE INTERNAL ENVIRONMENT IN THE FUTURE**

Not.	Statement	H	M	L
1.	The Current Business development provides a solution	x		
2.	User/client capacity To pay for the solutions offered at this time		X	
3.	The availability of means of transport is necessary to reach the user's site/client is currently		X	
4.	The budget form is issued to the user/client Against the current solution			X
5.	The availability of Waranty provides services to the user/client in the development of today's business	X		
6.	Current state aid in business development			X
7.	Current business circumstances help in business competence			X
8.	Current business circumstances may develop	X		
9.	The Status of the sourceAn educated man Aya For the development of the user/client service is currently	X		
10.	Indicate the number of employees who are in the development of a user/customer service	X		
11.	The State of work force in the field of technology and BDM (Consultan, Marketing, technician) against the user/client service is currently	X		
12.	Currently, the State of technological development for the development of user/Client service	X		
13.	The State of science development in the field of technology for the development of service to the user/client is currently		X	
14.	The State of communication technologies development for the development of the user/client service			X
15.	The State of technology in price and according to the needs Currently			X
16.	Reference Availability and documentation required by the user/client Currently	X		

**Table 4.6 List of priority risks and recommended control  
 List THE CURRENT EXTERNAL ENVIRONMENT**

Not.	Statement	S	W	O	T
1.	The Current Business development provides a solution	X			
2.	User/client capacity To pay for the solutions offered at this time				X
3.	The availability of means of transport is necessary to reach the user's site/client is currently		X		
4.	The budget form is issued to the user/client Against the current solution				X
5.	The availability of Waranty provides services to the user/client in the development of today's business	X			
6.	Current state aid in business development			X	
7.	Current business circumstances help in business competence				X
8.	Current business circumstances may develop		X		
9.	The Status of the sourceAn educated man Aya For the development of the user/client service is currently	X			
10.	Indicate the number of employees who are in the development of a user/customer service	X			
11.	The State of work force in the field of technology and BDM (Consultan, Marketing, technician) against the user/client service is currently			X	
12.	Currently, the State of technological development for the development of user/Client service			X	
13.	The State of science development in the field of technology for the development of service to the user/client is currently				X
14.	The State of communication technologies development for the development of the user/client service		X		
15.	The State of technology in price and according to the needs Currently				X
16.	Reference Availability and documentation required by the user/client Currently			X	

**List THE CURRENT INTERNAL ENVIRONMENT**

Not.	Statement	S	W	O	T
1.	The Current Business development provides a solution			X	
2.	User/client capacity To pay for the solutions offered at this time				X
3.	The availability of means of transport is necessary to reach the user's site/client is currently		X		
4.	The budget form is issued to the user/client Against the current solution		X		
5.	The availability of Waranty provides services to the user/client in the development of today's business	X			

6.	Current state aid in business development		X		
7.	Current business circumstances help in business competence				X
8.	Current business circumstances may develop		X		
9.	The Status of the sourceAn educated man Aya For the development of the user/client service is currently		X		
10.	Indicate the number of employees who are in the development of a user/customer service		X		
11.	The State of work force in the field of technology and BDM (Consultan, Marketing, technician) against the user/client service is currently		X		
12.	Currently, the State of technological development for the development of user/Client service				X
13.	The State of science development in the field of technology for the development of service to the user/client is currently		X		
14.	The State of communication technologies development for the development of the user/client service		X		
15.	The State of technology in price and according to the needs Currently			X	
16.	Reference Availability and documentation required by the user/client Currently	X			

**List THE EXTERNAL ENVIRONMENT IN THE FUTURE**

Not.	Statement	S	W	O	T
1.	The Current Business development provides a solution			X	
2.	User/client capacity To pay for the solutions offered at this time				X
3.	The availability of means of transport is necessary to reach the user's site/client is currently				X
4.	The budget form is issued to the user/client Against the current solution				X
5.	The availability of Waranty provides services to the user/client in the development of today's business	X			
6.	Current state aid in business development			X	
7.	Current business circumstances help in business competence			X	
8.	Current business circumstances may develop			X	
9.	The Status of the sourceAn educated man Aya For the development of the user/client service is currently			X	
10.	Indicate the number of employees who are in the development of a user/customer service			X	
11.	The State of work force in the field of technology and BDM (Consultan, Marketing, technician) against the user/client service is currently		X		

12.	Currently, the State of technological development for the development of user/Client service				X
13.	The State of science development in the field of technology for the development of service to the user/client is currently	X			
14.	The State of communication technologies development for the development of the user/client service		X		
15.	The State of technology in price and according to the needs Currently				X
16.	Reference Availability and documentation required by the user/client Currently		X		

**List THE INTERNAL ENVIRONMENT IN THE FUTURE**

Not.	Statement	S	W	O	T
1.	The Current Business development provides a solution			X	
2.	User/client capacity To pay for the solutions offered at this time		X		
3.	The availability of means of transport is necessary to reach the user's site/client is currently		X		
4.	The budget form is issued to the user/client Against the current solution		X		
5.	The availability of Waranty provides services to the user/client in the development of today's business			X	
6.	Current state aid in business development	X			
7.	Current business circumstances help in business competence			X	
8.	Current business circumstances may develop			X	
9.	The Status of the sourceAn educated man Aya For the development of the user/client service is currently	X			
10.	Indicate the number of employees who are in the development of a user/customer service	X			
11.	The State of work force in the field of technology and BDM (Consultan, Marketing, technician) against the user/client service is currently	X			
12.	Currently, the State of technological development for the development of user/Client service			X	
13.	The State of science development in the field of technology for the development of service to the user/client is currently			X	
14.	The State of communication technologies development for the development of the user/client service			X	
15.	The State of technology in price and according to the needs Currently		X		
16.	Reference Availability and documentation required by the user/client Currently				X

**Appendix 2. Priority Factors**

EKSTERNAL SAAT INI			
	H	M	L
H	1,15,22		
M		2,3,5,9,12,13,16	
L			4,6,7,10,11,14
T			

INTERNAL SAAT INI			
	H	M	L
H	9,10,11,15,		
M		1,6,12,13	
L			2,3,4,7,8,14,16
T			

EKSTERNAL MASA MENDATANG			
	H	M	L
H	1,5,10,11,12,13,15,16		
M		2,4,6,7,8,9,14	
L			3,
T			

INTERNAL MASA MENDATANG			
	H	M	L
H	1,5,8,9,10,11,12,16		
M		2,3,13	
L			4,6,7,14,15
T			

No	Type Faktor	Internal saat ini	Internal Masa Mendatang	Total
1	High	4	8	12
2	Medium	4	3	7
3	Low	7	5	12

No	Type Faktor	Eksternal saat ini	Eksternal Masa Mendatang	Total
1	High	3	4	7
2	Medium	7	3	10
3	Low	6	7	13

Identification of strategic issues is done basically with a direct approach to the mandate and mission of the organization, and SWOT (Strengths, Weaknesses, Opportunities, Threats). As a follow-up of the identification, it is to manage strategic issues where strategic need is formulated based on the results of analysis of external and internal factors. Matrix strategy as seen in figure 2.2 has been developed into Matrix SWOT or TOWS Matrix. The Wheelen and Hunger developed SWOT matrix is structured as shown in table 2.1. The horizontal line contains the Internal Factor Analysis Summary (IFAS), and the vertical column

contains the External Factor Analysis Summary (EFAS). At Cell Strengths-Opportunities (SO) programmed the strategy to exploit the opportunity to grow by using existing strengths. In the Weakness-Opportunities (WO) cell program is strategized to exploit opportunities by addressing internal weaknesses. In Strengths- Threats (ST) cells stratified strategies utilize the power to avoid threats; in Weakness-Threats (WT) cells built strategies to minimize weaknesses and at the same time avoid external threats.

**Matriks SWOT Kearns**

EKSTERNAL INTERNAL	OPPORTUNITY	TREATHS
STRENGTH	<i>Comparative Advantage</i>	<i>Mobilization</i>
WEAKNESS	<i>Divestment/Investment</i>	<i>Damage Control</i>

Sumber: Hisyam, 1998

**Results and Discussion : Setting Priority Risk**

At this stage the swot team will concentrate on prioritizing factors according to the risk type definition of the weaknesses and their impacts discussed in the previous chapter and assisted using

the priority matrix, but in this session there is a priority matrix adjustment in order to facilitate the prioritization of the risks of adding numerical sequences, Such adjustments are shown in Figure a.

		<b>Business Impact</b>		
		High	Medium	Low
<b>Vulnerability</b>	High	<b>A 1</b>	<b>B 1</b>	<b>C 1</b>
	Medium	<b>B 2</b>	<b>B 3</b>	<b>C 2</b>
	Low	<b>C 3</b>	<b>C 4</b>	<b>D 1</b>

**Figure a Priority Priority Factor**

In the final stages of this SWOT session, the SWOT team is required to determine the suggested controls against prioritized risks and only on the priority risks of type S, W, O and T because those priority categories are more in need of action. The process of determining risk control can be done in a way, the authors can direct the SWOT team to any priority risk that has a high category and ask the team to see enough controls to deal with those risks. Determination of risk control refers to 14 controls that have been established by the SWOT (listed in the appendix). shows the table of control lists on risks that have been prioritized by the SWOT team. The final stage of the analysis using SWOT is to create a work plan or often called an action plan. After the cross reference sheet is established, an action plan is developed that will explain

the actions that management and operations can take on how to control the risks identified and prioritized. for risks that are still open and the risks to be implemented control. Project leaders, business writers and managers determine which control measures are most effective and determine which parties will implement those controls along with their implementation dates.

Similar to cross reference sheets, this action plan is formed by combining identified risks with a control list giving a clear picture of how each risk will be treated, complete with a work plan. The result of the action plan is shown in Table b.

No Risk	Decryption Risk	Control	Action	By Who	When
1	Human Resources	PRIORITIES	Adds staff with skills and education.	division Manager	In progress
2	Research and Development Team	PRIORITIES	Create a research and development team to help marketing and consultants provide solutions	IT Manager	In progress
3	Transport and Shipping	MEDIUM	Cooperate with shipping and transport service providers	Finance team	In progress
4	Sumber Daya Manusia Human Resources	MEDIUM	Training and workshop for all employees	Division Manager	In progress
5	sales	PRIORITIES	Know the policies and regulations on shipping and transportation	AM Manager	In progress
6	Knowledge of Products	MEDIUM	Work with product providers	Marketing dan IT Manager	Has been done
7	Develop a business by dividing the type of business industry and developing products to be sold	MEDIUM	Divide marketing with the type of business industry with specialization in the field of business industry	Sales and Marketing manager	Has been done

**Figure b Result of the action plan**

In the action plan shown in Table b, each risk is registered together with the type of risk, description, control, control that can be carried out, and work plan. In preparing an action plan, a risk can have several controls that are appropriate to the type of risk faced. This means that in dealing with a risk several controls can be applied which are interrelated. Controls that are still general are then explained in the action plan.

From Table b, it can be seen that each risk has been mapped with controls in accordance with the risks faced. In the action column there are recommendations for actions that can be taken to overcome risks. An action can solve more than one risk, this happens because there is a link between each risk, so that doing an action plan can overcome several risks at once. This risk comparison is carried out based on the communication between the author and the clerk with the project leader on the risks and controls that have existed before and then carried out a comparison with the risks and controls after the SWOT process is implemented. Risks that have been determined After the SWOT

process is carried out . Based on the results of interviews with project leaders, the risks that have existed before and have been determined are as many risks as they appear, as shown in table 4.6. After the SWOT process is obtained as much as internal strength factor 6 factors, weakness 13 factors, 9 factor opportunities and 4 threat factors and external factors internal strength factors 6 factors, weakness 6 factors, 10 factor opportunities and 10 threat factors which have internal risk comparisons and external SWOT process can be concluded that before applying this method the factors identified through the process of interviewing the team in the integrity aspect there are only a few risks, after going through the brainstorming process and mapping the risk using the SWOT method the identified risk is very significant, namely internal factors strength 6 factors, weakness 13 factors, 9 factor opportunities and 4 threat factors and external factors internal strength factors 6 factors, weakness 6 factors, 10 factor opportunities and 10 threat factors. The more factors that are identified, the better, because with the controls that will be

applied, the company will be more prepared to face the worst possible future events.

1. Companies need to identify and apply management to risks in certain periods that may occur, especially in operations that are used to anticipate the emergence of an increasingly high impact of new risks that arise.

2. Based on the action plan document, the Company needs to increase the number of experts and policies related to the business process and its information technology infrastructure in writing and then conduct training for all personnel of the company, and supervise the implementation that has been made

3. Based on the action plan document, the institution needs to conduct training or training of all personnel with a certain period in order to develop the expertise of the personnel themselves as well as develop a good strategy and research on the system used.

At this stage the SWOT team will identify the factors that are possible from the results of the discussion of the brainstorming stage and has occurred in the institution's business system. After referring to the list of 120 factors available from the SWOT method, the SWOT team found as many as 31 factors and were grouped according to the 3 risk type classifications shown.

Determining the risk priorities of the swot team will concentrate on prioritizing factors according to the definition of risk types of weaknesses and their impacts discussed in the previous chapter and assisted by using a priority matrix, but in this session there is an adjustment of priority matrices in order to facilitate the determination of priorities of risk, namely the addition of a number sequence. the adjustments are shown in table c.

		Business Impact		
		High	Medium	Low
Vulnerability	High	A 1	B 1	C 1
	Medium	B 2	B 3	C 2
	Low	C 3	C 4	D 1

Table c

**Conclusion** Based on the research that has been done by the author using the approach of strength, weakness, opportunity, threat (SWOT), then obtained the following conclusion:

**Comparing the risk before and after the process is carried out Swot**

The risk comparison is done from communication between the author and leadership of the project against the risks and controls that have been there before and then make a comparison with the risk and the control after the SWOT. Comparative risk Table of internal and external SWOT process can be concluded that before applying this method of factors identified through the process of interview with the team in the aspect of integrity, there are only some of the risks, after going through the Process *Brainstorming* And the allocation of risks using the DAFO method of identified risks are very significant internal factors, namely strength 6 factors, 13 factors, opportunities for weakness 9 4 factors and threat factors and internal factors external factors of force weakness of factors, 6 6 Factors, 10-factor opportunities and 10-threat factor. The more factors identified then better because the control you want to apply the company's parties will be more prepared to face the worst possible that will occur in the future. The final stage of the analysis to Swot is to make a work plan or often called *Action Plan*. After *Cross-reference Sheet* Format, compost *Action Plan* That would explain the actions that the management can adopt or operate on how the risks that have been

identified and which have been prioritized are controlled. The risk that will remain open and the risk-that will implement control. Project Manager, writer, and business managers to determine what the action of the most effective controls and determines which party will implement these controls along with the date of their application. In *Action Plan* Country, Table 4.10 Risk are incurred with types of risk, description, ControlControl which can conducted the work plan. In Compose *Action Plan*, a risk can have Some The control that corresponds to the type of risks found. This means dealing with a risk can be applied to several simultaneously interconnected controls. The controls are still common then described in *Action Plan*. From Table 4.10 It seems that any risk had already been allocated with the control corresponding to the risk in the hand. In a column of action contained action recommendations that can be made to tackle these risks. An action can perform more than one risk, this happens because there is a link between each risk, so that when making an action plan you can tackle some of the risks at the same time.

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# The Level of Impact on Spiral Progression Approach in Mathematics to the Academic Performance of the Grade 10 Students

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**Abstract:** The study was to determine the level of impact of spiral progression approach in mathematics to the academic performance of the grade 10 students in Ampayon National High School. Three specific questions were raised to determine: (1) extent of students' participation in the spiral progression approach in Mathematics in terms of discussion, peer collaboration, and problem-solving activities? ;(2) what is the level of student's academic performance in mathematics from grade 7 to 10?; and (3) is there a significant correlation between the extent of student participation in spiral progression approach in mathematics and the academic performance of the students? Some statistical measures were used on the analysis of data. The mean was utilized to determine the level of extent of the students' participation in spiral progression approach in terms of discussion, peer collaboration, and problem-solving activities, as well as the level of students' academic performance in four corresponding years. The Pearson's correlation was used to determine the significant impact of students' participation in Spiral Progression. Teaching Approach in mathematics to the academic performance of the respondents. This study concluded that the extent of students' participation in peer collaboration, and problem-solving activities did not merely influence the students' academic performance. However, there is a significant correlation between the extent of student participation in spiral progression approach in mathematics and the academic performance of the student in the discussion. This means that students were motivated to learn when the teacher presents the process well and they were interested to participate during the discussion. Hence, the students' participation had influenced their academic performance. Based from this conclusion, this study suggested that the teacher should employ techniques and strategies that are appropriate to the learners' needs and abilities, and the students should also be attentive and participating during discussion to acquire effective learning.

**Keywords:** teaching approach ,Spiral approach, academic performance

## THEORETICAL AND CONCEPTUAL FRAMEWORK OF THE STUDY

This study centred on the theory that spiral progression approach is a factor that contributes to the academic performance of the grade ten students. This is supported by studies conducted by various researchers and educational thinkers.

This study is anchored the theory Spiral Progression which was proposed by Jerome Bruner with principles derived from John Dewey.

The Spiral Progression is predicated on cognitive theory advanced by Jerome Bruner (1960), who wrote, "We begin with the hypothesis that any subject can be taught in some intellectually honest form to any child at any stage of development". In other words, a very young children is capable of understanding even a most complex material if it is structured and presented properly.

In the book, *The Process of Education*, Bruner (1960) opposed Piaget's notion of readiness. He argued that schools waste time trying to match the complexity of subject material to a child's cognitive stage of development. This means that the students are troubled to understand certain topics since it is considered to be too difficult to them, and those topics must be taught when the teacher believes the child has reached the appropriate state of cognitive maturity.

Bruner suggested that curriculum should be designed in a way that it pursues a spiral progression that starts from simple to complex and requires revisiting prior knowledge (1960/1977). In short, students continuously build concepts upon what already know and return the basic ideas until they grasped the full formal concept. Therefore, subjects would be taught at levels of gradually increasing difficulty.

Bruner emphasized the gains that can be acquired by developing student’s power of analysis, judgement and memory in or to increase capacity to transfer learning (Hatuina, 2013). His idea was that, transfer of thinking processes from one another which require students to learn the fundamental principles of subjects and to explore ideas on a deeper level rather than just mastering facts rote learning procedures.

Learning also involves memory or remembering. In spiral progression approach, memory is very important factor. There are two basic theories to explain as how we memorize events. According to one theory memory is said to be stored in the brain as a memory trace. When we learn or experience something, impulses are generated in the nerves of the brain. These impulses impart their effects in the brain in the form of a record. According to the other theory, sensations created by learning produce some permanent changes in the brain which remain there in the form of memory (Espiritu, 2008).

Bruner (1961) proposes that learners’ construct their knowledge and do this by organizing and categorizing information using a coding system. Bruner believed that the most effective way to develop a coding system is to discover it rather than being told it by the teacher. The concept of discovery learning implies that students construct their own knowledge for themselves, also known as constructivist approach.

Moreover, the teacher’s role is to facilitate the learning process rather than to teach information by rote learning. The use of the spiral progression approach can aid the process of discovery learning if teachers give students the information they need through discussion, but without organizing for them.

The spiral progression approach is also said to be a “child-centered approach”. According to Angeles (2013), the new curriculum is composed of set of activities like, collaborative learning, peer tutoring, outcome-based performance or performance task. In which the students are exposed to socializing, sharing thoughts and ideas or brainstorming, communicating, expressing their multiple intelligences, abilities and skills. Hence, the students will be able to achieve better understanding of the concepts of a subject matter if they are participating to the activities conducted by the teacher such as peer collaboration, and problem solving.

The conceptual pattern shows that the researchers considered the connection of independent variables to the dependent variable, as shown in figure 2.

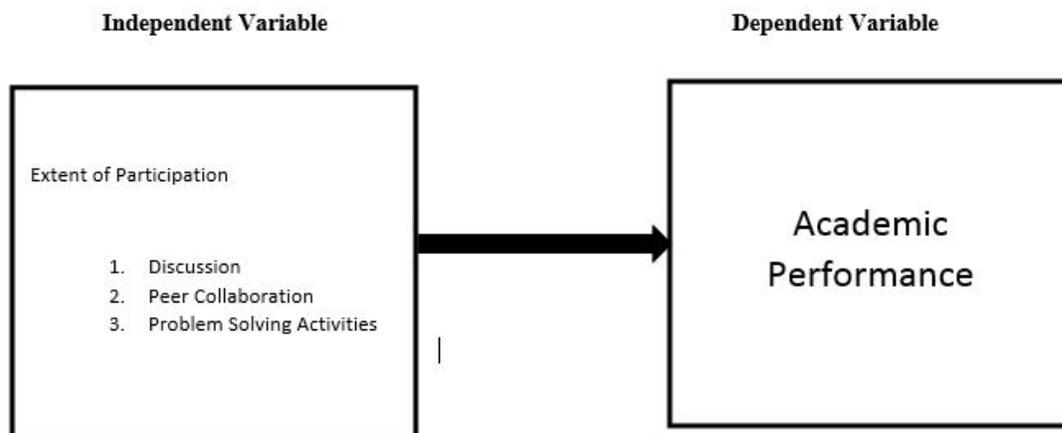


Figure 1. Schematic diagram of the study.

## Hypothesis

The problems pose one null hypothesis:

Ho1: There is no significant correlation between the extent of student participation in spiral progression approach in mathematics and the academic performance of the grade 10 students in Ampayon National High School.

## METHODOLOGY

This study used the descriptive method of research. It was a fact-finding study with sufficient interpretation and evaluation. It also gathered data and information of the level of impact of spiral progression to the academic performance of the students.

The study was conducted in Ampayon National High School, Butuan City. It is about 1.2 kilometers far from Caraga State University. It can be reached by a bikecab, motorcycle or jeepney for about 4-6 minutes.

The respondents of the study were the three sections of grade 10 students in Ampayon National High School, Butuan City as presented in Table 1.

**Table 1** *Distribution of Population*

Section	Population	Sample Size (n)
1. Einstein	48	34
2. Galileo	44	33
3. Newton	48	29
<b>Total</b>	140	96

A survey questionnaire was used during the baseline survey for the evaluation of some questions added to address specific areas to be explored. The researcher administered the questionnaire used to collect data from the students. This data includes that parts of the questionnaire: Part I contains the information of the student, specifically, the Academic performance from grade 7,8,9, up to the first quarter in grade 10. Part II contains questions about the extent of student's participation of the curriculum in terms of: Discussion, Peer Collaboration, and Problem Solving Activities.

## Scoring and Quantification of Data

The following were quantified to be used for statistical analysis:

### A. Academic Performance

Grade Ranges	Level	Descriptive Rating
95-above	5	Outstanding
86-94	4	Very Satisfactory
80-85	3	Satisfactory
75-79	2	Fairly Satisfactory
Below 75	1	Did not meet expectation

### B. Student's Participation

Scale	Verbal Description	Interpretation
4.5-5	5	Very High
3.5-4.49	4	High
2.5-3.49	3	Moderate
1.5-2.49	2	Low

1-1.49	1	Very Low
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**RESULTS AND DISCUSSION**

**Problem 1:** What is the extent of students’ participation in the Spiral Progression Approach in Mathematics in terms of discussion, peer collaboration, and problem-solving activities.

**Table 2:** *Extent of students’ participation in spiral progression approach in Mathematics in terms of discussion.*

Indicators	Mean	Std. Deviation	Verbal Description	Interpretation
1. I like the way Math in every grade level has different branches.	3.73	0.79	Agree	High
2. I like to recall every lesson I’ve learned in math every year with increasing complexity.	3.86	0.82	Agree	High
3. I am eager to listen when our teacher recalls the past lessons.	4.03	0.76	Agree	High
4. I feel easy to learn math since all topic/branches of math were taught in order of difficulty and actively engaged in solving problem.	3.31	0.85	Moderately Agree	Moderately
5. I am interested to participate in the discussion.	3.94	0.95	Agree	High
6. I actively participate to the discussion.	3.63	1.07	Agree	High
7. The lessons in math are very useful in our everyday life.	4.21	0.91	Agree	High
8. I am not confused to every lesson I meet in every grading period.	3.44	0.87	Moderately Agree	Moderate
9. I am motivated to learn when my teacher presents the process well.	4.19	0.79	Agree	High
<b>Overall</b>	<b>3.81</b>	<b>0.51</b>	<b>Agree</b>	<b>High</b>

Table 2 showed the extent of students’ participation in the discussion. It showed that students agreed mostly on the indicators 1,2,3,5,6,7, and 9 with a mean value of 3.73, 3.86, 4.03, 3.94, 3.63, 4.21, and 4.19 respectively. It implied that students agreed that they like the structure of how math is taught- which has different branches in every grade level; they also like to recall every lesson they’ve learned in math every year with increasing complexity; they are eager to listen when their teacher recalls the past lesson, and presents the process well they were interested to participate in the discussion actively. However, they moderately agreed on the remaining indicators which are indicators 4, and 2, which have a mean value of 3.31, and 3.44.

The overall mean value 3.81, which has a verbal description “Agree”. This means that learners have a high level of participation in the discussion towards learning Mathematics lesson.

**Table 3:** *Extent of students’ participation in the spiral progression approach in Mathematics in terms of peer collaboration.*

Indicators	Mean	Std. Deviation	Verbal Description	Interpretation
1. I am motivated to listen when there are group/diad activities.	3.99	0.84	Agree	High
2. I like to share my understanding of the lesson to my classmates.	3.89	0.79	Agree	High
3. I feel it easy to learn different topics in math when being taught or guided by my classmates.	3.66	0.94	Agree	High

4.	I like learning my lessons in math with my classmates.	3.80	0.80	Agree	High
5.	I learned to cooperate with others group activities.	3.95	0.70	Agree	High
6.	I work cooperatively with any group member in seeking solutions to the problems	3.77	0.80	Agree	High
7.	I can easily ask questions from my groupmates.	3.67	0.82	Agree	High
8.	I am not hesitant to solve some problems when I'm with the group.	3.33	0.87	Moderately Agree	Moderate
9.	I can compare my answers with my group mates and determine if I got the right answer.	3.76	1.02	Agree	High
10.	I learn some easy techniques of solving from the ideas of our group mates.	3.79	0.97	Agree	High
<b>Overall</b>		<b>3.76</b>	<b>0.44</b>	<b>Agree</b>	<b>High</b>

Table 3 presented the extent of students' participation in the peer collaboration of the students in learning Mathematics. It can be seen that out of 10 indicators, 9 were rated as "Agree", as evident on indicators 1,2,3,4,5,6,7,9 and 10. These nine(9) indicators has mean value of 3.99, 3.89, 3.66, 3.80, 3.95, 3.77, and 3.67 respectively. This means that students agreed that they were motivated to listen and learn when there are group activities, and when being taught or guided by their classmates; they liked to share their understanding of the lesson to their classmates; they can easily ask questions in seeking solutions; they worked cooperatively with their group; they can compare their answers; and they learned some easy techniques of solving from the ideas of their classmates. However, they moderately agreed on indicator 8 which a mean value of 3.33. It implies that they moderately agree they are not hesitant to solve some problems when they are with their group.

The overall mean value is 3.76 with a verbal description "Agree". It reveals that the students have a high level of participation in peer collaboration. They learned better in Mathematics when their classmates accompanied them.

**Table 4:** Extent of students' participation in the spiral progression approach in Mathematics in terms of problem solving.

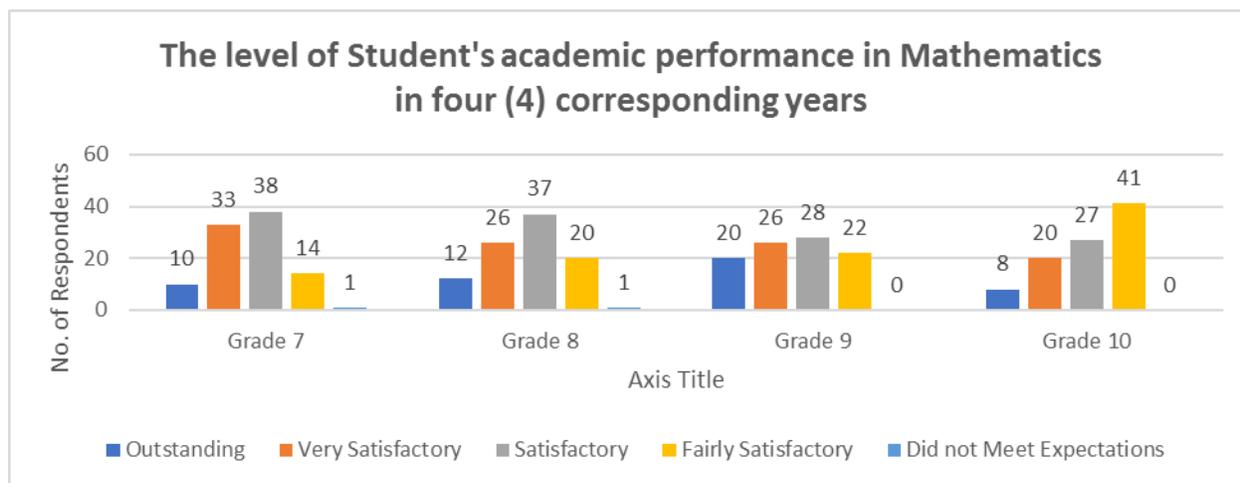
Indicators	Mean	Std. Deviation	Verbal Description	Interpretation
1. I can easily answer the given problem since I already had a prior knowledge about it.	3.52	0.91	Agree	High
2. I am confident in my answer in every problem solving activities.	3.52	0.92	Moderately Agree	Moderate
3. I got correct answers in every problem solving activities/written books.	3.16	0.80	Moderately Agree	Moderate
4. I like to answer the different branches/topics in math every year.	3.44	0.88	Moderately Agree	Moderate
5. I am not confused to every problem given to me in every grading exams.	3.34	0.89	Moderately Agree	Moderate
6. The problem solving activities that we met every year level doesn't show shocking difficulty.	3.32	1.07	Moderately Agree	Moderate
7. My problem solving skill enhances when my teacher give board works, seat works, and problem sets.	3.89	0.90	Agree	High
8. I am solving my assignment with the used of basic problem solving skills learned from my teacher.	3.92	0.89	Agree	High
9. I search another set of problems to practice, improve, and master my problem solving skills.	3.50	1.03	Moderately Agree	Moderate
10. I am more comfortable to the steps presented by the teacher.	3.79	1.01	Agree	High
<b>Overall</b>	<b>3.51</b>	<b>0.60</b>	<b>Agree</b>	<b>High</b>

Table 4 showed the extent of students’ participation in the problem solving activities. As observed, indicators 1,7,8, and 10 has a mean value of 3.52, 3.89, 3.92, respectively with a verbal description “Agree”. They agreed that they can easily answer the given problem since they had a prior knowledge about it; their problem solving skill enhances when their teacher give board works, seat works, and problem sets; they are solving their assignment with the use of basic problem solving skills learned from their teacher; and they are comfortable to the steps presented by their teacher.

However, indicators 2,3,4,5,6, and 9 have a verbal description “Moderately Agree” as evident on the mean values 3.32, 3.16, 3.44, 3.34, 3.32, and 3.50 respectively. This implied that they moderately agreed that they are confident in their answer in every problem solving activities; they got correct answers in every problem solving activities/written works; they liked to answer the different branches/topics in math every year level; they were not confused to every problem given to them in every grading exams; the problem solving activities that they met every year level doesn’t show shocking difficulty; and they search another set of problems to practice, improved, and mastered their problem solving skills.

The overall mean value was 3.51, with a verbal description “Agree”. It revealed that the students have a high level of participation in problem solving activities. This means that they liked to engage themselves in problem solving activities.

**Problem 2:** What is the level of students’ academic performance in Mathematics in four (4) corresponding years?



**Figure 3.** The level of students’ academic performance in mathematics in four (4) corresponding years

Figure 3 shows that most of the respondents got “Satisfactory Level” on academic performance in Mathematics from grade 7 to grade 9, which have grades ranging 80-85. It implies that the level of their academic performance in 3 consecutive years does not change, but there is an improvement since the number of respondents who belong to the outstanding level increases.

However, most of the respondents got “Fairly Satisfactory Level” of academic performance in mathematics for the first quarter of the current grade level-grade 10 which has grades ranging 75-79.

Overall, the level of students’ academic performance in mathematics in four (4) corresponding years has an improvement but there’s a bit change to their academic performance in grade 10, since the data collected on the said grade

level was the first quarter academic performance. Improvement of the student’s academic performance is the effect of the implementation of the curriculum. Thus, the findings indicate the applied curriculum. Thus, the findings indicates that the applied curriculum is effective on the students with a satisfactory level.

**Problem 3:** Is there a significant correlation between the extent of student participation is Spiral Progression Approach in Mathematics and the academic performance of the student?

**Table 5.** *The significant correlation between the extent of students’ participation in the Spiral Progression Approach in Mathematics towards the academic performance of the student in the 7<sup>th</sup> grade.*

Grade 7			
Activities	Performance		Impact Description
	Pearson R	P-value	
Discussion	0.07	0.52	Not Significant
Peer Collaboration	0.12	0.23	Not Significant
Problem Solving Activities	0.01	0.92	Not Significant

Table 5 revealed the result that the extent of students’ participation on the classroom activities has no significant influence to the academic performance of the respondents during their 7<sup>th</sup> grade level. This finding implies that the activities does not merely contribute in improving their academic performance.

**Table 6.** *The significant correlation between the extent of students’ participation in the Spiral Progression Approach in Mathematics towards the academic performance of the student in the in the 8<sup>th</sup> grade*

Grade 8			
Activities	Performance		Impact Description
	Pearson R	P-value	
Discussion	0.07	0.03	Not Significant
Peer Collaboration	0.10	0.35	Not Significant
Problem Solving Activities	0.04	0.70	Not Significant

Table 6 revealed the result that the extent of students’ participation on the classroom activities has no significant influence to the academic performance of the respondents during the 8<sup>th</sup> grade level. This finding implies that the activities does not merely contribute in improving their academic performance.

**Table 7.** *This significant correlation between the extent of students’ participation in the Spiral Progression Approach in Mathematics towards the academic performance of the students in Grade 9*

Grade 9			
Activities	Performance		Impact Description
	Pearson R	P-value	
Discussion	0.22	0.03	Significant
Peer Collaboration	0.12	0.25	Not Significant
Problem Solving Activities	0.05	0.60	Not Significant

Table 7 represent the result of the Pearson R between the extent of students’ participation on the classroom activities and performance in grade 9. It can be shown that the discussion under activities has a P-value of 0.03, which is

less than 0.05, this implies that the discussion has an influence to the academic performance of the respondents in the 9<sup>th</sup> grade level. This finding indicates that the discussion has a great role to improve the performance of the respondents because the implementation of the spiral progression curriculum in this grade level is evident in the process of discussion.

**Table 8.** *The significant correlation between the extent of students’ participation in the Spiral Progression Approach in Mathematics towards the academic performance of the student in Grade 10*

Grade 10			
Activities	Performance		Impact Description
	Pearson R	P-value	
Discussion	0.22	0.03	Significant
Peer Collaboration	0.12	0.26	Not Significant
Problem Solving Activities	0.05	0.60	Not Significant

Table 8 represent the result of the Pearson R between the extent of students’ participation on the classroom activities and performance in grade 10. It can be shown that the discussion under activities has P-value of 0.03 which is less 0.05, this implies that the discussion has an influence on the academic performance of the respondents in grade 10. This finding indicates that the discussion has a great role to improve the performance of the respondents since all of the prerequisite concepts of their math subject that were taught from lower grade level were included in their discussion.

**CONCLUSION**

Based on the findings of the study, the following conclusions were drawn:

On the level of students’ participation in terms of discussion, peer collaboration and problem solving activities, it has been found out that the students have agreed to the statement in every indicator. This implies that the respondents have a high level of participation on the activities in the classroom and they were interested to enhance their learning in mathematics by acquiring the knowledge imparted by their teacher, socialization with their classmates, and by engaging themselves in problem solving activities.

The level of students’ academic performance in mathematics in for (4) corresponding years has an improvement but there’s a bit change to their academic performance in grade 10, since the researchers had collected the first quarter of their grades in mathematics. This indicates that the applied curriculum is effective on the students with a satisfactory level.

There is a significant correlation between the extent of student participation in spiral progression approach in mathematics towards the academic performance of the student in the discussion in grades 9 and 10. This means that the students were motivated to learn when the teacher presents the process well and they were interested to participate during the discussion since the prerequisite concepts of their math subject that were taught from previous grade levels were included in their discussion. Hence, the students’ participation had influenced their academic performance. However, the students’ participation in peer collaboration, and problem solving activities did not merely influence the students’ academic performance.

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# Assessment of Substantive Causes, Effects and Mitigation Strategies of Flood Scenario in Yola South LGA, Adamawa State, Nigeria.

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## Abstract

*Yola South LGA is one of the probable flood prone areas in Adamawa state which seriously cause damages to the inhabitants seasonally. Therefore, this study saddled to assess the substantive causes, effects and mitigation strategies of flood scenario in Yola South LGA, Adamawa state. The study adopted quantitative survey techniques where 385 inhabitants were selected as the respondents from eight different flood prone areas. Well-structured and defined questionnaires were randomly administered to the sample respondents and data obtained were analyzed using descriptive statistics. The findings in respect of socio-economic characteristics indicated that most inhabitants of the areas were in low income cadre earning less than a minimum wage salary (< 18000 naira) from farming and artisan work. Heavy rainfall (18 %) and river over flows (17%) were the major factors that caused flooding in the area. It was also revealed that Sabon Pegi D/L and Modere (20 % and 17 %) were the utmost dominant flood prone areas due to their proximity to River Chochi. In terms of effects caused by the flood scenario in the area loss of properties was found to be more destructive conceived by 23 % of the respondents and 17 % of them revealed that farmlands were also damaged by flood. The months of August and September were the prominent where flood found to occur seasonally. Thus, this study therefore recommends that government should establish resettlement project scheme to relocate the affected people to safer terrain and to integrate effort towards construction and expansion of drainage system in the most flooded areas. Buildings should be ensured legally planned and constructed under intensive supervision of the agencies concern. Environmental problems and consciousness should be enlighten to the inhabitants by both state and federal ministries of environment*

**Index Terms:** Floods, Causes, Effects, Mitigation and Yola South LGA.

## INTRODUCTION.

Flood is a natural event or occurrence where a piece of land (or an area) that is usually dry, suddenly get submerged under water. (Nigeria Hydrological Services Agency: Annual flood Outlook. NIHSA: AFO: 2016). Similarly, Bwala, Oladosu and Nghalmi, (2015) had explained that flood is simply seen as an environmental hazard that occurs when there is an overflow of water that submerges land which is usually dries. The increasing need for human development through rapid urbanization has led to a wide spread horizontal development especially in the developing countries ( Adewumi, 2013) .Thus, Nigeria is not an exceptional. Floods

are the most common environmental hazard in Nigeria. (Etuonovbe, 2011: in Dama, Ishaku, and Abdurrahman. 2014). In Nigeria, flooding is the most frequent and most widespread natural hazard accounting for about one-third of all disasters arising from geophysical hazards and adversely affecting more people than any other natural hazard (Adebayo and Oruonye , 2012: in Obeta, 2014). Moreover, in Nigeria, Adamawa state is one of the most occurring flooded states over the decade with a large extent of vulnerability leading to devastating loss of lives, properties, farmlands, displacement and negatively affecting the socio-economic activities in the state (Sadiq and Hena, 2018). Similarly, in Adamawa state, there are areas that are highly prone to flood for the past decades with a peculiar high extent of a particular year which might be associated with an indiscriminate human/ anthropogenic activities and their proximity to the River Benue Plains coupled with some natural climatic phenomenon such as high rainfall or precipitation, Evaporation Rate, Low atmospheric temperature, High Relative Humidity, River flow, Run-off, gauge height, etc (Sadiq and Hena, 2018). Thus, Yola South LGA is not exceptional in the state.

### **CAUSES OF FLOODING IN NIGERIA**

Nwigwe and Emberga, (2014) stated that, generally, causes of flood in Nigeria could be as a result of natural cause or human cause. Adeyanju (2008) stated that 90% of flooding in our locality is human induced; mostly caused by blockage of drainages by silts and debris, building of houses along river banks and on drainage systems. These channels' obstruction always keep the flood plain soil saturated with water, making them areas liable to flooding giving the slightest rise in channels' flow (Moffat and Linder, 1995). Also human factors like deforestation and overgrazing are some of the causes of flooding, adding however that, flood could be as a result of collapse of dams leading to water overflowing their banks. It may also be as a result of heavy storm or storm surge and it is equally today attributed to climatic change. According to Folorunsho and Awosika, (2001) floods in Nigeria occur in three main forms: coastal floods which occur in mangrove and delta coastlines; river floods which occur on the flood plains of large rivers; and flash floods which are short lived events developing in less than 6 h from rainfall to the onset of flooding. Floods have been identified to be caused by many factors including surcharges in water level due to natural or man-made construction on flood plains, sudden dam failure, inappropriate land use planning, mudflow, inadequate drainage capacity, ice jam, snow fall, and deforestation of catchment basins ( Odemerho, 2004 and Nwafor, 2006.). Similarly, Nwigwe and Emberga, (2014) stated that, coastal flooding occurs in the low-lying belt of mangrove and fresh water swamps along the coast river flooding occurs in the flood plains of the larger rivers flash floods are associated with rivers in the inland areas where sudden heavy rains can change them into destructive torrents within a short period. Urban flooding occur in towns located on flat or low lying terrain especially where little or no provision has been made for surface drainage, or where existing drainage has been blocked with municipal waste, refuse and eroded soil sediments, extensive urban flooding is a phenomenon of every rainy session in Lagos, Maiduguri, Aba, Warri, Benin and Ibadan. Virtually every Nigerian

is vulnerable to disasters, natural or man-made. Every rainy season, wind gusts arising from tropical storms claim lives and property worth millions of naira across the country. Flash floods from torrential rains wash away thousands of hectares of farm land. Dam bursts are common following such flood. In August 1988 for instance, 142 people died, 18,000 houses were destroyed and 14,000 farms were swept away. When the Baguada Dam collapsed following a large flood. Urban flooding such as the Ogunpa disaster which claimed over 200 lives and damaged property worth millions of naira in Ibadan, are common occurrence. Floods paralyze economic activities in many towns and cities in the country. Major roads, some linking states are flooded causing hardship to motorists. When these roads were constructed, the flooding problems were not there, and the companies that constructed the roads probably did not anticipate the problem. As noted by Oyegun, 2001 and Angillieri, (2007) flood may be induced by a variety of factors, most notably heavy precipitation (intensity, duration, amount, or snow). In urban areas, flooding is induced by inadequate drainage, incompatible land-use practices, weak control mechanism and high concentration of impervious surfaces which lead to remarkable increases in the volumes of runoff even at the instance of a little downpour of a short duration (Lazaro, 1990 and Adelekan, 2010 and Adewale, Sangodoyin and Adamowski, 2010).

### **EFFECTS OF FLOODING IN NIGERIA**

According to Obeta, (2009) flood disasters accounted for about 38% of all the federally declared natural disasters between 1995 and 2005 in Nigeria. Floods have been a recurring phenomenon in Nigeria and has had devastating effects in Ibadan (1985, 1987 and 1990), Yobe (2000) and Akure (1996, 2000, 2002, 2004 and 2006). The most recent experience of floods which occurred in 2012 claimed an estimated 431 people, displaced over 2.1 million people and damaged properties worth millions of Naira in Benue, Bayelsa, Delta, Borno, Cross River Ebonyi, Bauchi, Gombe, Katsina, Kebbi, Kaduna, Plateau, Taraba and Adamawa States. It is reported by the NIHSA: AFO: (2013) that, during recent years there has been an alarming rise in economic losses due to flooding in the country. In 2012 alone, Nigeria recorded a total estimated loss of N 2.29 Trillion (National Emergency Management Agency, NEMA: 2013 in NIHSA; AFO; 2016). Moreover, In many parts of Nigeria flooding continue to be an increasing problem, catching individuals and communities by surprise in a repeatedly exasperating way and causing disruption of social activities, damage of infrastructure and even death of people and livestock (Ayoade, 1985 and Okeke 2006). In many parts of Nigeria, flooding continue to be an increasing problem, catching individuals and communities by surprise in a repeatedly exasperating way and causing disruption of social activities, damage of infrastructure and even death of people and livestock (Ayoade, 1985 and Okeke, 2006). Similarly, In Nigeria, Adamawa state is one of the most occurring flooded states over the past decades with a large extent of vulnerability leading to devastating loss of lives, properties, farmlands, displacement and negatively affecting the socio-economic activities in the state (Sadiq and Hena, 2018). Similarly, William (1999) in his study of Loko river basin in Adamawa State flood disaster of August 1998

asserted that properties, animals and houses worth millions of Naira were destroyed. He further explained that the effects included structural and erosion damages, loss of lives and contamination of water and the destruction of other socio-economic activities. However, in Adamawa state, Yola South LGA, is among the probable flood prone area for all most a decade with a peculiar high extent of a particular year which might be associated to human induced factors such as poor or absence of drainage, illegal building structures on/across drainage channels, blockages of canals/drains, dumping of waste in gutters and culverts, illegal channelization of channels, poor waste management and poor physical planning. Plates below show the evident of human induced factors of flood in Yola South LGA.



Plates1.Show unplanned construction of buildings on water ways and improper waste disposal at Modere and Anguwan Tabo areas of Yola South LGA which aid flood reoccurrences.

The repeated occurrence of catastrophic flood episodes in Adamawa state, particularly in Yola South LGA the impacts of flooding have increasingly assumed from significant to threatening proportions, resulting in losses sustained by the urban dwellers and flood victims, have been sustained by the citizen of the study area due to what has become perennial anthropogenic disaster. Houses,

schools buildings, bridges, markets places were submerged and collapse by flooding in the study area as depicted in the plates 2,3 and 4 below;





Plates 2. Shows the Submerged Tashan Sani Market in Yola South LGA which halt people from the market and economic activities.



Plate 3. Shows the flooded area at Modere in Yola South LGA .



Plate 4. Shows the flooded area at Sabon Pegi D/L in Yola South LGA.

The devastating effect of floods was not limited to houses and people in the study area. Many farmlands both arable and agro-forestry were swept and mapped away by soil creeping, solifluction and siltation effects as shown on plates 5 below;



Plates 5. Shows the submerged farmlands along Chochi bridge in Yola South LGA .

Hence, this justifies the ardent and pivotal need of comprehensive understanding of these human induced activities that leads to annual exacerbated flooding scenarios and its effects on lives and properties in the study area. This study therefore saddled to assess the substantive causes, effects and mitigation strategies of 2018 flood scenario in Yola South LGA, Adamawa State. The specific objectives of this study are to identify both climatic and human causes and effects of flood in Yola South LGA with a view to induce mitigation strategies for protection and sustainable development in the area.

#### **THE STUDY AREA**

The study will be conducted in Yola South LGA of Adamawa State which lies on latitude  $09^{\circ} 14'N$  and  $09^{\circ} 20'N$  of the equator and longitude  $12^{\circ} 25'E$  and  $12^{\circ} 28'E$  of the Greenwich meridian, it has total population of 336, 648 persons as of 2010 (NPC; 2006). The average annual rainfall in the study area ranges between 850mm-1000mm with over 41% of rain falling in August and September. Temperature also has a significant temporal variation in the study area; with an average maximum temperature of  $42^{\circ}C$  with an average relative humidity of about 29%. (Upper Benue River Basin Development Authority, 'UBRBDA' 2018).

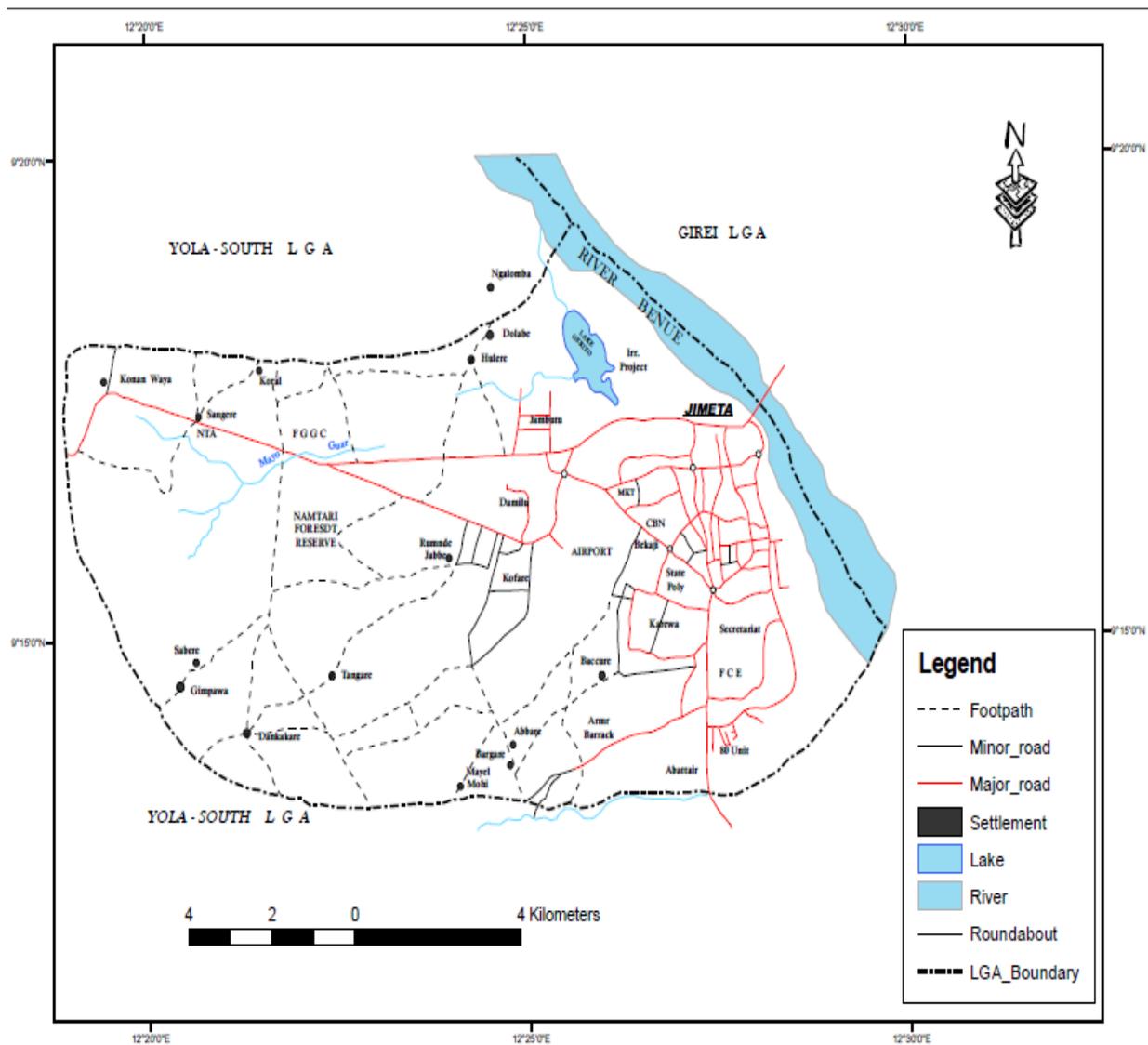


Fig 2. Shows the map of the Study Area (Adopted from Festus, 2016)

## SAMPLING TECHNIQUES AND DATA COLLECTION

Both primary and secondary sources were explored to obtain the required data for this study. The primary sources were the raw data that was collected through Field Survey Assessment (FSA), questionnaires and oral interview. A set of questionnaires containing open and close-ended questions were well-structured and administered randomly to the sampled size of 385 respondents in the study area. The Journals, textbooks, internet, unpublished thesis and maps were obtained from the library and institutions which formed the secondary sources explored in the study.

### DATA ANALYSIS

To achieve the objectives of this study, the data obtained was analyzed using descriptive statistics where frequencies, percentages and charts were assessed and presented clearly.

### RESULTS

Table 1 Demographic Data of the Respondents.

VARIABLES	CATEGORY	FFREQUENCY	PERCENT %
<i>Age of the Respondents</i>	≤ 20	8.085	2.1
	21-30	46.2	12.0
	31-40	92.785	24.1
	41-50	117.425	30.5
	51-60	70.455	18.3
	61-70	35.55	9.0
	≥70	15.4	4.0
		<b>TOTAL N = 385</b>	<b>TOTAL P=100</b>
<i>Age of staying in the area</i>	< 3years	35.55	9
	3-5 years	69.3	18
	6-8 years	80.85	21
	9-11 years	107.8	28
	>11 years	92.4	24
		<b>TOTAL N = 385</b>	<b>TOTAL P = 100</b>
<i>Level of Education</i>	Never been in school	65.45	17.0
	Religion school	77	20.0
	Primary school	100.1	26.0
	Secondary school	82.775	21.5
	Tertiary school	59.675	15.5
		<b>TOTAL N = 385</b>	<b>TOTAL P = 100</b>
<i>Occupational status</i>	Civil servant	57.75	15
	Private servant	38.5	10
	Business	73.15	19.
	Pensioner	42.35	11.
	Farmer	92.4	24
	Artisan	80.85	21
		<b>TOTAL N = 385</b>	<b>TOTAL P = 100</b>
<i>Monthly Income level(Naira)</i>	< 9000	84.7	22.0
	9001-18000	111.65	29.0
	18001-27000	81.62	21.2
	27001-36000	72.38	18.8
	>3600	35.55	9.0
	<b>TOTAL N = 385</b>	<b>TOTAL P = 100</b>	

Source: Author's Field Observation Assessment, (2018)

**Occupational Status of the Respondents**

From the result presented in table 1, only 10 % of the respondents were private servant, 11 % of them were found to be pensioners and most of them (24%) were farmers and Artisan formed 21 %. The remaining 19 % and 15 % of them were engaged in business and civil servant as their occupational status respectively.

**Monthly Income Level (Naira)**

29% of the respondents earn monthly income of N 9001-18000 and 22 % of them obtained N < 9000 as their monthly income. This result revealed that majority of the inhabitants in the study area earn below the current minimum wage benchmark of N18000.00 in Nigeria which defined the nature of their occupation as peasant farmers and artisan. This perhaps suggests the different reasons they gave for their continuous stay in the area despite the annual threat of flood experienced in most part of the area.

**Age of the Respondents**

The result of the findings revealed that majority of the respondents which formed 30.1 % were within the age of 41-50 years which still they are within the active age group that mostly affected by flood and participates in flood mitigation strategy. Similarly, 24.1 % of them were found at age bracket of 31-40 years.

**Age of Staying in the Area**

Majority of the respondents (28 %) stay in the area for a period of 9-11 years despite the flood incidences experienced, while 24 % of them leave for > 11 years and 21 % accommodates the areas for a period of 6-8 years respectively.

**Level of Education**

26 % of the respondents formed the majority had obtained primary school, those with secondary school certificate assessed to be 21.5 % and 17 % of them had not been to school, the remaining 15.5 % formed those with tertiary certificates.

Table 2 What are the major affected areas by flood in Yola South LGA.

Flood Areas in Yola South LGA	Frequency	Percentage %
Yolde- Pate	50.05	13
Modere	65.45	17
Tashan Sani	57.75	15
Sabon Pegi D/L	77	20
Shagari Phase 2	57.75	15
Bole Phase 2	30.8	8
Lakare	15.4	4

Wurochekke	23.1	6
Others	7.7	2
<b>TOTAL N = 385</b>		<b>TOTAL P = 100</b>

**Source:** Author’s Field Observation Assessment, (2018)

Findings on the major affected areas by flood in the study area were presented in table 2 above. From the result 20 % of the respondents pointed out that Sabon Pegi D/L was found to be the major area affected by flood annually then followed by Modere area ( 17 %) of the respondents while Tashan Sani and Shagari Phase 2 each forming 15 % respectively.

Table 3 What are the reasons of occupying the flood affected areas in Yola South LGA.

Variables	Frequency	Percentage %
Inadequate finance	65.5	17
Family origin	50.05	13
Cheaper rent	77	20
Cheap land	100.1	26
Unavailability of land	77	20
Others	15.4	4
<b>TOTAL N = 385</b>		<b>TOTAL P = 100</b>

**Source:** Author’s Field Observation Assessment, (2018)

26 % of the responses from the respondents revealed that cheap land of the area is the main reason for the inhabitants for occupying the area, while unavailability of land and cheaper rent recorded 20 % each as shown on table 3. Inadequate finance among respondents (17 %) prompted them to stay in the area despite the annual flood scenarios experienced, while only 13% of the respondents were leaving in the area as family origination.

Table 4 What are the major causes of the floods in Yola South LGA

Variables	Frequency	Percentage %
Absence and poor drainage system.	61.6	16
River over f lows	65.45	17
Heavy rainfall	69.3	18
Illegal buildings on drainage channels	50.05	13
Improper dumping of waste in gutters	38.5	10
Topography	30.8	8
Poor physical planning	46.2	12
Others	23.1	6

**TOTAL N = 385**                      **TOTAL P = 100**

**Source:** Author’s Field Observation Assessment, (2018)

Findings of the study revealed that many factors are responsible for flooding in Yola South LGA, as expressed by the respondents in table 4 above. From the result 18 .0% of the respondents attributed it to heavy rainfall, 17 % conceived it to be river over flows, while absence and poor drainage system was revealed to have 16 % and 13 % of them had attributed it to illegal buildings on drainage channels.

Table 5 Which type of flood does Yola South LGA usually experienced

Variables	Frequency	Percentage %
River	130.72	34
Urban	88.55	23
Flash	107.8	28
Dam	26.95	7
Coastal	19.25	3
Others	11.55	2
	<b>TOTAL N = 385</b>	<b>TOTAL P= 100</b>

**Source:** Author’s Field Observation Assessment, (2018)

From table 5 above, it was revealed that the river flooding is the major type of flood experienced in the area with 34 % of the respondents. 28 % said that flash flood is the type of flood noted annually in the area while urban flooding revealed to have 23 % of respondents. The remaining 12 % of them had attributed it to dam, coastal and others respectively.

Table 6 Which Months does the flood reoccurrence usually was at peak.

Variables	Frequency	Percentage %
May	7.7	2
June	38.5	10
July	57.75	15
August	127.05	33
September	115.5	30
Others	38.5	10
	<b>TOTAL N = 385</b>	<b>TOTAL P = 100</b>

**Source:** Author’s Field Observation Assessment, (2018)

The result presented on table 6 revealed that, the peak month of usual flood occurrence in Yola South based on responses of the respondents in the studied areas was the month of August with 33 %, respondents, while 30 % had conceived it to be in the month of September and 15 % revealed to occurred annually in July.

Table 7 What are the types of effects or damages that usually caused by the flood in the area.

Variables	Frequency	Percentage %
Loss of lives	23.1	6
Destruction of farmland	65.45	17

Spread of diseases	26.95	7
Loss of livestock	50.05	13
Destruction of buildings	53.9	14
Loss of properties	88.55	23
Paralyze of socio-economic activities	50.05	13
Contamination of water	26.95	7
<b>TOTAL N = 385</b>		<b>TOTAL P = 100</b>

*Source:* Author’s Field Observation Assessment, (2018)

From the result on table 7, 23 % of them had the opinion that huge properties were lost annually in the area due to flood. Similarly, 17 % of the respondents had conceived to had destruct farmlands in the area, while 14 % of the respondents had attributed the flood damage on destruction of buildings. Loss of livestock and Paralyze of socio-economic activities were due to flood forming 13 % each.

Table 8 What is the Possible Practical Workable Mitigation Strategy of Flood in Yola South

Variables	Frequency	Percentage %
Legal building of houses	88.55	23
Proper construction of drainages	134.75	35
Proper disposal of waste	73.15	19
Good waste management	34.64	9
Physical planning	53.9	14
<b>TOTAL N = 385</b>		<b>TOTAL P= 100</b>

*Source:* Author’s Field Observation Assessment, (2018)

The mitigation strategies of flooding destruction in Yola South LGA were suggested by the respondents in the study as depicted on table 8 above. Proper construction of drainages is the most workable mitigation strategy to flood reoccurrence in the area as conceived by 35% of the respondents, while 23 % of them linked the solution to legal building of houses by the inhabitants, proper disposal of waste formed the 19 % of the respondents and the remaining 9 % attached it to good waste management.

### DISCUSSIONS

From the results presented above, it was discovered that Sabon Pegi D/L, Modereare and Yolde Pate were the major flood prone places in Yola South LGA. This might be attributed to the steep nature of slope and were all lies along River Chochi which is one of the minor tributaries to River Benue. Similarly, in a technical report of Gangunen, (2018) explained that the level of devastation of flood at Yolde Pate and Modire was very severe which over topped the bridge and the surrounding culverts on the main road leading to Yolde Pate from Yola town.

The cheapness amount of the land and rent in the area were the major reasons for most of the inhabitants to continue staying in the flood prone areas of Yola South. This is because the multiple increase in population density in Yola South coupled with the migrants

as well as internally displaced persons ( IDPs) from the Northern part of the state due to Boko Haram insurgency prompted them to patronize the flooded areas . Thus, it is affordable looking at its menace of flooding seasonally which consequent led to its cheapness. This findings concord with what Ayoade, (1988) noted; Floods disasters are man-made, as they occur where and when man puts himself at risk by developing and occupying floodable areas. He also noted that, man develops and occupies flood plains at risk of flooding out of ignorance or for economic reasons. Among the factors that caused flooding in the study area heavy down pour and river overflows were the two major factors revealed from the study. Despite the climatic region of Yola south with low amount of annual rainfall, the area from the last decade ( 2008-2018) was experienced an increase in total amount of rainfall of more than 800 mm with more than 60 days number of rainy days as shown in the figure below respectively.

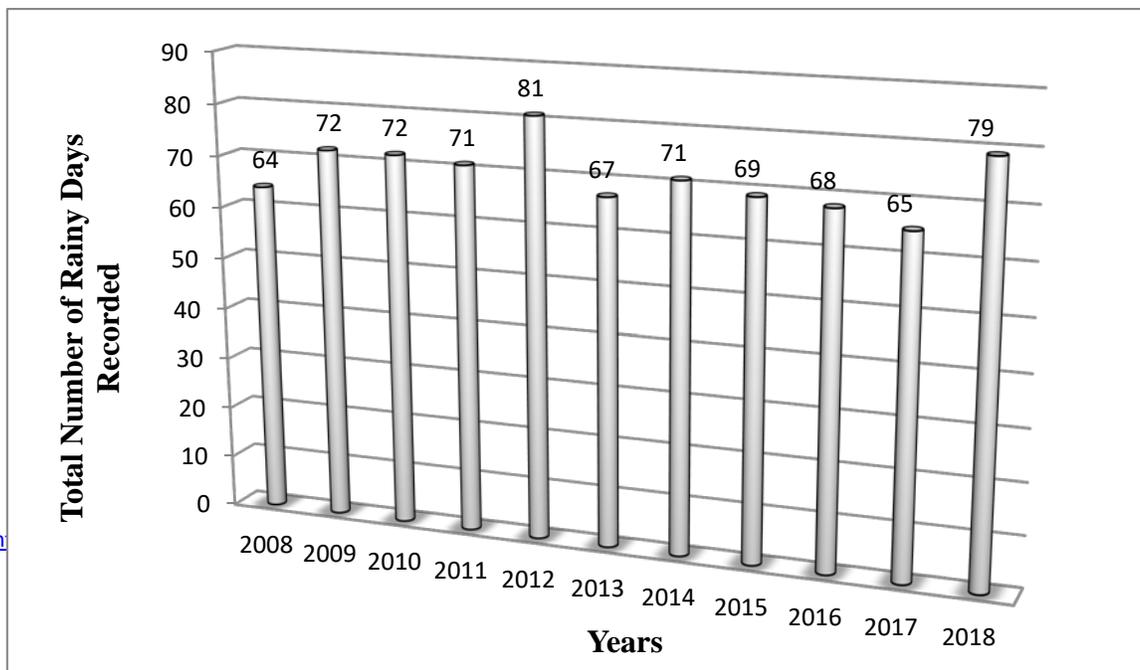
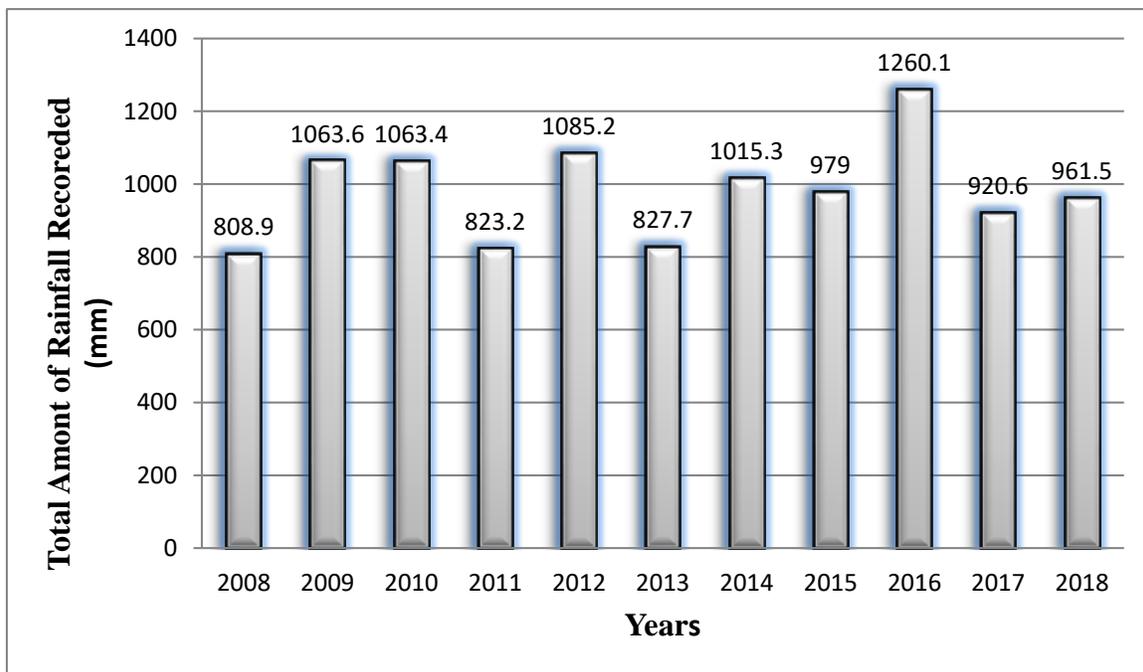


Fig 1. Shows the total amount of rainfall for a recent decade ( from 2008-2018) of Yola South LGA. (Source: UBRBDA, 2018).

Fig 2. Shows the total number of rainy days for a recent decade (from 2008-2018) of Yola South

(Source: UBRBDA, 2018).

This finding is in conformity with the verdict of Ward and Robinson, (1990) where they explained that quick flood are those usually caused by intense or prolonged rainfall or snow melt or combination of these two in a given area. Similarly, it was noted also by Oyegun, (2001) and Angillieri, (2007) that flood may be induced by a variety of factors, most notably heavy precipitation (intensity, duration, amount, or snow) Thus, Changes in precipitation events will affect flow rates and timing (Constantine, 2009) and also Knapp (1979) looked time to time heavy rainfall resulted in flood occurrence. Similarly, river flows been the second factor might be as a result of proximity of the area to River Chochi. The river was originated from Verre Hill South-eastern part of Yola. It has a river bed 158.461 m above mean sea level on latitude  $09^{\circ} 13'$  and longitude  $12^{\circ} 28'$  which carries substantial amount of water beyond its capacity after heavy down pour consequently submerged the area. In addition, Obeta (2014) added that, the release of water from the Lagdo dam upstream of the River Benue led to the flooding of the entire length and breadth of the downstream catchment of the basin. (Obeta, 2014). The study area seasonally experienced River flood and Flood flash which was sourced from River Chochi and also Wuro-chekke area along River Benue. Hence, all the settlements (both rural communities and townships) along the River Benue were flooded (Adebayo and Oruonye, 2012). Thus, the study area was situated on low undulating terrain at the south western bank of River Benue and South eastern part of River Chochi with some patches liable to flood when the discharge is high. The months of August and September were the months where flooding usually was at peak in the area. This followed the heavy precipitation usually experienced in the two months than the remaining months of the rainy season in the study area. Similarly, the number of rainy days

was maximum in the months of August and September. The figures below shows the variation of total monthly amount of rainfall recorded in 2018 in Yola South LGA.

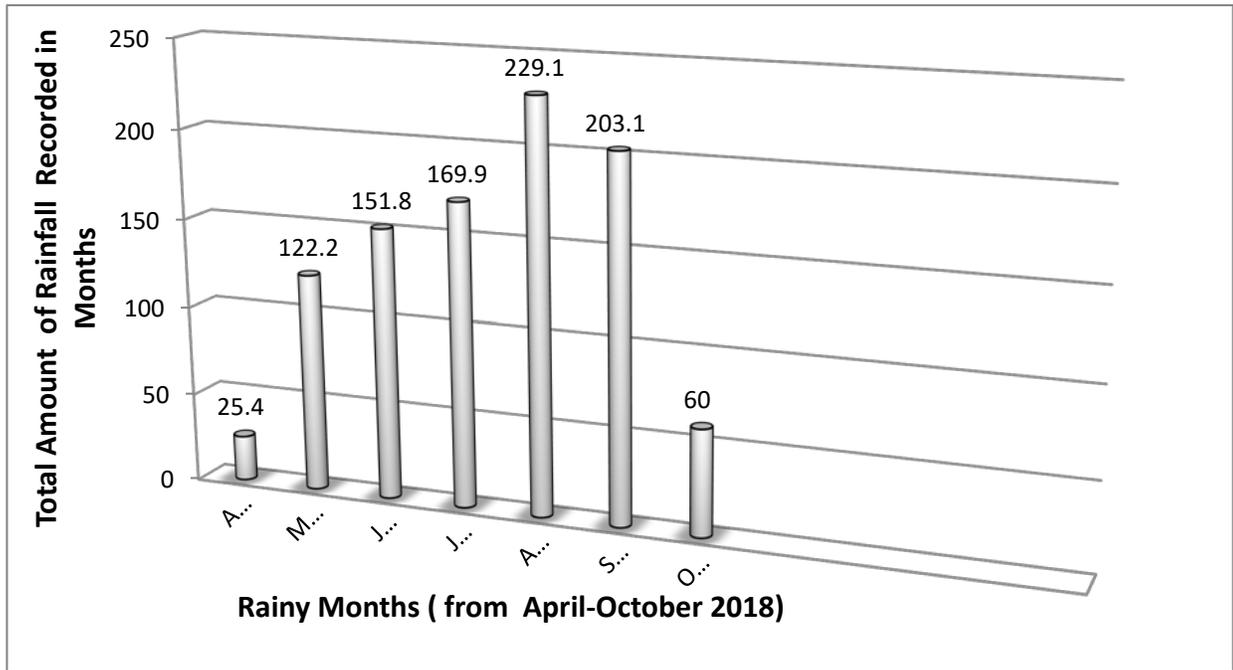


Fig 3.Shows the monthly variation of total amount of rainfall recorded in 2018 in Yola South LGA. ( Source: UBRBDA, Yola 2018).  
Loss of properties worth of hundred thousand naira

was the major threat attached to the flooding in the areas. These properties include cloths, food items, utensils, vehicles among others. Similarly, hundreds hectares of farmlands were been lost seasonally, where cereals such as maize, rice and sorghum were destroyed by sediment materials ( on-site effects) while some were been removed by run-off ( off-site effects) as shown on plates 6 and 7 below respectively.



Plate 6. Depicts the on-site effects of flooding on rice farm along River Chochi at Auguwan Tabo in Yola South LGA during 2018

flood. (Field Observation Photo. 7<sup>th</sup> September, 2018)



Plate 7. Depicts the off-site effects of flooding on maize farm at Tashan Sani in Yola South LGA during 2018 flood. (Field

Observation Photo. 17<sup>th</sup> August, 2018)

Maigari, (2002) explained that flood is the most universally experienced natural hazards involving greater loss of lives and properties. Similar findings was reported by Williams, ( 1999) who pointed out that Loko flood in Song LGA, of Adamawa State that occurred in August, 1989 was the worst where properties worth millions of naira and farmlands were destroyed. However, destruction of buildings was not severe during the flooding but few houses were recorded destroyed at Modere during the 2018 flood scenario as shown on plates 8 and 9 below.





Plate 8. Shows the destruction of buildings leading the inhabitants homeless by flood in Modere.

(Field observation Photo, 17<sup>th</sup> August, 2018)

Though, flood destruction varies from time to time and place to place depending on its intensity and magnitude respectively. Generally, this flood usually results in the destruction of properties worth millions of Naira (Areola and Akintola, 1980). Private and public properties worth millions of Naira were lost (Daura, Gisilambe and Waziri.,2001). For mitigation strategy proper construction of drainages is the most ardent practical solution identified by the respondents in the study area. This is because the area does not have adequate and well capacitated drainages that will accommodate smooth flow of flooded water as a result of heavy rainfall experienced in the area. This finding agreed with the what Mazumder (1983), pointed out that when there is heavy downpour in short period of time with poor drainage system in a given area will lead to stagnation of surface run off for some period consequently leading to flooding. Also, legal buildings by the inhabitants are a second major solution to the menace in the area suggested. This suggestion agrees with the conclusion drawn by Habitat (1996) who provides guidelines for sitting building construction in flood prone areas as structural measures of flood control.

### CONCLUSION

Flood is one of the most natural disaster affecting people in Nigeria, most especially in Adamawa state where thousands of houses, farmlands and properties worth of millions of naira were destroyed. In Adamawa state, Yola South LGA is among the probable flood prone areas where flooding occurs annually submerging most areas due to different factors. Findings from this study revealed that the key principal factor that caused flooding in Yola South LGA was found to be heavy rainfall experienced then followed by river overflows as well as poor drainage system. Similarly, Sabon Pegi D/L, Modere and Tashan Sani were the major affected flood prone areas in Yola South LGA where majority of the inhabitants stay in the areas due to the cheapness nature of the land and rent. Similarly, it was also assessed that river and flash floods were the types of flood usually experienced in the area usually in the months

of August and September where properties worth of millions of naira was found to most affected and farmlands destruction been the second affected. Suggestions were made by the respondents where proper construction of drainage system considered as the fast workable solution to the threat. Additionally, legal buildings were also reflected effective as mitigation strategy.

### RECOMMENDATIONS

Consequent upon the analysis of the results obtained from the data collected in respect of the demographic characteristics of the inhabitants, field observation and investigation of the physical setting, topographical features, effects and mitigations as well as the inferences drawn from the study, the following recommendations were observed for effective mitigation of the menace;

1. An integrated approach involving relocating those living along flood prone areas to a safer terrain through establishment of well secured and comprehensive resettlement scheme project should be considered by the government of all levels through it agencies such as Ministry of Urban and Regional planning.
2. Government should embarked as a matter of emergency on construction of larger drainages and to complete the drainage system along Sabon Pegi D/L and Modere areas which linked River Chochi at the Southern eastern part of Yola South LGA.
3. Illegal buildings and dumping of refuse into drainages and culverts should be waged against anyone found involved among the inhabitants.
4. Public enlightenments and sensitization program on environmental problems and consciousness should be conducted by the related agencies such as Ministry of environment, National Orientation Agency (NOA) among others.

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# Assessment of Substantive Causes of Soil Degradation on Farmlands in Yola South LGA, Adamawa State, Nigeria

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**Abstract-** Soil degradation remains a major serious threat agenda receiving a global attention on the pragmatic causes and its effects on food availability for the growing population. Yola South LGA, of Adamawa State is among the soil degraded region most especially in the tropics as a result of different causative agents. Therefore, this study aimed to assess the substantive causes of soil degradation on farmlands in Yola South LGA, of Adamawa State. Parameters related to soil degradation such as anthropogenic, cultural, edaphic and climatic factors were surveyed and assessed. Data collected from 180 sampled farmers using administered questionnaires were statistically analyzed using descriptive simple percentage method. The result indicated that land use/ rapid urbanization (23 %), continuous cropping (26 %), soil erosion (24 %) and high amount of rainfall (25 %) were the major factors in the parameters that led to soil degradation on farmlands in the study area. To curtail the existing menace of soil degradation in the area, extension workers should intensively engaged in training and educating farmers on soil sustainability and conservation techniques. Similarly, agricultural land should be provided by the government at all levels and make available to the small scale farmers in the area.

**Index Terms-** Assessment, Soil, Degradation, Causes, Yola South LGA and Farmlands.

## I. INTRODUCTION

The United Nations and a number of global and regional institutions/entities have throughout the years recognized that growing soil degradation is not only a [major threat to humanity](#), in that it compromises the continued tenure of food availability for a growing global population. (United Nations and Globalization on Soil Degradation Threats, 2018). Fertility status of a soil is a natural inherent gift bestowed within the layers of soil which are regulated under various physico-chemicals, geo-microbial, hydro-climatic and anthropogenic processes eventually subjecting the soil in to stage of depletion from its inherent nature (Sadiq, 2018). Soil degradation is the loss of actual or potential productivity and utility, and soil degradation implies a decline in the soil's inherent capacity to produce economic goods and perform environmental regulatory functions (Lal, 1997). Similarly, Soil degradation, refers to a broad

spectrum of changes in soil characteristics because of natural or anthropogenic factors that alter their structure and quality, including deforestation and the removal of natural vegetation, agricultural activities, overgrazing, overexploitation of vegetation for domestic use, and industrial activities (Lal, 1997; FAO, 2015; DeLong, Cruse, and Wieneret 2015; . Karlen and Rice , 2015 and Lal, 2015). Soil degradation is causing a decline in crop productivity and huge economic loss, putting the food security and livelihood of farmers at risk (Bhattacharyya, Ghosh, Mishra, Mandal, Rao, Sarkar, Das, et al., 2015). In sub-Saharan Africa (SSA), soil degradation (nutrient depletion is the primary form of soil degradation in SSA), is leading to a decline in crop productivity, and has been linked to hunger and poverty (Tully, Sullivan, Weil, and Sanchez, 2015.).

## II. CAUSES OF SOIL DEGRADATION

Historically, soil degradation caused by agricultural intensification started to receive research interest from the 1940s onwards (e.g. Jacks and Whyte, 1939; Howard, 1940; Osborn, 1948) but it took until the 1970s before it received serious international attention (Hartemink, 2003). Thus, Soil degradation is not a new problem and many of the ancient cultures broke down and disintegrated because of soil degradation problems such as erosion and salinization (Hillel, 1991). The causes that lead to soil degradation are complex and can be of a different nature: biophysical (i.e., land use, cropping system, farming practices, deforestation), socioeconomic (i.e., institutions, markets, poverty), and political (i.e., policies, political instability, conflicts) (Blaikie and Brookfield, 1987; Young, 1998; Lal, 1997; FAO, 2015; DeLong, Cruse and Wieneret, 2015; Lal and Stewart, 2013; Oldeman, Hakkeling, and Sombroek, 1991; Lambin, Turner, Geist, Agbola, Angelsen, *et al.* 2001; Barrett and Bevis, 2015). Similarly, Roy *et al.*, (2007), stated the basic factors causing soil nutrient losses are: soil erosion, crop removal, human activities, leaching and losses in gaseous forms. The major pathways of soil fertility declines on farmlands include the loss of nutrients through erosion, leaching, volatilization, crop uptake, poor management and harvests without proportionate replenishments. Many soils have been changed in their chemical, physical or biological properties through the agricultural activities of man, including cultivation, tillage, weeding, terracing, subsoiling, deep ploughing, manure

and fertilizer addition, liming, draining and irrigation (Bridges and de Bakker, 1997). Thus, soil in Yola South LGA is not exceptional in degradation process. However, agricultural land has become one of the largest terrestrial biomes on the planet, occupying an estimated 40% of the land surface (Tilman, Cassman, Matson, Naylor and Polasky, 2002, Tilman, Fargione, Wolff, D'Antonio, Dobson, Howarth, and Schindler, D. 2001, and Foley, Defries, Asner, Barford, Bonan, Carpenter et al., 2005). But unfortunately, people have been building and expanding their cities on the most fertile soils, thereby squandering such a valuable resource (Hillel, 1991; Montgomery 2007; Nizeyimana, Petersen, Imhoff, Sinclair, Waltman, Reed-Margetan, Levine, and Russo, 2001). Thus, in Yola South LGA of Adamawa state soil degradation prompted farmers to look for new land due to rapid urbanization on the fertile agricultural land. Similarly, intensification of agriculture has also led to the degradation and exhaustion of soil and land (Gomiero, 2016). The factors that determine the kind of degradation are as follows: soil inherent properties (i.e., physical, chemical), climate (i.e., precipitation, temperature), the characteristics of the terrain (i.e., slope, drainage) and the vegetation (i.e., biomass, biodiversity) (Lal, 1997 ;Lal, 2015).

### III. GUIDELINES FOR ASSESSING SOIL DEGRADATION PROCESS

According to Lal (1997), soil degradation happens when soil cannot perform one or several of the following principal functions:

1. Sustain biomass production and biodiversity including preservation and enhancement of gene pool.
2. Regulate water and air quality by filtering, buffering, detoxification, and regulating geochemical cycles.
3. Preserve archaeological, geological and astronomical records.
4. Support socio-economic structure, cultural and aesthetic values and provide engineering foundation.

Similarly, Hartemink, (2003), further explains the two main guidelines that can be of help in assessing soil degradation:

1. Clear signs of soil degradation that can be observed in the field. These could be erosion features, sealing or slaking of

the soil surface, salt accumulation at the surface, or compacted and dense soil layers. These features may be accompanied by poor crop growth but that may also be caused by other, less visible, symptoms, such as drought or the outbreak of pests and diseases.

2. Trends in crop yield. This is probably the best indicator of soil degradation although a number of confounding factors exist, such as a build-up of pests and diseases over time, increased weed infestation, or weather fluctuations.

Globally, the first approximation to assess and map soil degradation at a global scale was made by Oldeman *et al.* (1991). The Global Assessment of Soil Degradation (GLASOD) recognizes five different types of human intervention that have caused soil to degrade to its present status: deforestation, overgrazing, agricultural practices, overexploitation of the vegetative cover, and bio-industrial and industrial activities. (Hartemink, 2003). GLASOD indicated that almost 40% of the agricultural land in the world has been affected by human-induced soil degradation, and that more than 6% is degraded to such a degree that rehabilitation is only possible through large capital investments. The loss of nutrients (i.e. soil fertility decline) was severe in Africa and South America, but less of a problem in the upland soils of Asia (Oldeman *et al.*, 1991).

Generally, in Yola South LGA of Adamawa state, soil degradation is quite glaring and felt through on-field observation conducted by the authors these factors includes development of erosions on farmlands ( sheet to gully), deforestation practices which gradually manifest to desert encroachment, overgrazing effects on soil structure, industrialization and urbanization of buildings on fertile agricultural lands due to increase in population rate. The evident of such factors are depicted on plates 1 A-D below. In addition, reduction in crop yield had significantly experienced through poor crop growth as a result of soil nutrient depletion. Thus, it is timely and highly imperative to properly understanding and assesses the factors that caused soil degradation on their farmlands in the study area. Therefore, this study saddled to assess the soil degradation causes in Yola South LGA Adamawa State, with the specific objectives of assessing the major causes from anthropogenic, cultural, physical and climatic factors of soil degradation in the area.



A. Gradual development of desertification



B. grazing animals trampling on farmlands

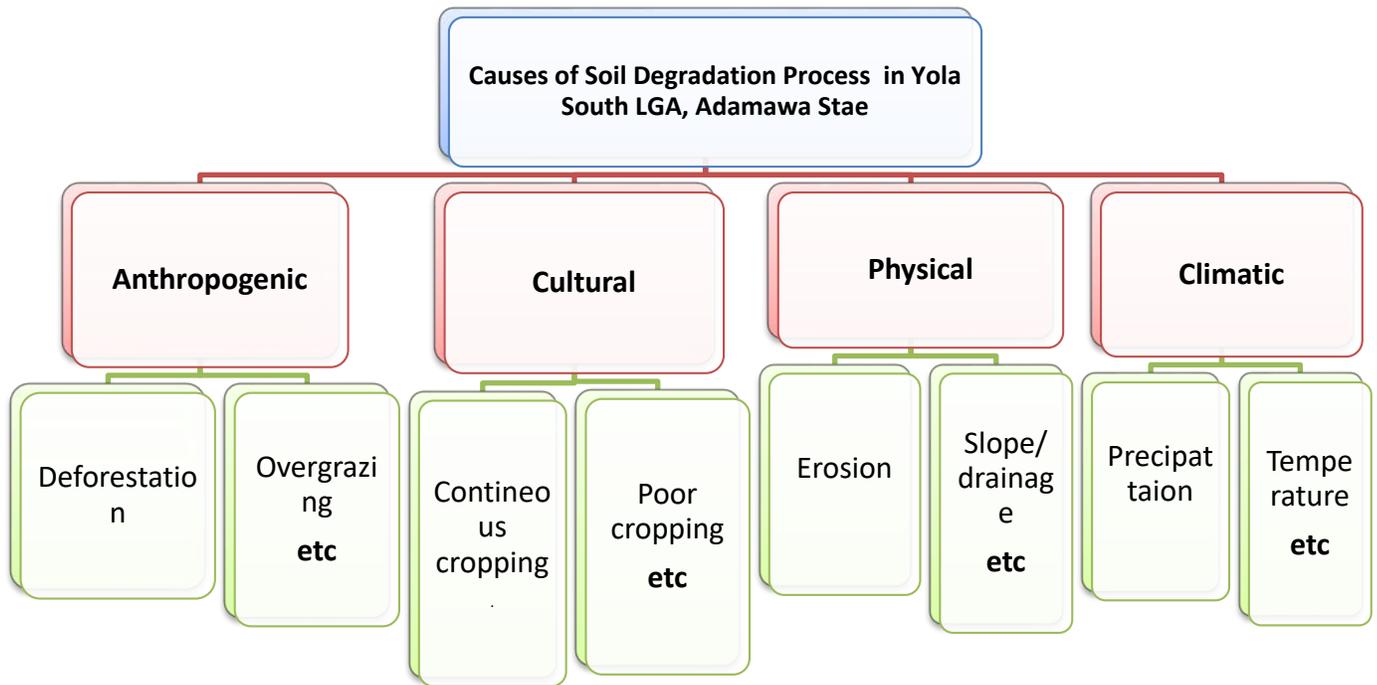


C. Destruction of soil structure caused by overgrazing



E. Urbanization on fertile agricultural land

**Plates 1 A-E Shows some factors of soil degradation in Yola South LGA, of Adamawa State.**

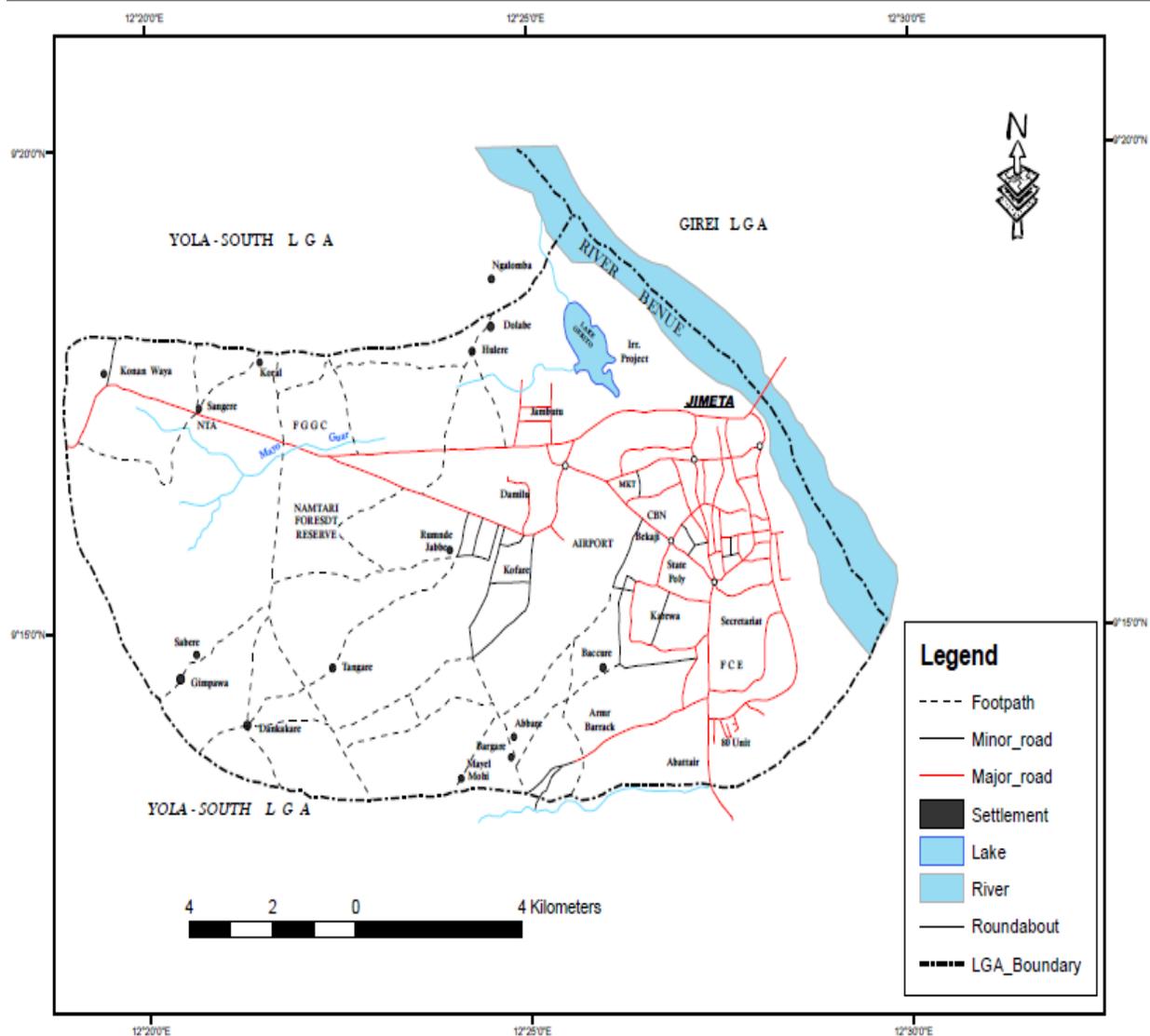


**Fig.1. Shows the overview of some factors that cause soil degradation in Yola South LGA, Adamawa State. (Adopted by the authors; field observation. , 2019)**

#### IV. STUDY AREA

The study was conducted in Yola South LGA of Adamawa State which lies on latitude  $09^{\circ} 14'N$  and  $09^{\circ} 20'N$  of the equator and longitude  $12^{\circ} 25'E$  and  $12^{\circ} 28'E$  of the Greenwich meridian, it has total population of 336, 648 persons as of 2010 ( Census, 2006; National Bureau of Statistics, 2006).

The average annual rainfall in the study area ranges between 850mm-1000mm with over 41% of rain falling in August and September. Temperature also has a significant temporal variation in the study area; with an average maximum temperature of  $42^{\circ}C$  with an average relative humidity of about 29%. (Upper Benue River Basin Development Authority, 'UBRBDA' 2018).



**Fig 2. Shows the map of the Study Area (Adopted from Festus, 2016)**

### V. SAMPLING TECHNIQUES AND DATA COLLECTION.

This study was quantitative in nature which largely based on both primary and secondary data, where total number of 180 sampled farmers were randomly selected as respondents and administered to them a well design and structured field assessment questionnaires (FAQ) with on-field oral interviews respectively. While Secondary sources were obtained from

relevant agencies/institutions and other related scientific literatures were also overviewed from Journals, textbooks, from e-library, institutions, internet and unpublished thesis as well.

### VI. DATA ANALYSIS

The data collected were subjected to descriptive statistical analysis where simple percentages, frequency distribution and charts were obtained.

### VII. RESULTS AND DISCUSSIONS

**Table 1. Assessment of Anthropogenic Causes of Soil Degradation.**

VARIABLES	Frequency	Percentage (100 %)
Bush Burning	27	15

Overgrazing	34	19
Deforestation	38	21
Removal of Crop Residues	40	22
Land Use/Urbanizations	41	23
<b>TOTAL</b>	<b>180</b>	<b>100 %</b>

*Source*; Authors’ Field Survey Assessment ( 2019)

Anthropogenic causes of soil degradation process entails direct and indirect human activities associated with soil nutrients depletion. From the above table 1, it was revealed that land use and or urbanization was the utmost factor that caused devastating soil degradation in the study area with 23 % of the respondents. This might be largely due to increase in population density which prompted inhabitants in the area to occupy the fertile agricultural land under cropping to building of houses and industries. This finding agreed with the report of Montgomery, (2007) who explained that people have been building and expanding their cities on the most fertile soils, thereby squandering such a valuable. Similarly, 22 % of the respondents agreed that removal of crop residues on the farmland caused the soil degraded; likely crop residues are removed in the study area as animal forage rather than incorporating them in to the soil to improve the soil nutrients. This finding is in conformity with the report of Sadiq and Tekwa ( 2018) explained that, in Mubi region, most farmers usually gather crop residues on their farms and sale them to pastoralists as a source of income without minding its negative implications or even understand the need to recycle such crop residues as sources of soil fertility enrichment on their farmlands and more than 50% of crop residues are utilized for animal feeds

and other economic purposes. While other respondents ( 21%) assessed deforestation as the main factor of soil degradation in the area, where trees ( leaves, litters which decomposed in purification process of organic matter in nitrogen cycle are indiscriminately cut down as fuel wood for cooking and economic purposes subsequently subjecting the area in to desert encroachment zone .Thus, In Nigeria desertification is fast becoming a threat in the northern parts especially the states in the sahel and sudan svanna areas ( Uchegbu, 2002). Overgrazing by the animals was perceived by 19 % of the respondents to had caused soil degradation in the study area. Perhaps might be due to their traction effects on the soil physical properties such as structures, texture, porosity and compaction. Overgrazing affects soil structure, compaction rates, porosity, and top soil depletion which have led to soil erosion and reduced soil fertility. (Sadiq, Abdullahi and Ardo, 2019a). Lastly, bush burning had received fewer respondents (15 %) in the area to have cause soil degradation respectively. Hence, in an oral interview conducted with the respondents revealed that bush burning practices was not heavily engaged by the inhabitants in the study area due to the sanctions attached to it by the traditional rulers.

**Table 2. Assessment of Cultural Causes of Soil Degradation.**

<b>VARIABLES</b>	<b>FREQUENCY</b>	<b>PERCENTAGES (100%)</b>
Continuous Cropping	47	26
Excessive and Deep Tillage	32	18
Poor Soil Management	38	21
Nutrient imbalance	29	16
Excess use of Chemicals	34	19
<b>TOTAL</b>	<b>180</b>	<b>100 %</b>

*Source*; Authors’ Field Survey Assessment ( 2019)

Among the cultural causes which has to do with the farming practices and farmer’s perception that leads to soil degradation in Yola south LGA, were depicted on table 2 above. Continuous cropping revealed to be an ultimate factor that caused degradation of soil resources with 26 % of the respondents. It might be probably due to unavailability of farmland and tenure system as a result of high increase in population. In an on-farm oral interview conducted with some farmers revealed that they cultivated over than 20 years on the same piece of land as they inherited the farmlands from their parents without effective management practices. This result had agreed with the report of Sadiq, ( 2018) who explained that that unavailability of fertile agricultural lands has made most farmers to engaged in continuous cropping systems and without involving proper management techniques. Similarly, farmers in Mubi area cultivated a piece of land for over 15 years without minding the recommended soil nutrient management rules. (

Sadiq and Tekwa, 2018). Thus, this farmers’ behavior have degraded the inherent resources of soil in Yola South LGA, and thereby causing lower crop yields over time. In addition, 21 % of the respondents conceived that poor soil management by the respondents caused degradation of soil resources. Perhaps this might due to lack of adequate skills and technical know-how and less or no adoption of effective conservation techniques. Akintola, Odu and Baiyegunhi (2013) explained that intensive cultivation and cropping, coupled with less or no adoption of conservation techniques concerned the farmlands’ nutrient status and eventually put most of their (farmers) production less economical. Similarly, other respondents (19 %) agreed that excessive use of chemicals while 18 % of them attached it to deep tillage practices were among the cultural causative factors of soil degradation in the study area respectively.

**Table 3. Assessment of Physico-Edaphic Causes of Soil Degradation.**

VARIABLES	FREQUENCY	PERCENTAGES (100 %)
Soil Erosion/ Erodibility	43	24
Poor Drainage system	38	21
Soil Compaction	30	17
Nature of the Slope	40	22
Soil Creeping/ Solifluction	29	16
<b>TOTAL</b>	<b>180</b>	<b>100 %</b>

*Source;* Authors' Field Survey Assessment ( 2019)

Among the physico-Edaphic causes of soil degradation process in the study area as shown on table 3 above, soil erosion and erodibility was revealed by the most of the respondents ( 24 %) to had triggered dilapidation of soil nutrients. Yola south LGA is experiencing rapid development of extended gully erosion from its all farmland axis which carries organic soil from the top soil and sediment on farmlands. Thus, Soil erosion by water or wind agents selectively damages the soil by removing organic matter, soil particles, plant nutrients, pedon thickness, and reducing soil chemical capacity to retain added nutrients (Sadiq, *et al.*,2019a). Hence, erosion removes soil particles that are necessary for water storage and denies root exploration for plant nutrients (Sadiq and Tekwa, 2018). In Nigeria, it has been reported that over 25 million tons of valuable top soils are lost annually to erosion (Ezedinma, 1982). Moreover, 22 % of the respondents conceded that nature of the slope in the area causes

the soil to degraded, because some farmlands in the study area is suited in steeply sloping ( 20-22 %) ground most especially those along Benue riverine areas. The sloppy nature of the farmland increases the rate of erosion and is the most serious soil loss agent devastating the area. It was reported by Serageldin, (1987) in West Africa, soil erosion gulps about 10-21 tons of top soils per ha on nearly gentle slopes of 0.4 - 0.8% and up to 30 - 35 tons on 1-2% slopes. Poor drainage system considered to have caused soil resources depletion with 21 % of the respondents in the area which led to seasonal flooding affecting hundred hectares of valuable farmlands and consequently reducing the yield per unit area. Others among the respondents 17 % and 16 % conceived that soil compaction and soil creeping were among the causative agents of soil degradation respectively.

**Table 4. Assessment of Hydro-climatic Causes of Soil Degradation.**

VARIABLES	FREQUENCY	PERCENTAGES ( 100 % )
Humidity	29	16
Temperature Level	36	20
Evaporation Rate	30	17
High amount of Rainfall	45	25
Flooding	40	22
<b>TOTAL</b>	<b>180</b>	<b>100 %</b>

*Source;* Authors' Field Survey Assessment ( 2019)

From table 4 presented above, it was revealed that high amount of rainfall experienced in the area was found to be major factor of soil degradation among the hydro-climatic parameters. This is because the flood frequency and magnitude, rate of run-off, erosion and soil loss depends directly on the amount of rainfall recorded. Similar finding was made by Sadiq, *et al* (2019b) who reported that 28.5% of the respondents believed that high amount and prolong duration of rainfall was responsible for flooding in the area which hampered hundred hectares of land. This finding is in conformity with the verdict reported by Oyegun, 2001 and. Angillieri, (2007) that flood may be induced by a variety of factors, most notably heavy precipitation

(intensity, duration, amount, or snow) . Similarly, Knapp (1997) looked time to time heavy rainfall resulted in flood occurrence. Despite the climatic region of Yola South with relatively low amount of annual rainfall, the area however from the last decade ( 2008-2018) was experienced an increase in total amount of rainfall of more than 800 mm with more than 60 days number of rainy days as shown in the figure 3 and 4 below respectively. Thus, the high amount of rainfall experienced in the year 2018 had led to excessive run-off which subsequently resulted to river flooding in the study area which aids in degrading soil nutrients. Changes in precipitation events will affect flow rates and timing (Constantine, 2009)

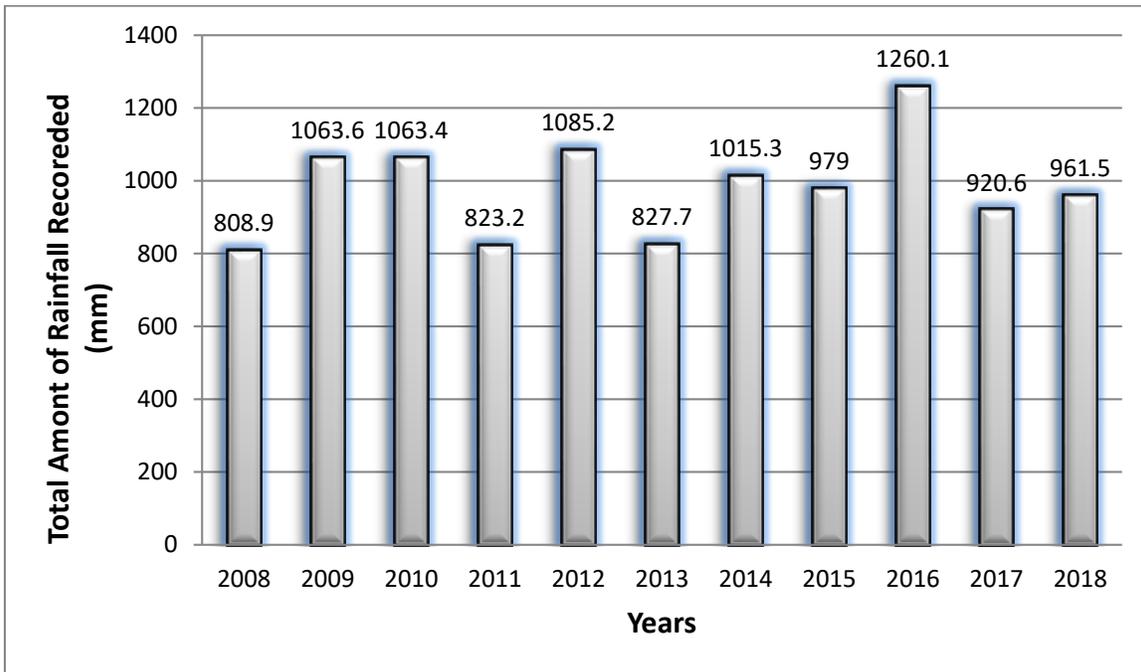


Fig 3. Shows the total amount of rainfall for a recent decade ( from 2008-2018) of Yola South

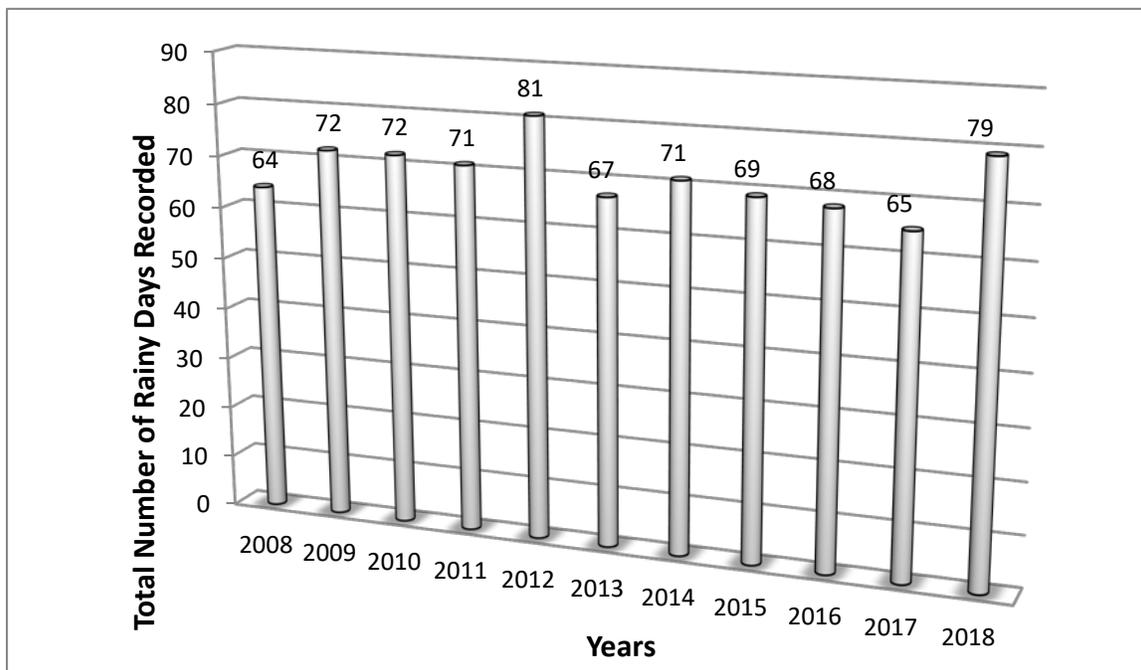


Fig 4. Shows the total number of rainy days for a recent decade (from 2008-2018) of Yola South.

Flooding also was found to be second major causes of soil degradation in the study area with 22 % of them. It was reported in the recent findings of Sadiq *et al*, (2019b) in Yola, floods have removed significant amount of topsoil on farm lands (off-

site effects) while some parts of the farmlands were deposited (with some sediments; on-site effects) which damaged crops as shown in plates 2 below..



Plates 2. Shows the apparent effects of on-site erosion caused by river flooding in the study area (Adopted from Sadiq *et al.*, 2019b)

In Nigeria, flooding is the most frequent and most widespread natural hazard accounting for about one-third of all disasters arising from geophysical hazards and adversely affecting more people than any other natural hazard (Adebayo and Oruonye, 2012). According to the report of Sadiq and Hena, (2018) who explained that in Nigeria, Adamawa state is one of the most occurring flooded states over the decade with a large extent of vulnerability leading to devastating loss of lives, properties, farmlands, displacement and negatively affecting the socio-economic activities in the state. They added that in Adamawa state, Yoal South LGA, is grouped in a highly flood prone areas for the past decades consequence to its extent, proximity to river Benue and reoccurrence respectively.

The Temperature level in the area was agreed to have caused degradation of soil resources with about 20 % of the respondents. Temperature plays a vital role in decomposition process of organic matter and other element mineralization. High amount of temperature aids in organic matter declination and volatilization of nitrogen. Thus, organic material in the soil is essentially derived from residual plant and animal material, synthesized by microbes and decomposed under the influence of temperature, moisture and ambient soil conditions (Ajoade, 2004). The temperature regime in Yola LGA is warm to hot throughout the year described as hyper-thermic soil temperate region due to high radiation which is relatively and evenly distributed throughout the year had led to loss of organic matter because of increase rate of decomposition rates most

especially when there is a gradual increase in temperature from January to April with seasonal average maximum temperature of 42°C with an average relative humidity of about 29%. (UBRBDA, 2018). Practically, flood is indirectly depended on atmospheric temperature of a given geographical area, because temperature has a direct effect on evaporation rate of water bodies on the ground surface. Hence, rising temperature will lead to an intensification of the hydrological cycle, resulting in drier dry seasons and wetter rainy seasons, and subsequently heightened risks of more extreme and frequent floods and droughts (Holmes, 2007). High temperature facilitates evaporation rate while low temperature decreases/ reduces the rate of water, moisture and vapour loss from the ground surface which may affects the availability and sustainability of soil nutrients. As the Earth's average temperature rises, the proportion of precipitation in the form of rain increases and there is also a decrease in precipitation proportion in the form of snow. (Adams and Peck, 2008). Humidity and Evaporation were among the minor climatic factor of soil degradation assessed with about 16 % and 17 % of the respondents respectively. Humidity plays a pivotal role in predicting rate of precipitation. The study area experienced moderate to high relative humidity as shown in table 6 below. This sensation might also be contributed to the unique scenario of flood and soil run-off (Solifluction effect) in the study area, because the extent of saturation depends on the quantity of water vapour present in the air which might give rise to condensation and later excessive precipitation. Thus, as the relative humidity (RH) ranges between 70-75 % there would be high possibility of intensive precipitation as was glared in the monthly mean of RH from 2007-2016 in the study area.

**Table 5. Monthly Mean Relative Humidity (%) in Yola South LGA, Adamawa State.**

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL (%)
2007	22	21	28	47	68	70	74	82	79	72	51	26	645
2008	25	21	29	45	56	68	73	81	77	66	36	36	613
2009	27	22	26	47	62	71	75	79	80	74	46	26	635
2010	24	26	29	36	63	72	76	79	80	80	52	29	646

2011	30	36	31	38	61	66	73	77	82	72	41	31	638
2012	35	34	22	42	65	70	77	77	84	74	55	37	672
2013	30	23	38	46	60	76	77	77	78	69	50	40	664
2014	24	19	30	48	69	73	75	78	76	71	56	30	649
2015	25	23	29	28	47	65	71	77	74	71	39	27	576
2016	23	21	39	34	60	67	73	78	75	67	38	24	599

**Source:** UBRBDA, Agromet, Station Yola (2018).

Similarly, evaporation rate was also received a significant response (17 %) as a factor that indirectly caused soil nutrients depletion. This is because if the rate of precipitation is higher than the evaporation rate it occurs mostly in rainfall intensive months of the rainy season with low atmospheric temperature (July-September) the soil macro and micro-pores spaces will filled up with water leading to waterlogging effects and consequently rejuvenating to devastating soil degradation as it was glared in the study area. Conversely, if the rate of evaporation is higher than the precipitation the ground water surface will eventually reduce or deplete which consequently manifest to hydrological drought leading to reduction of soil moisture content at field capacity, hygroscopic water, drying of reservoirs, lakes, streams, rivers and cessation of spring flows and fall in the groundwater table thereby reducing the soil viable resourced components.

### VIII. CONCLUSION

From the present research conducted in Yola south LGA, of Adamawa state, it was therefore concluded that the area is undergoing severe degradation consequence on the major identified factors such as rapid urbanization on fertile agricultural land as anthropogenic factor, continuous cropping system adopted by the farmers revealed as cultural factor, while soil erosion which regarded as physic-edaphic factor and for climatic factor heavy rainfall was assessed respectively. Therefore, technical ardent attentions are required to find out a practical workable solution as matter of emergency with the aim of realizing maximum food production per unit area of land for the growing population in the study area. Thus, optimum food production largely depends on soil productivity potentials.

### IX. RECOMMENDATION.

Based on the research findings obtained. It is therefore recommends that, professional extension workers should be incorporated in the soil and water conservation agenda towards educating and training the peasant farmers cultivating on the degraded soils. Similarly, government at all levels should provide adequate agricultural land to the farmers in the area with the aim of increasing food production for the growing population in the tropics and sustaining the soil nutrients for future use as well.

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# STATISTICAL Analysis of the Nutritional Status OF Women in Ethiopia: Evidence From the 2016 ETHIOPIA Demographic and Health Survey

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**Abstract** *Poor nutritional status of women has been a serious problem in Ethiopia for many years. This study aims at identifying and investigating determinants of women nutritional status in Ethiopia. The analysis is based on Body Mass Index (BMI) of 11,955 women aged between 15 and 49 years that are obtained from the 2016 Ethiopian Demographic and Health Survey. A multilevel logistic regression analysis is employed to estimate the parameters and captures the hierarchical nature of the dataset. The result indicates that women's nutritional status differs across regions, and that nutritional status of women varies from 20 percent to 45 percent. Demographic, socio-economic and infrastructure variables significantly determine nutritional status of women. Strengthening primary health care, educating women and creating employment opportunities are found to be crucial way forwards.*

**Key Words:** Nutritional Status, Women and Multilevel Analysis

## I. Introduction

Nutritional status is the result of complex interactions between food consumption and the overall status of health and health care practices. Numerous socioeconomic and cultural factors influence patterns of feeding children and the nutritional status of women and children. The period from birth to age two is especially important for optimal growth, health, and development. Unfortunately, this period is often marked by micronutrient deficiencies that interfere with optimal growth. Additionally, childhood illnesses such as diarrhea and acute respiratory infections (ARI) are common. For women, improving overall nutritional status throughout the life cycle is crucial to maternal health. Women who become malnourished during pregnancy and children who fail to grow and develop normally due to malnutrition at any time during their life, including during fetal development, are at increased risk of prenatal problems, increased susceptibility to infections, slowed recovery from illness, and possibly death. Improving maternal nutrition is crucial for improving children's health (CSA and ICF 2012).

Chronic energy deficiency is caused by eating too little or having an unbalanced diet that lacks adequate nutrients. Women of reproductive age are especially vulnerable to chronic energy deficiency and malnutrition due to low dietary intake, inequitable distribution of food within the household, improper food storage and preparation, dietary taboos, infectious diseases, and inadequate care practices. It is well known that chronic energy deficiency leads to low productivity among adults and is related to heightened morbidity and mortality. In addition, chronic under-nutrition among women is a major risk factor for adverse birth outcomes (CSA and ICF, 2016)

Women in developing country are most vulnerable to malnutrition, due to low dietary intakes, inequitable distribution of food at household level, improper food storage and preparation and infectious diseases (CSA and ORC Macro, 2006). Poor nutritional status of women has been a serious problem in Ethiopia for many years. For example, more than one out of every four (27 per cent) women in Ethiopia who are in the reproductive age is undernourished (CSA and ICFI, 2012).

Under-nutrition among women age 15-49, as measured by BMI less than 18.5, has declined over the last 16 years. The percentage of thin women dropped from 30% in 2000 to 22% in 2016. In

contrast, the proportion of women who are overweight or obese, which is indicative of over nutrition, has increased during the same period. The proportion of women who are overweight or obese has increased from 3% in 2000 to 8% in 2016 (CSA and ICF, 2016).

A number of research works were conducted on the levels and determinants of maternal nutritional status using Ethiopian Demographic and Health Surveys (EDHS). However, those studies have not looked into sources of women nutritional status disparity among regions. In Ethiopia context, however, there is a significant variation among regions in terms of resource allocation, level of poverty, social services, environmental challenges and level of infrastructure development that may directly or indirectly affect nutritional status of women. Thus, this it is worth capturing region as one important source of variation for women nutritional status.

This study, thus, takes into account important sources of regional variation to investigate determinants of women's nutritional status using a multilevel model. This study centers on estimating the level, identifying determinants and examining determinants of women nutritional status at intra-regional and inter-regional levels. The remainder is organized in four sections. Section 2 presents the methodology of the study in some detail. In section 3 the findings of the study are presented. Section 4 highlights conclusions and recommendations of the study.

## II. Methodology

### *Study area and data*

Ethiopia is the second most populous nation in Africa with a total population of 86.6 of which half of them are females (CSA, 2016). The latest country's census depicted those women in the reproductive age group (15-49) make up about a quarter (24 per cent) of the total population (CSA, 2007).

The country is administratively divided into nine regional states-Tigray, Affar, Amhara, Oromiya, Somali, Benishangul-Gumuz, Southern Nations Nationalities and Peoples (SNNP), Gambela, and Harari-and two city administrations-Addis Ababa and Dire Dawa.

The analysis of this study is based on the fourth comprehensive EDHS 2016 dataset.

In the interviewed households, 16,583 eligible women were identified for individual interviews. Interviews were completed with 15,683 women, yielding a response rate of 95%. A total of 14,795 eligible men were identified in the sampled households and 12,688 were successfully interviewed, yielding a response rate of 86%. Although overall there was little variation in response rates according to residence, response rates among men were higher in rural than in urban areas (CSA and ICF, 2016).

The 2016 EDHS collected anthropometric data on height and weight for women age 15-49. These data were used to calculate several measures of nutritional status such as maternal height and body mass index (BMI). BMI is calculated by dividing weight in kilograms by height in meters squared  $\frac{\text{Kg}}{\text{m}^2}$ . For this study, **11,955** women's BMI data were taken for which information on height and weight were available. Women age 15-49 who are not pregnant and who have not had a birth in the 2 months before were included.

### Variables

**Outcome variable** The response variable is the nutritional status of women measured in BMI. Most frequently this indicator is used as a standard indicator to assess the progressive loss of body energy. The International Dietary Energy Consultative Group (IDECG) suggests the cut-off point for adults Chronic Energy Deficiency (CED) to be BMI < 18.5 (James et.al., 1988). For this study the same threshold is used, as well. The response variable dichotomized as malnourished if BMI<18.5, and otherwise (if BMI>=18.5).

### *Explanatory variables*

Explanatory variables include indicators of demographic characteristics of households to which the women belong to, socioeconomic status of households, geographic location of the women, health status of the women and access to infrastructure. Some of these indicators are: age, educational level, marital status, employment status, household economic status (wealth index), place of residence, region, number of children, and source of water supply of the women.

*Method of Data Analysis*

The analysis was made in two stages. In the first stage a single level analysis was fitted using standard ordinary logistic regression ignoring the hierarchical structure of the data and the possible correlation that may exist across the regions. In the second stage, we recognized the hierarchical structure of data and that attempt made to separately identify regional effects using multilevel modeling approaches.

*Standard logistic regression model*

Key determinants of nutritional status were first analyzed using standard ordinary logistic regression model. the response variable, women nutritional status measured in bmi and dichotomized as malnourished or not as can be seen below:

$$\text{That is, BMI} = \begin{cases} 1, & \text{if woman is malnourished} \\ 0, & \text{otherwise} \end{cases}$$

The logistic regression model is given as follows (Hosmer and Lemisow, 2000):

$$\text{logit}(\pi_{ij}) = \ln\left(\frac{\pi_{ij}}{1 - \pi_{ij}}\right) = \beta_0 + \sum_{i=1}^K \beta_p X_{ij} \dots\dots\dots (1)$$

where  $x_{ij}$ 's the predictor variables and  $\pi_{ij}$  were denoted the probability.

*Multilevel models*

Advnatage of multilevel analysis is that it adequetly represents unexplained variability of nested structure, which is often difficult to represent in multiple regression analysis such as standard ordinary logit regression indicated above. In multiple regression analysis the unexplained variability is assumed to be a single level and that it emantes only from the variance of the residual term. Whereas, in multilevel analysis the variability has more complicated structure related to several populations involved in modelling (Snijders and Bosker, 1999).

*Random coefficients logistic regression model*

Multilevel logistic regression analysis is the method of examining hierarchical data structures and finding the relationship between two or more variables. The outcome variable of multilevel logistic regression is the dichotomous variable and has the Bernoulli distribution ( $n_{ij} = 1$ ). A dichotomous random effects model has a binary outcome (Y=0 or Y=1) and regresses the log odds of the outcome probability on various predictors to estimate the probability that Y=1 happens, given the random effects. The simplest dichotomous is a 2-level model that is given as follows:

Assume there are  $k$  explanatory variables  $X_1, \dots, X_k$ . The values of  $X_p$  ( $p=1, 2, \dots, k$ ) are indicated by  $X_{pij}$ , ( $p=1, 2, \dots, k$ ;  $i=1, 2, \dots, N_i$  and  $j=1, 2, \dots, N$ ). Since some or all of these variables are level-one variables, the success probability is not necessarily the same for all individual in a given group. The success probability depends on both the individual and the group that the individual belongs to. It is denoted by  $\pi_{ij}$ . The outcome variable is expressed as the sum of the success probability (expected value of the outcome variable) and a residual term  $\epsilon_{ij}$ . That is,  $Y_{ij} = \pi_{ij} + \epsilon_{ij}$  the residual term  $\epsilon_{ij}$  is assumed to have mean zero and variance  $\sigma_\epsilon^2$ . The logistic regression model with random coefficients express the logs-odds (i.e. the logit of  $\pi_{ij}$ , ) is the sum of a linear function of the explanatory variables with randomly varying coefficients.

That is,

$$\text{logit}(\pi_{ij}) = \beta_0 + \sum_{p=1}^K \beta_{pj} X_{pij} + U_{0j} + \sum_{p=1}^K U_{pj} X_{pij}$$

In the equation,  $\beta_0 + \sum_{p=1}^K \beta_{pj} X_{pij}$  is the fixed part of the model, whereas  $U_{0j} + \sum_{p=1}^K U_{pj} X_{pij}$  is the random part. The

term  $\sum_{p=1}^K U_{pj} X_{pij}$  represents the random interaction between group and the explanatory variables.

*Intercept-only model*

Intercept-only model sometimes referred as empty model. This is the simplest form of multilevel logistic regression model without explanatory variables. The model only contains random groups and random variation within groups. It can be expressed as a model where the dependent variable is the sum of a general mean, a random effect at the group level, and a random effect at individual level.

It can be expressed as:

$$\text{logit}(\pi_{ij}) = \ln\left(\frac{\pi_{ij}}{1 - \pi_{ij}}\right) = \beta_{0j} = \beta_0 + U_{0j}$$

Where  $\beta_0$  is the overall mean and  $U_{0j}$  the variance component between regions. This will be used as parametric version for assessing heterogeneity among regions with respect to nutritional status of women.

*Random intercept logistic regression model*

Random intercept logistic regression model has all its lower level explanatory variables are fixed. This means that the corresponding variance components of the slope are fixed at zero. It is used to assess the contribution of each individual explanatory variable.

$$\begin{aligned} \text{logit}(\pi_{ij}) &= \log\left(\frac{\pi_{ij}}{1 - \pi_{ij}}\right) = \beta_{0j} + \sum_{p=1}^K \beta_p X_{pij} \\ &= \beta_0 + \sum_{p=1}^K \beta_p X_{pij} + U_{0j} \end{aligned}$$

The first part,  $\beta_0 + \sum_{p=1}^K \beta_p X_{pij}$  is the fixed part of the model; because the coefficients are fixed. The remaining part  $U_{0j}$  is called the random part of the model.

the two prevailing approximation procedures for estimating multilevel logistic regression models are marginal quasi likelihood (mql) and penalized quasi likelihood (pql) (goldstein and rasbash, 1996). however, pql has best approximation procedure and is preferred to mql (goldstein, 2003). for this study, second-order pql (pql-2) method is adopted.

**III. Results and Discussion**

Table1 the percentage of nutritional status among women by selected socio-economic and demographic characteristics, EDHS 2016.

	Well nourished BMI=18.5-24.99	Undernourished BMI<18.5	P –value
<b>age</b>			<b>0.000</b>
15-19	65.5%	34.5%	
20-24	72.4%	27.6%	
25-29	76.0%	24.0%	

30-34	74.6%	25.4%	
35-39	73.3%	26.7%	
40-49	70.1%	29.9%	
<b>place of Residence</b>			<b>0.000</b>
Urban	77.5%	22.5%	
Rural	68.9%	31.1%	
<b>Educational Status</b>			<b>0.000</b>
No education	70.2%	29.8%	
Primary	71.8%	28.2%	
Secondary and above	73.5%	26.5%	
<b>Source of drinking water</b>			<b>0.000</b>
Unprotected	72.0%	28.0%	
Protected	70.3%	29.7%	
<b>Economical Status</b>			<b>0.000</b>
Poor	64.5%	35.5%	
Middel	73.0%	27.0%	
Rich	77.1%	22.9%	
<b>Marital Status</b>			<b>0.000</b>
nevermarried	68.9%	31.1%	
Married/living together	72.3%	27.7%	
Widowed/divorced/Separated	72.9%	27.1%	
<b>Employment Status</b>			<b>0.000</b>
Unemployed	67.8%	32.2%	
Employed	75.2%	24.8%	
<b>No of Children</b>			<b>0.000</b>
No children	72.5%	27.5%	
one to two children	70.5%	29.5%	
3 or more children	71.4%	28.6%	

Source: Own computation using EDHS 2016

### *Levels of under-nutrition*

Table 1 shows BMI scores of women undernourished (severely thin, moderately thin, and thin) based on background characteristics. More specifically, women who were unemployed (32.2 percent), never married (31.1 percent), belonged to poor household (35.5 percent) are most affected by severe undernourishment. Slightly large portion of women who are in the age between 15 and 19 and above 40years found to be in severely thin category.

### *Model Estimation*

#### *Intercept Only Multilevel Logistic Model (Empty model)*

Table 2 presents parameter estimates, standard errors of a standard logistic and a multilevel logistic regression models without explanatory variables. The maximum likelihood estimates from the standard logit model of the ratio between undernourished and nourished women is  $\exp(-756) = 0.470$ , which is the ratio of 4,238 malnourished by 9,030 nourished women. In the intercept only model, the average log-odds of malnourished women in PQL-2 parameter is  $-0.752$  that corresponds to odds of  $\exp(-0.752) = 0.471$ . Similarly, in MQL-2, PQL-2 and MCMC parameter estimate the odds of  $\exp(-752) = 0.471$ ,  $\exp(-752) = 0.471$  and  $\exp(-7) = 0.474$  respectively.

Compared to the odds-ratios estimate obtained by all multilevel methods except PQL-1, the standard logistic model has underestimated and shown significant different odds-ratio estimates.

Table 2 Parameters and standard errors of an intercept-only logit model and an intercept-only multilevel model predicting the probability of under-nutrition.

Model Effect	Standard Logit	Multilevel Models				
	Logit	MQL-1	MQL-2	PQL-1	PQL-2	MCMC
Fixed effect						
Intercept, $\beta_0$	-0.756	-0.717	-0.752	-0.784	-0.752	-0.746
S.E	0.019	0.133	0.135	0.137	0.138	0.138
P value	<b>0.000***</b>	<b>0.000***</b>	<b>0.000***</b>	<b>0.000***</b>	<b>0.000***</b>	<b>0.000***</b>
Random Effect						
Level-two variance $\text{Var}(U_{oj}) = \sigma_0^2$		0.191	0.193	0.203	0.205	0.244
S.E		0.083	0.085	0.088	0.089	0.134
P value		0.021**	.023**	0.021**	0.021**	.069*
-logL Dviance	15808.731					16118.66
N	13268	13268	13268	13268	13268	13268

Note: \*= significant at 10%, \*\*= significant at 5%, and \*\*\*= significant at 1%

The region level variation is estimated to 0.191, 0.193, 0.203, 0.205, and 0.204 from the multilevel model by the MQL-1, MQL-2, PQL-1, and PQL-2 and MCMC methods on the logit scale respectively. The chi-square value of 5.222 on 1 degree of freedom is significant, so we reject the null hypothesis ( $H_0 : \sigma_0^2 = 0$ ) and conclude that there is an evidence of unobserved heterogeneity among region. This means there is a considerable variation in women nutrition across regions.

When the multilevel second order Penalized Quasi Likelihood (PQL-2) is applied the expected log-odds of malnutrition is found to be -0.752, which corresponds to odds of  $\exp(-752) = 0.471$ . This corresponds to a predicted probability

of  $\pi_{ij} = \frac{\exp(-752)}{1 + \exp(-752)} = 0.3201$ . But for the standard logistic model the predicted probability

is  $\pi_{ij} = \frac{\exp(-756)}{1 + \exp(-756)} = 0.3196$ . Assuming the region's log-odds of malnutrition,  $\beta_{oj}$  to be approximately normally distributed

with mean -0.752 and  $\text{Var}(\beta_{oj})=0.205$ . When multilevel model is fitted with no predictor, at 95% confidence interval,  $\beta_{oj}$  for malnutrition varies from 20 percent to 45 percent across regions.

Figure 1 plots the region level residual. The residuals  $U_{oj}$  are plotted in ascending order of magnitude with their confidence intervals. When this confidence interval crosses the dotted line (the origin 0.0), under-nutrition for this region (from top to bottom Dire Dawa, Amhara, Ben-Gumuz, Oromia and Harari) is not significantly different from the overall under-nutrition in Ethiopia. If the confidence interval is entirely below the dotted line, under-nutrition is significantly lower for that region (SNNPR and Addis Ababa) and if the

confidence interval is entirely above the dotted line (colored red/yellow) under-nutrition is significantly higher for that region (Affar, Gambela, Tigray, and Somalia).

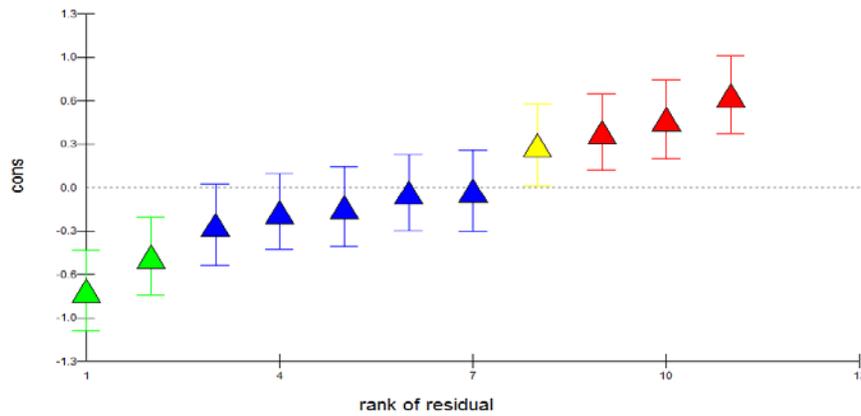


Figure 1 the region level residual plots

*A multilevel analysis for determinants of nutritional status of women*

Table 2 indicates that nutritional status of women differs across regions; in order to capture this variation a two-level structure multilevel analysis is employed. Region is taken as the second-level unit and woman as the first-level unit.

A chi-square test is run to assess heterogeneity in the proportion of undernourishment of women in the 11 regions. The *p-value* of the chi-square test is  $p < 0.01$  that is evident for the presence of heterogeneity in (women) undernourishment across the regions.

The significant level-two variance ( $\text{Var}(U_{0j}) = \sigma_0^2$ ) in the intercept of multilevel mode ( $p = 0.000$ ) is 0.205 using PQL-2, which suggests the presence of variation in women nutritional status across regions. The univariate model is fitted for each covariate **Y** to check the significance of the random effect across regions, but no variable is found to be significant ( $p > 0.10$ ). This means the model does not allow intra-regional difference to vary across inter-regions. This tells the best fitness of the random coefficient (intercept) with fixed explanatory variables.

Table 2 presents the multilevel univariate analysis and each models indicates a random intercept and a fixed slope for the variable. The 5<sup>th</sup> column presents odds ratios of the multilevel logistic regression; unlike in the standard logistic regression converting parameter estimates into odds ratios is difficult in multilevel logistic regression (Hasinur and Ewart, 2011).

The  $\beta$  coefficients of the explanatory variables for multilevel and standard models are significantly different, because of the random effects used in multilevel model. The significant value of the random effects suggests the distortion of estimated values from true values. It depicts variation that would have been evaded had the multilevel model had not been used. For example, in the single level model the  $\beta$  coefficients for the number of children and source of drinking water are underestimated, while the coefficients for place of residence and wealth index are overestimated. Estimated coefficient for the number of children is underestimated by almost 52 percent and 41 percent for no-children and 1-2 children, respectively.

The multilevel model result in Table 2 shows that nutritional status of women varies across regions. Partly this variation is significantly determined by age, marital status, employment status, place of residence and number of children that a woman has, and that of economic status of a household, access to toilet facilities and partner's educational level.

Younger women-age between 15 and 19 years-are in slightly higher risk (OR=1.05) of malnourishment than older women whose age between 40 and 49 years. However, women whose age are between 20 and 29 years are less likely to be malnourished than older women (age between 40 and 49 years).

Partner's educational level is found to be an important determinant to explain undernourishment of women in Ethiopia. A woman who is partnered with a man with no education or only educated to primary level is more likely to be malnourished than a woman who is partnered with man who has secondary or above level of education. This partly is because women in poor countries are economically dependent on their partners. A low level of partner's education reflects a low-level of income earning, which negatively affects both the household and individual nutritional status. Fikrewood and Daniel (2010) have documented a similar finding that depicts women nutritional status improves with the level of partner educational. Similarly, women from poor and medium economic status background are 1.5 and 1.2 times more likely to be malnourished than women who are from rich economic status background.

Marital status plays a significant role for women nutritional status. Never married women are found to exhibit a higher risk of malnourishment compared to widowed/divorced/separated women. More specifically, never married women have 1.33 times more chance of undernourishment than that of divorced/separated/widowed women. This goes with the general fact, in Ethiopia, that women are highly economic dependent on their partners.

Evidences suggest that the risk of undernourishment is high among unemployed women even in households with a relatively better socio-economic status (Girma and Timotiowa, 2002). This study also confirms that the risk of undernourishment for unemployed women is 1.16 times more likely than for employed women.

Women from urban areas are about 20 percent less likely to be malnourished than women from rural areas. This is may be women in urban areas have better access to education and opportunities for making extra income than women from rural areas, which in turn affect their nutrition status.

Malnutrition is often associated with an unhygienic condition that causes communicable diseases, which in turn aggravate malnutrition.

## **Conclusions**

Both the standard logistic and multilevel logistic models are employed to identify the nested effect of women are nested within the different regions in Ethiopia. In the multilevel approach, nonparametric and parametric tests are applied to check whether there is a difference in the nutritional status of women across the regions.

Socio-economic and demographic variables-age, educational level, employment status, household economic status, marital status, place of residence, number of children and access to toilet facilities-are significant determinants of nutritional status of women in Ethiopia. Moreover, there is a significant variation in the nutritional status of women across regions.

The robust conclusion is that nutritional status of women varies across regions. This variation primarily has to do with the disparity in food security status, healthcare facilities, cultural and dietary practices, socio-economic and environmental settings, and inequality in the distribution of services and resources across regions. This calls for an integrated policy intervention, which aims at addressing primary health care, food insecurity and malnutrition problems, improve women's access to education and support women on job creation.

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# Propagation of *Eucheuma spp.* (Agar-agar) Using Vertical Hanging Rope Method in Open Water Cultivation

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**Abstract.** The study aimed to determine the increase in length and number of fronds of *Eucheuma spp.* after cultivation using vertical hanging rope culture method. Five (5) fronds of *Eucheuma spp.* were inserted in an individual mesh bags tied 12 inches away from each other in a rope. A total of 25 sets of ropes were used in this study. The physico-chemical parameters (temperature, salinity and pH) of water in Sinunuc Bay, Zamboanga City, Western Mindanao, Philippines were analyzed. The increase in length and number of fronds were recorded daily for 45 days. Results showed that the 3 physico-chemical parameters were in the highly suitable ranged for seaweed farming. The mesh bags tied and exposed near the water surface produce higher longer fronds. This study will provide alternative methods in cultivating highly valued *Eucheuma spp.* to further increase the production and provide alternative livelihood and income to local fisherfolks.

**Keywords:** *Eucheuma spp.*, vertical hanging rope culture method, fronds

**Introduction:** Seaweed farming or Seaweed agriculture is the practice of cultivating and harvesting seaweed (Hurtado 2013). Seaweed farming provides an important source of livelihood to families living in the coastal areas. Seaweeds or benthic marine algae are the group of plants that live either in marine or brackish water environment. The seaweeds contain photosynthetic pigments and with the help of sunlight and nutrient present in the seawater, they photosynthesize and produce food (Verlacar *et al.* 2004). It is an important component of the marine environment along with the mangroves and coral reefs. Seaweed are harvested worldwide primarily for the extraction of chemicals that serve as gelling and thickening agents in foods, and for media used in medical and microbiological work.

Humans have carried out the culture of seaweeds for hundreds of years and it is well developed in several Asian countries (Neori *et al.* 2004). Nowadays, cultured seaweeds represent most of the seaweed production, which is about 10 million tons fresh weight worldwide (Lüning and Pang 2003).

Production of seaweeds has greatly increased worldwide, from 1.995 million tons of fresh weight seaweeds in 1970 to 19 million tons in 2010 to meet the demands for phycocolloid production, food and the emerging seaweed based pharmaceutical, nutraceutical and biofuel industries.

The Philippines seaweed is highly diversified among the flora in Asia Pacific regions. More than 800 species of seaweeds have been recorded in the Philippines. The Philippines is one of the top producers of seaweeds in the world, and aquatic plants next to Indonesia (FAO 2007). Seaweeds are exported either in raw forms (fresh or dried seaweeds) or processed forms (semirefined chips/carrageenan and refined carrageenan).

In the Philippines, the different species cultured and collected are *Eucheuma*, *Gracilaria* and *Caulerpa*. The most popular and commercially cultured species is the *Eucheuma* sp. because it is easy to cultivate and due to fast growing characteristics and high market place (BFAR).

According to Narvaez 2015, Mindanao area contributes about 57 percent of the national seaweed production. Zamboanga Peninsula rank third of the top five producing regions, contributing 13 percent of seaweeds.

*Eucheuma* locally known as “agar-agar” was found abundant in the Philippines, particularly in the province of Tawi-Tawi, Sulu and Zamboanga City. These seaweeds are the most common and fast growing species in the Philippines and are found from just below the low tide mark to the upper subtidal zone of the reef, growing usually on sandy-coral to rocky substrata where water movement is

slow to moderate (FAO 2009). It became a source of livelihood among the people living in the coastal areas especially in Region 9 and Autonomous Region for Muslim Mindanao (Kalbi 2002).

Global concern has been rising regarding the impact of climate change on seaweed abundance, distribution and quality (Straub *et al.* 2016) and due to increasing demand for the dried seaweeds in both local and international markets. There is still a need to link strongly the institutional research and development to the problems and concerns of the seaweed farmers, especially on production and productivity (Hurtado 2013). Hence, a new technique of culturing *Eucheuma* spp. should be implemented to further increase the production and productivity of the said species and an effective technique that is also convenient to the local farmers and to the environment. With this, researchers would want to conduct a study on cultivation of *Eucheuma* spp. using vertical hanging rope culture method.

**Materials and Methods**

*Research design.* The *Eucheuma* spp. culture rafts were placed along the coast of Sinunuc, Zamboanga City Bay. The site is selected because it is moderately sheltered to the dominant wave regimes, providing some protection to the culture units.

*Preparation of Cultivation.* A total of 25 culture ropes were secured to a bamboo stick or plastic pipe (2 m long). The stick or pipe was suspended 0.5m below the sea surface from two to four (2-4) empty water bottles and was being fixed in position on the seabed by two concrete anchor weights or stones. Polyethylene ropes were used for growing the fronds of *Eucheuma* sp. contained in an individual mesh bags, there were five (5) mesh bags in each rope. A second bamboo stick at the bottom keeping all the ropes in place avoiding rope twisting.

*Collection of Stock Material.* Fresh *Eucheuma* spp. were bought from Zamboanga Public Market, Zamboanga City. Only fronds free from epiphytes and dark-green in color was being selected for cultivation. The fronds were kept in a submersed mesh bags in the sea before cultivation.

*Cultivation Experiment.* The culture period was done approximately for 45 days and the cultures were being checked and monitored daily. The 5 fronds of *Eucheuma* spp. were inserted in an individual mesh bags tied in the 25 individual ropes. The initial length and number of fronds were recorded before cultivation as well as the physico-chemical parameters of the site. Frond length and numbers was being monitored for 45 days.

**Results**

Table 1 revealed that the mesh bag 1 has the highest total increase in the length of the fronds (4.3 cm) *Eucheuma* spp. after 45 days.

Table 1. Total increase in length per bag of *Eucheuma* spp. after 45 days of experimentation.

					total increase in length (cm)
R1B1	R2B1	R3B1	R4B1	R5B1	4.3
0.4	0.7	1.1	0.7	1.4	
R1B2	R2B2	R3B2	R4B2	R5B2	2.8
0.2	0.5	0.8	0.4	0.9	
R1B3	R2B3	R3B3	R4B3	R5B3	1.9
0	0.2	0.9	0.2	0.6	
R1B4	R2B4	R3B4	R4B4	R5B4	0.7
0	0	0.5	0	0.2	
R1B5	R2B5	R3B5	R4B5	R5B5	0.5
0	0	0.3	0	0.2	

Legend: R = replicate; B = mesh bag

Table 2 shows that the mesh bag 1 has the highest total increase in number of fronds (8), followed by mesh bag 2, mesh bag 4, mesh bag 3, and mesh bag 5 has the lowest number of fronds of *Eucheuma* spp. after 45 days of experimentation.

Table 2. Total increase in number of fronds per bag number of each ropes of *Eucheuma* spp. after 45 days of cultivation.

					total increase in # of fronds
R1B1	R2B1	R3B1	R4B1	R5B1	8

2	3	1	2	0	
R1B2	R2B2	R3B2	R4B2	R5B2	7
1	1	2	2	1	
R1B3	R2B3	R3B3	R4B3	R5B3	4
1	1	1	1	0	
R1B4	R2B4	R3B4	R4B4	R5B4	7
0	1	2	2	2	
R1B5	R2B5	R3B5	R4B5	R5B5	1
0	0	0	1	0	

Legend: R = replicate; B = mesh bag

The paired sample test revealed that there was a highly significant difference ( $p = 0.000$ ) between the initial length and final length of *Eucheuma* spp. after 45 days of experimentation at  $\alpha = 0.05$  level of significance (Table 3).

Table 3. Paired Sample Test on the length of *Eucheuma* spp. after 45 days of experimentation.

Paired Samples Test							
		Paired Differences			t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean			
Pair 2	final length - initial length	0.41	0.39	0.08	5.18	24	0.000

Paired Sample Test shows that there was a highly significant difference ( $p = 0.000$ ) in the initial and final number of fronds of the *Eucheuma* spp. after 45 days of experimentation (Table 4).

Table 4. Paired Samples Test on the number of fronds.

Paired Samples Test							
		Paired Differences			t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean			
Pair 1	final fronds - Initial fronds	1.080	0.862	0.172	6.263	24	0.000

**Discussion.** This study was conducted along the coast of Sinunuc, Zamboanga City Bay for 45 days. A Vertical Hanging Rope Method was used in the study and the physico-chemical parameters were determined. According to Gednet (*et al.*1982) that ecological parameters are the most important factor in the cultivation of *Echeuma* spp. These ecological parameters are water movement, salinity, depth, pH, light intensity and temperature.

Seaweed has a tolerance at a temperature of 24-36 °C (Gros 1992 in Patajai, 2017). According to Dawes (1981), temperatures affect some physiological functions of seaweed, such as photosynthesis, respiration, metabolism, growth, and reproduction and the optimum salinity for seaweed cultivation of *Eucheuma* spp. or *K. alvarezii* is at salinity of 33 ppm (Israel *et al.* 2010). Too high or too low salinity will cause disruption to the physiological process of seaweed (Heriansah *et al.* 2017). In this study, the physico-chemical parameters were within the ranged suitable growth of seaweeds. The temperature of seawater during the study ranged from 30°C to 37°C, salinity from 25 to 33 ‰ and pH from 7.8 to 7.9. All these 3 parameters were the highly suitable range for seaweed farming. Initial length of *Eucheuma* spp. fragments were recorded as well as the number of its fronds before it was cultivated for 45 days. The result of the study shows an increase in length and number of fronds in mesh bag 1. The result showed that the fragments that are nearly exposed to the surface have the most significant increase in length as well as to the number of fronds after 45 days of experimentation. This is due to the environment which is optimal condition for seaweed growth such as sunlight, water movement and depth. Seaweed obtains its nutrients for growth from the water and water movement is a very important factor for the growth of the

seaweed. Moderate water movement is preferable; this also helps to stabilize water temperature and salinity. The direct association between water movement and nutrient absorption should be pointed out. In fact, Ryder *et al.* (2004) demonstrated that the lack of water movement significantly decreases growth rates of *Gracilaria parvispora*.

**Conclusion.** Preliminary field open sea culture of *Eucheuma* spp. using vegetative fragments inserted between braids of ropes suspended vertically inside a floating cage was undertaken to assess the growth rate and yield as influenced by five different spacing intervals. The result showed that the fragments that are nearly exposed to the surface have the most significant increase in length as well as to the number of fronds developed after 45 days of experimentation.

**Recommendation.** It is necessary to conduct the same research on different location and to include other parameters such as Nitrate and Phosphate Test. Further studies are needed to refine the cultivation technique for increased production of *Eucheuma* spp. in the Philippines.

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# Zingiber officinale: Clinical aspects for treatment of Candida infections

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**Abstract- Background:** In present study, we aim to assess the anticandidal activity of crude extracts and screening of bioactive compounds and their identification by NMR, IR and GC-MS.

**Results:** A total of 192 isolates were isolated from patients having oral and vaginal candidiasis and a total of 134 isolates showed positive results with Gram staining. The selected isolates APKU-2, APKU-3 and APKU-4 were identified as *C.albicans*, *C.lusitaniae* and *C.krusei* by studying its morphological, biochemical, and molecular characteristics. Chemical characterization of the extracted compounds was done by H1NMR, Fourier transform infrared spectroscopy (FTIR), Gas chromatography–mass spectrometry (GC-MS) analysis to determine the structure, melting point, and molecular mass of the purified compounds.

**Conclusions:** The crude extracts and purified compounds from the sandalwood holds potential as medications for various antifungal therapeutics. However, further research on their potential incorporation into different preparations, safety and cost-effectiveness remains to be done.

**Index Terms-** Anticandidal activity, Saunth, Dry ginger, Candida sp.

## I. INTRODUCTION

*Candida* is a diploid, dimorphic yeast producing three morphologic forms: yeast cells, pseudo hyphae and true hyphae. It is an opportunistic pathogen causing various types of candidiasis which are on the increase around the globe. Candidiasis (or moniliasis) is an opportunistic fungal infection of humans caused by various species of *Candida*, especially *Candida albicans*. Superficial candidiasis of the oral cavity called thrush, seen as white patches, are common complications of AIDS, diabetes or prolonged antibiotic therapy (Imamura *et al*, 2008; Pfaller and Diekema 2007). *Candida* can invade the lungs, kidneys, and heart or to be carrier in blood, where it causes a severe toxic reaction. Of the 17 pathogenic species, *C. albicans*, *C. glabrata*, *C. parapsilosis*, *C. tropicalis*, and *C. krusei* are often involved in 90% of invasive infections. *C. kefyr*, *C. guilliermondii*, *C. lusitaniae*, *C. stellatoidea*, and *C. dubliniensis* are the other major pathogens (Achkar and Fries 2010; Fenn JP, 2007). Majority of the clinically used antifungals suffer from various drawbacks in terms of toxicity, drug-drug interactions, and lack of fungicidal efficacy, high cost and emergence of resistant strains resulting from frequent usage (Kirk *et al*, 2008). The phenomenon

of drug resistance has raised interest in substances of natural origin as a therapeutic alternative (Boklari, 2009; Al-Juraifani, 2011). Majority of the clinically used antifungals suffer from various drawbacks in terms of toxicity, drug-drug interactions, and lack of fungicidal efficacy, high cost and emergence of resistant strains resulting from frequent usage. The phenomenon of drug resistance has raised interest in substances of natural origin as a therapeutic alternative (Al-Juraifani, 2011).

The known success of traditional medicine has guided the search for new chemotherapeutic alternatives to eliminate the infections caused by drug-resistant microbes and to reduce the harm caused by antibiotics. Medicinal plants and corresponding preparations have been used for a wide range of purposes and for many centuries people have been trying to treat diseases as well as alleviate symptoms by using different plant extracts and formulations (Aneja and Mehrotra 2011). Medicinal plants are rich in a wide variety of secondary metabolites such as tannins, terpenoids, alkaloids, flavonoids and phenols, which have been used worldwide in traditional medicine to treat several diseases and infection. Among the plants investigated to date, one showing enormous potential is the **Family: Zingiberaceae**. It is cultivated throughout South-eastern Asia, China, Japan, Austria, Latin America, Jamaica and Africa. 61

**Parts used:** Rhizome

**Botanical description:** It is an herbaceous rhizomatous perennial herb, reaching up to 90 cm in height. Rhizomes are aromatic, thick lobed, pale yellowish, bearing simple alternate, distichous narrow oblong lanceolate leaves. Leaves are long and 2 - 3 cm broad with sheathing bases, the blade gradually tapering to a point. Flowers are rare, rather small, calyx superior, gamosepalous, three toothed, open splitting on one side, corolla of three sub /equal oblong to lanceolate connate greenish segments.

**Chemical constituents:** The pungency of ginger is due to gingerol (5-hydroxy-1-(4-hydroxy-3-methoxy phenyl) decan-3-one), an oily liquid consisting of homologous phenols (Supreetha *et al*, 2011). It is formed in the plant from phenylalanine, malonate and hexonate. The volatile oil consists of mainly mono and sesquiterpenes; camphene, betaphellandrene, curcumene, cineole, geranyl acetate, terphineol, terpenes, borneol, geraniol, limonene, linalool, alpha-zingiberene (30-70%), beta-sesquiphellandrene (15-20%), betabisabolene (10-15%) and alpha-farnesene.

**Therapeutic uses:** It is found to possess aromatic, carminative, antispasmodic, digestive, stomachic, vasodilator, appetizer, expectorant, bronchodilator, topical and local stimulant,

analgesic, antifatulent, aphrodisiac, digestive, antitussive, antifatulent, arthritis, rheumatism, sprains, muscular aches, pains and laxative (Shivanand *et al.*, 2004). It also exhibits different pharmacological activities as immuno-modulatory, antitumorigenic, anti-inflammatory, anti-apoptotic, antihyperglycemic, anti-hyperlipidemic, analgesic, antipyretic, antimicrobial, anti-emetic actions, hypoglycemic and anti-oxidant.

## II. METHODS

### 1. 1, Isolation of oral and vaginal candidiasis pathogens

To diagnose fungal infection, debris/exudates samples were collected from the vaginal and oral sites, aseptically with the help of sterile cotton swabs and maintained at 4°C and brought to the Microbiology laboratory and processed to have immediately the exact nature of fungal flora involved. A detailed history was taken with particular reference to age, sex, presence of predisposing factors, onset and duration of complaints, initial appearance and progression of t+8he lesions, treatment taken, marital status, exposure to sexually transmitted diseases and HIV status in relevant cases also noted. A detailed history regarding similar incidents in the family members were enquired into.

The samples both from vaginal and oral sites were processed for direct isolation and examination of the *Candida* spp. on malt yeast extract agar (MEA) media. For direct microscopic examination, a small portion of the specimen was mounted in 10% KOH and Careful microscopic examination will reveal oval-shaped blastospores, pseudo hyphae and occasionally chlamydiospores. The size and shape of the yeast observed may also suggest the presence of non-*albicans* yeast. The budding cells of *C. krusei* for example are noticeably larger and more elongate than those of *C. albicans*. For selective isolation of a *Candida* spp. the samples were inoculated on four different media: Malt yeast extract agar, Candidchrom agar, Biggy agar, Cornmeal with tween 80 agar. For isolation, sample swab was rolled and inoculated over the surface of agar plates of all the four media and incubated at 25°C, 37°C and 40°C for 24-48 hrs. The plates were examined for the presence of growth and sporulating structures.

### 1. 2, Microscopic and cultural characterization of isolates

The purified isolates were identified on the basis of cultural characteristics (colour, exudates, texture of colony) by consulting various books, and available monographs. The identification of yeasts was done on the basis of morphological characteristics in lacto phenol cotton blue wet-mount microscopy (presence of budding). Direct examination of samples with KOH until enough dissolution of keratinized cells is achieved to microscopic visualization of the fungal cells can be performed. Gentle pressure applied to coverslip placed on sample, mixed with KOH solution, and should flatten the sample completely in order to allow good microscopic resolution. Different isolates were characterized with respect to growth on four different media i. e. MEA, Candidchrom agar, Biggy agar (containing fluorogenic or chromogenic substrates) and Corn meal agar for production of chlamydiospores, Germ tube test, Carbohydrate assimilation and fermentation and Esterase production (lipolytic activity).

### 1. 3, Molecular characterization

The molecular characterization of isolates has been done by Xcelris Labs Ltd. Ahmedabad, India

### Identification of a microbial culture using D1/D2 region of LSU based molecular technique

DNA was isolated from the culture provided by the scientist. Its quality was evaluated on 1. 2% Agarose Gel, a single band of high-molecular weight DNA has been observed. Fragment of D1/D2 region of LSU (Large subunit 28S rDNA) gene was amplified by PCR from the above isolated plasmid DNA. A single discrete PCR amplicon band of 650 bp was observed when resolved on Agarose Gel (Gel Image-1).The PCR amplicon was purified to remove contaminants. Forward and reverse DNA sequencing reaction of PCR amplicon was carried out with DF and DR primers using BDT v3. 1 Cycle sequencing kit on ABI 3730xl Genetic Analyzer. Consensus sequence of 596 bp of D2 region of 28S rDNA gene was generated from forward and reverse sequence data using aligner software. The D1/D2 region of LSU (Large subunit 28S rDNA) gene sequence was used to carry out BLAST with the database of NCBI gene bank database. Based on maximum identity score first ten sequences were selected the phylogenetic tree was constructed using MEGA 4. The purity of genomic DNA using agarose gel electrophoresis indicated the good quality and integrity of DNA.

### 1. 4, Anticandidal activity of *Zingiber officinale* plant extract

The *Zingiber officinale* rhizome were collected from Ch. Devi lal park, Khizrabad. The taxonomic identity of this plant was confirmed by Dr. B. D. Vashishta, Kurukshetra University, Kurukshetra.

### 1. 5. 1, Extraction

The bark samples were carefully washed under running tap water followed by sterile distilled water and air dried at 35-40°C for 4-5 days, homogenized to a fine powder using a sterilized mixer grinder and stored in air tight bottles. Six different solvents ethanol, methanol, acetone, petroleum ether, dichloromethane and sterile water were used for extraction. Ten grams of sample was separately soaked in conical flasks each containing 100ml of solvents (Aneja *et al.*, 2010). Each preparation was filtered through a sterilized Whatman No. 1 filter paper and finally concentrated to dryness under vacuum at 40°C using a Rota evaporator. The dried extracts, thus, obtained were sterilized by overnight UV-irradiation, checked for sterility on agar plates and stored at 4°C in labelled sterile bottles until further use (15,16).

### 1. 5. 2, Purification and identification of active metabolites

The purification and identification of the active compounds were done from the acetonic extracts of *Zingiber officinale* (bark) showed best anticandidal activity against all the tested *Candida* pathogens. The purification of bioactive compounds was made by using thin layer chromatography (TLC- TLC Silica gel 60 F254 plates (Cat. No. 1. 05554. 0007) of Merck, Germany were used for performing TLC. The TLC was performed at room temperature using properly equilibrated chromatography glass chamber). Column chromatography and Gas chromatography and Mass spectrometry (GC-MS). All the purified fractions collected were

evaluated for their anticandidal efficacy against all the test organisms.

### 1. 5. 5, Structural elucidation of isolated metabolites

Identification of compounds usually involves a combination of different techniques such as nuclear magnetic resonance (NMR) spectroscopy (The <sup>1</sup>H NMR spectra of pure, dried isolated compounds (5-10 mg) were done at the Department of Chemistry, Kurukshetra University, Kurukshetra using Bruker Advance DRX 300 FT-NMR in deuterated solvents, either dimethylsulphoxide (DMSO-*d*<sub>6</sub>) or chloroform (CDCl<sub>3</sub>) using tetramethylsilane (TMS) as internal standard). Infrared spectrometry (IR- IR analyses of three purified compounds was performed at Department of Chemistry, Kurukshetra University, Kurukshetra using ABB MB 3000 DTGS FT-IR Spectrophotometer using the KBr pellet technique. It has a resolution of 1 cm<sup>-1</sup> and can scan range of 450-4000 cm<sup>-1</sup>). Gas and mass spectrometry (GC-MS- GC-MS of the compounds was got done through Advanced Instrumentation Research Facility (AIRF), Jawaharlal Nehru University (JNU), New Delhi, India. For molecular analysis of purified polymer a coupled GCMS was performed using a GCMS-QP 2010 Plus model with capillary Column- Rtx-5 MS (30 mX 0. 25 mm i. d. X 0. 25 micrometer film thickness). The samples were injected (1 μL) in the split mode and the injection temperature was 270 °C and column oven temperature was 100°C).

### 1. 6, Test microorganisms

The anticandidal activity was evaluated against different *Candida* spp. i.e. against three isolates (*C. albicans* strain-2 (KC139704) and *C. krusei* (KC616318) and one standard species (*C. albicans* strain-1 (MTCC No. 4748) as a control by agar well diffusion method. These were sub cultured on malt yeast agar (MEA) and incubated aerobically at 37°C.

### 1. 7, Screening for anticandidal activity

Anticandidal activity of six solvent extracts (acetone, methanol, ethanol, petroleum ether, dichloromethane and aqueous) of the leaves was determined by the agar well diffusion method. In this method, pure isolate of each yeast was sub cultured on the MEA plates at 37°C for 24h. Minimum of inoculum of the isolates were transferred into normal saline (0. 85%) under aseptic conditions. Density of each microbial suspension was adjusted equal to that of 106 cells/ml (standardized by 0. 5McFarland standard) and used as the inoculum for performing agar well diffusion assay. 100μl of inoculum of each test organism was spread onto the MEA plates. The inoculated agar plates were allowed to dry, wells of 8mm were made with a sterile borer and the lower portion of each well was sealed with a little molten MEA medium. 100μl of it was propelled directly into each well (in triplicates) of the inoculated agar plates for each test organism.

The plates were allowed to stand for 10 minutes for diffusion of the extract to take place and incubated at 37°C for 24h. Sterile DMSO served as the negative control and ketoconazole as the positive control. The anticandidal activity, indicated by an inhibition zone surrounding the well containing the extract, was recorded if the zone of inhibition was greater than 8mm (Aneja *et al*, 2010b). The experiments were performed in triplicates and the mean values of the diameter of inhibition zones with ± standard deviation were calculated.

### 1. 8, Determination of minimum inhibitory concentration (MIC)

MIC is defined as the lowest concentration of a compound/extract/drug that completely inhibits the growth of the microorganism in 24h. The MIC of all the extracts was determined following the modified agar well diffusion method of. A twofold serial dilution of each extract was prepared by first reconstituting the powder in DMSO followed by dilution in sterile distilled water to achieve a decreasing concentration range of 50mg/ml to 0. 39mg/ml. A 100μl volume of each dilution was introduced into wells (triplicate) of the MEA plates already seeded with 100μl of standardized inoculum (106cells/ml) of the test microbial strain. All test plates were incubated aerobically at 37°C for 24 hrs. and observed for the inhibition zones. The lowest concentration of the test extract showing a clear zone of inhibition (>8mm), considered as the MIC, was recorded for each test organism (Ahmad *et al*, 2012).

## III. RESULTS AND DISCUSSION

### Isolation of oral and vaginal candidiasis pathogens

A total of 134 samples from vaginal (108) and oral (26) patients were found to be positive, of which 73. 4% from vaginal and 57. 7% from oral were found to be positive for the presence of yeasts during examination.

### Microscopic, cultural, biochemical and molecular characterization of selected isolates

The selected isolate was classified up to genus level using the morphological and biochemical characteristics (Tables 1, 2 and 3). For further characterization, almost complete 28S rDNA gene sequences were determined. The obtained sequences were aligned and compared with the yeast sequences available in the Gene Bank database. The phylogenetic analysis (Figure 1, 2 and 3) was done using MEGA 4 software by neighbor-joining tree and distance matrix-based nucleotide sequence homology which revealed that isolates APKU-2, 3 and 4 were *C.albicans*, *C.lusitaniae* and *C.krusei*.

**Table 1 Colonial features of *Candida* spp. on four different media.**

S. No.	Standard/Isolate	Species/Source	Colony characteristics			
			Candidchrom agar	Biggy agar	On corn meal tween 80 agar	Malt yeast extract agar

1	Standard	<i>C. albicans</i> /blood	Creamish	Brownish	Creamish	Whitish with a sheen
2	Isolate	APKU-2/vaginal	Bluish	Dark brown	Creamish	Creamish
3	Isolate	APKU-4/oral	Light white greenish	Brown black	Creamish	Creamish

**Table 2 Morphological features of *Candida* spp.**

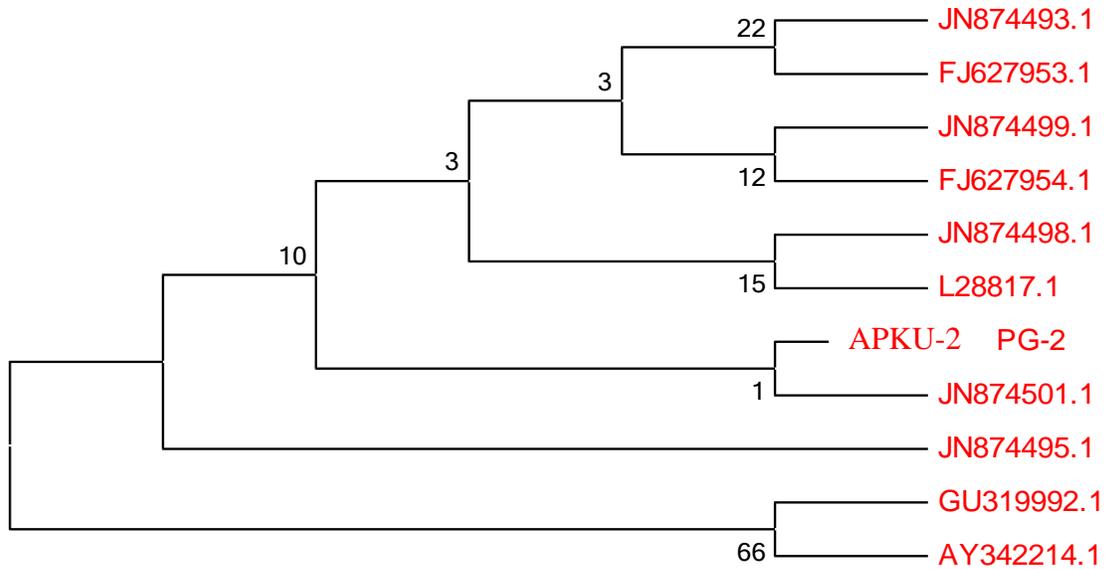
Species	Clamydospores	Germ tube	Pseudohyphae	Size of yeast ( $\mu\text{m}$ )
<b>Ca</b>	+	+	+	4-6×9-13
<b>APKU-2</b>	+	+	+	5-6×6-9
<b>APKU-4</b>	-	-	-	3-5×6-10

**Table 3 Biochemical features of *Candida* spp.**

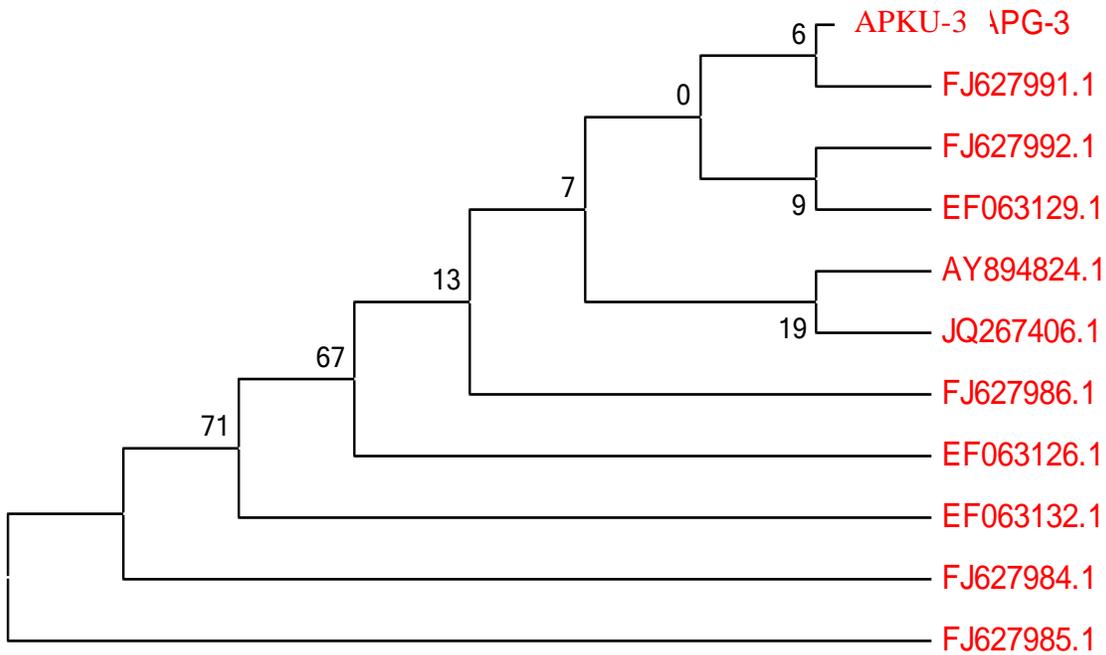
Tests	Ca	APKU-2	APKU-4
Catalase	+ve	+ve	+ve
Urease	-ve	-ve	+ve
<b>Carbohydrate assimilation</b>			
Cellobiose	+ve	+ve	+ve
Trehalose	+ve	+ve	-ve
Galactose	+ve	+ve	-ve
Melibiose	+ve	+ve	-ve
Arabinose	-ve	-ve	+ve
<b>Carbohydrate fermentation</b>			
Glucose	+ve	+ve	+ve
Trehalose	+ve	+ve	-ve
Galactose	+ve	+ve	-ve
Mannitol	+ve	+ve	-ve
Lactose	-ve	-ve	-ve
<b>Cycloheximide resistance</b>			
Susceptible/Resistance	+ve	+ve	-ve

**Molecular characterization of *Candida* spp.**

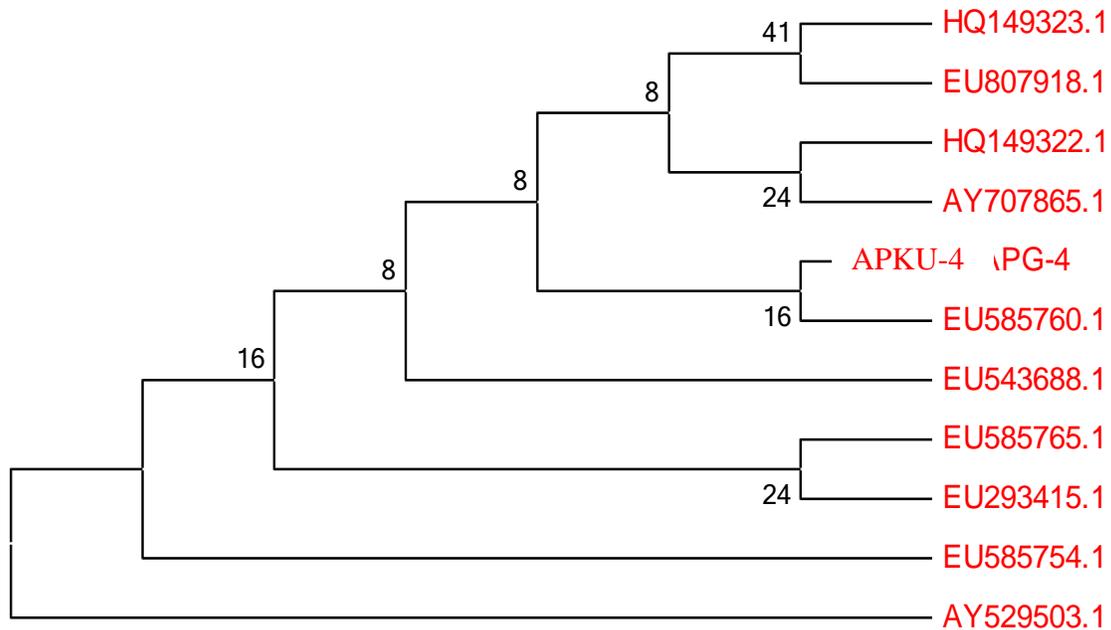
The purity of genomic DNA using agarose gel electrophoresis indicated the good quality and integrity of DNA. PCR amplification of 28S rDNA gene with DF and DR primers for all the *Candida* spp. viz. APKU-2, APKU-3 and APKU-4 produced an amplification product of approximately 609 bp, 560 bp and 605 bp.



**Fig 1 Evolutionary relationships of 11 taxa**



**Fig 2 Evolutionary relationships of 11 taxa**



**Fig 3 Evolutionary relationships of 11 taxa**

**Table 4 Similarity pattern of different isolates with the Gene Bank database sequences.**

Isolate	Similarity pattern	Identity percentage	Gene bank submitted name	Accession number
APKU-2 (vaginal)	<i>Candida albicans</i> strain ATCC MYA-4780	100%	<i>Candida albicans</i>	KC139704
APKU-3 (vaginal)	<i>Clavispora lusitaniae</i> strain EXOC7	100%	<i>Candida lusitaniae</i>	KC616317
APKU-4 (oral)	<i>Issatchenkia orientalis</i> strain QD2.1	100%	<i>Candida krusei</i>	KC616318

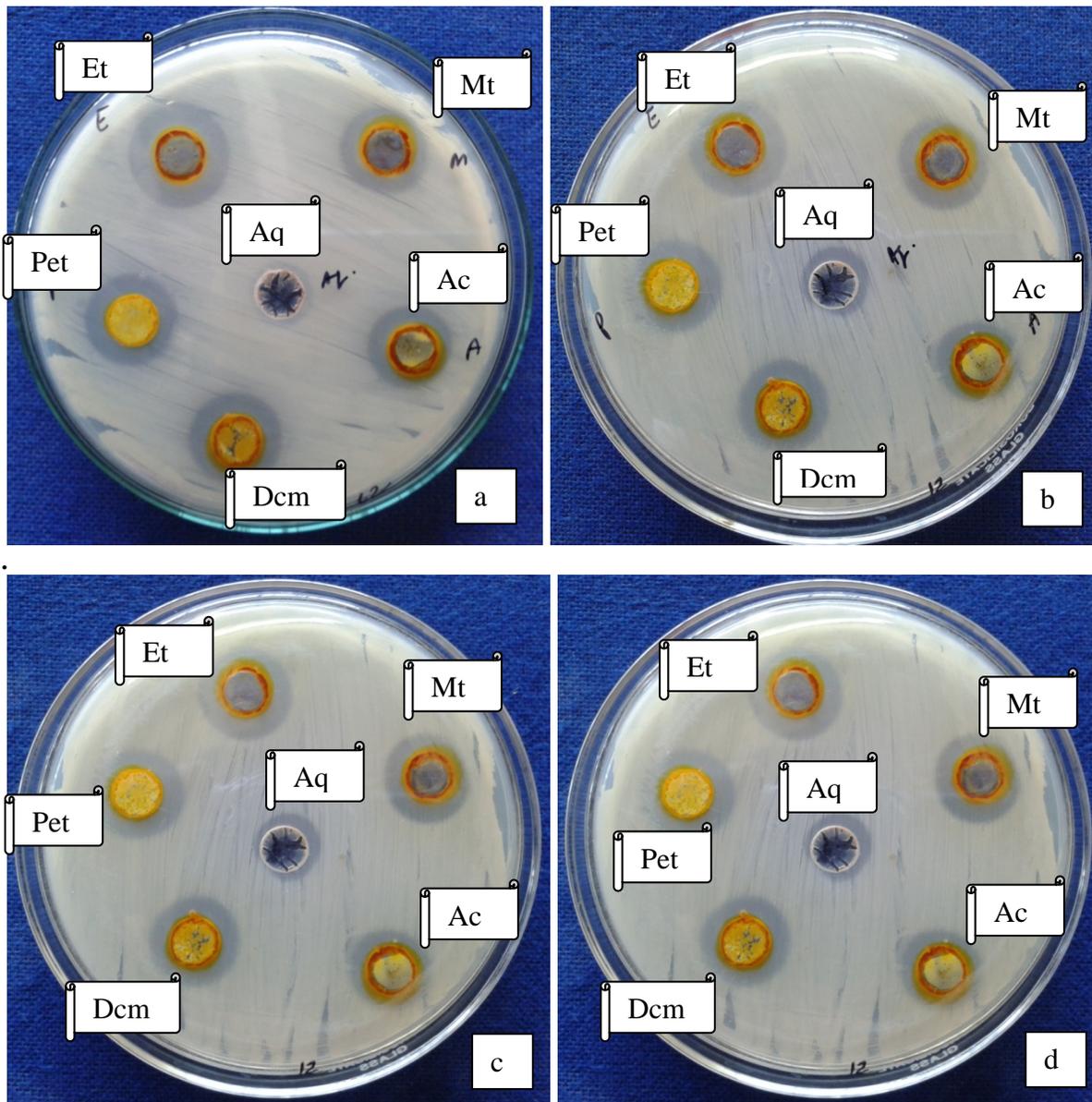
**Anticandidal activity of *Zingiber officinale* -rhizome**

Organic extracts of *Z. officinale* rhizome displayed anticandidal activity against all the tested species. The maximum zone of inhibition was observed in dichloromethane extract with zone of inhibition ranging between 35.6mm and 13.0mm followed by acetonic extract (30.6mm and 13.3mm), ethanolic (32.6mm and 14.3mm), petroleum ether (29.6mm and 14.0mm), methanolic (17.6mm and 13.0mm) and aqueous (17.6mm and 12.0mm). The most susceptible strain was *C. albicans* strain-2 (35.6mm).

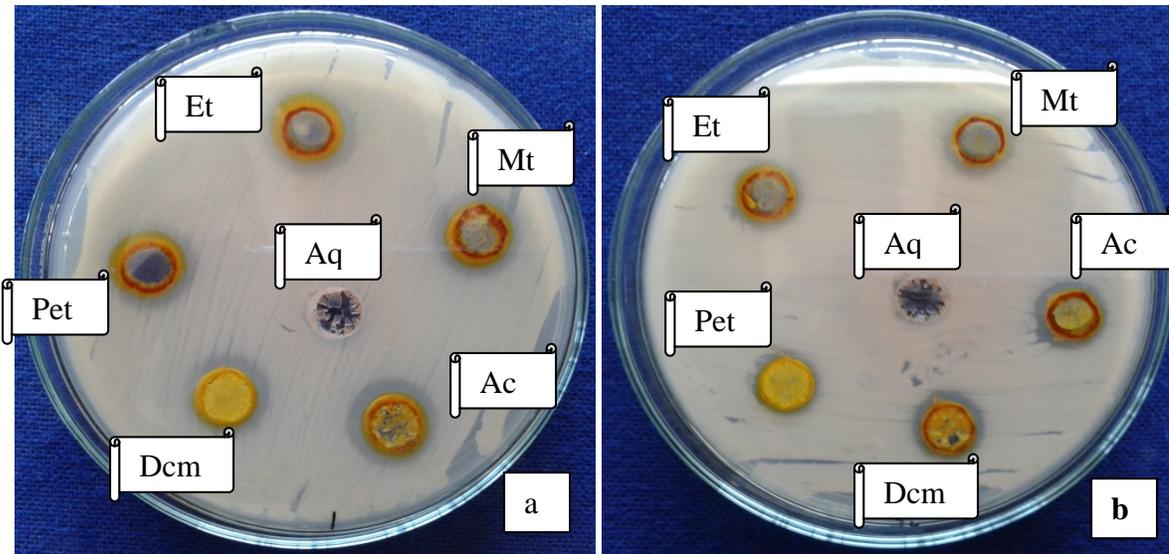
**Table 5 Anticandidal activity of *Zingiber officinale* -rhizome**

Solvent extract (mg/ml)	Diameter of zone of inhibition (mm)					
	Ca	Cg	Ct	Ca	Cl	Ck
<b>Ethanol</b>	21.6±0.57	16.6±1.15	22.3±1.15	32.6±0.57	14.3±0.57	14.6±0.57
<b>Methanol</b>	17.6±1.52	16.6±1.15	22.3±1.15	16.3±1.15	13.0±0.57	-
<b>Acetone</b>	17.6±1.52	17.3±1.52	24.6±0.57	30.6±1.52	18.6±1.15	13.3±0.57
<b>Petroleum ether</b>	18.3±0.57	16.3±1.15	24.6±0.57	28.6±0.57	29.6±1.15	14.0±0.57
<b>Dichloromethane</b>	18.3±1.15	14.0±0.57	17.3±1.52	35.6±1.15	16.6±1.15	13.0±0.57
<b>Aqueous</b>	15.3±0.57	14.3±0.57	17.6±1.52	17.3±1.52	12.0±0.57	-
<b>Antifungal drugs (%w/v)</b>						
Ketoconazole (2%)	40.6±1.52	30.6±1.52	30.6±1.52	30.3±1.52	35.6±0.57	33.3±1.52
Neem ras (9%)	<b>Neem ras</b>	16.6 <sup>a</sup> ±1.15 <sup>†</sup>	-	-	17.6±1.15	15.3±1.15

Ca, *C. albicans* strain-1; Ca, *C. albicans* strain-2; Ck, *C. krusei*, - No activity; <sup>a</sup> Values, including diameter of the well (8mm), are means of three replicates,  $\pm$  † Standard deviation. \*Anticandidal activity was determined by agar well diffusion method on MEA medium.



**Fig 4** Zones of inhibition produced by the organic and aqueous rhizome extracts of *Z.officinalis* against (a) *C.albicans* strain-1, (b) *C.albicans* strain-4, (c) *C.tropicalis*, (d) *C.lusitaniae*; Mt-Methanol; Et-Ethanol; Ac-Acetone; Pet- Petroleum ether; DCM-Dichloromethane; Aq-Aqueous.



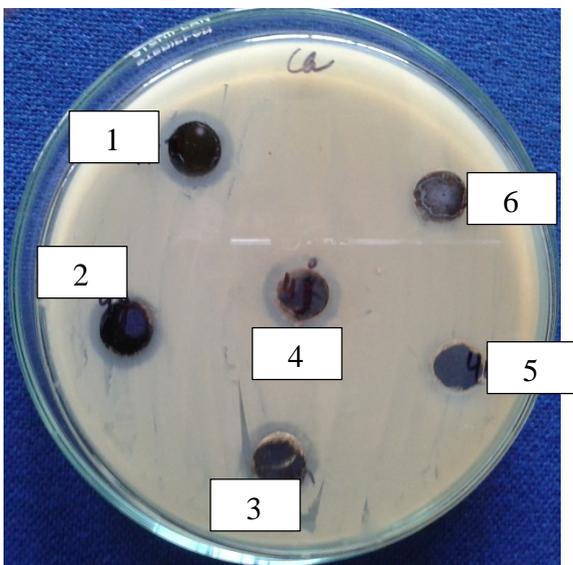
**Fig 5** Zones of inhibition produced by the organic and aqueous rhizome extracts of *Z.officinale* against (a) *C.glabrata*, (b) *C.krusei*; Mt-Methanol; Et-Ethanol; Ac-Acetone; Pet- Petroleum ether; DCM- Dichloromethane; Aq-Aqueous.

**MIC of solvent extracts of *Zingiber officinale* rhizome**

Both organic and aqueous extracts of *Z.officinale* rhizome possessed strong bioactivity against all the species of *Candida*. The dichloromethane extract showed MIC of 0.39mg/ml against *C.albicans*, followed by acetonic, petroleum ether and ethanolic extracts. MIC values ranged between 1.56mg/ml and 50mg/ml.

**Table 6** MIC of solvent extracts of *Zingiber officinale*

Solvent extract	MIC (mg/ml)					
	Ca	Cg	Ct	Ca	Cl	Ck
Ethanol	12.5	50	12.5	1.56	50	50
Methanol	25	50	12.5	50	50	nt
Acetone	25	25	6.25	1.56	25	50
Petroleum ether	25	50	6.25	1.56	1.56	50
Dichloromethane	25	50	25	0.39	50	50
Aqueous	50	50	25	25	50	nt



**Fig 6 Plates showing minimum inhibitory concentration (MIC) of *Z.officinalis* rhizome against *C. albicans* strain-1 (MTCC No. 4748) (1-50mg/ml; 2-25mg/ml; 3-6. 25mg/ml; 4-3. 12mg/ml; 5-1. 56mg/ml; 6-0. 39mg/ml).**

#### **Purification and identification of active compounds from *Z.officinalis***

In column chromatography of *Zingiber officinale*, the gradient system of petroleum ether:ethyl acetate ranging between 100:0 and 50:50 was used. A total of 128 sub fractions, in 100ml each were collected, and analyzed by TLC. The pooling up of similar fractions resulted in 9 sub fractions which were dried in rota evaporator.

#### **GC-MS analysis of acetone extract of *Z.officinale* rhizome**

GC-MS analysis helps in elucidating the structure of components. The key compounds of concern were identified based on their retention peak. A total of 142 compounds were identified from this plant with different retention time and area of percentage.

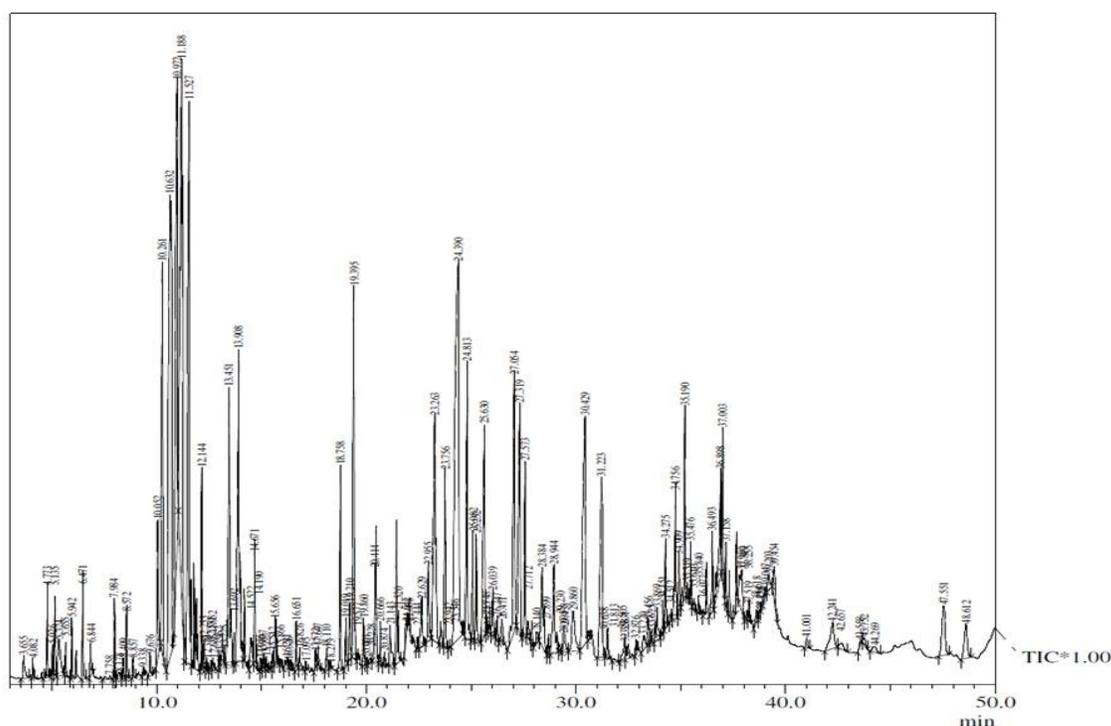
Analyzed by: \$Ajai Kumar\$

Analyzed: 5/6/2013 3:32:27 PM

Sample Type: \$Organic\$

Sample Name: Pet G

Method File: D:\GCMS Method\Outsiders\Kurushetra Uni\Parveen.qgm



**Fig 7 GC-MS of crude acetonetic extract of *Zingiber officinalis*.**

#### **Structural elucidation of pure compounds**

One compound PC-5 from *Zingiber officinalis*, was purified and was subjected to structural elucidation by NMR, IR and GC-MS spectroscopy.

#### **Identification of compound PC-5**

The compound PC-5, isolated from acetonetic extract of *Z.officinalis* rhizome, was recovered as colourless oil from the silica gel column after elution with petroleum ether- ethyl acetate.

#### **IR Spectroscopy:**

IR (KBr)  $\text{cm}^{-1}$ : 3348 (O-H), 1427-1597 (C-C). It was indicated from the spectrum that there was one functional groups present in the compound. The strong absorption bands at 3348  $\text{cm}^{-1}$  correspond to characteristic O-H and 1427-1597  $\text{cm}^{-1}$  correspond to characteristic C-C stretch. The bands pointed towards the presence of aromaticity. Thus, IR spectrum supported the results obtained from chemical analysis of PC-5 (Fig.4.50).

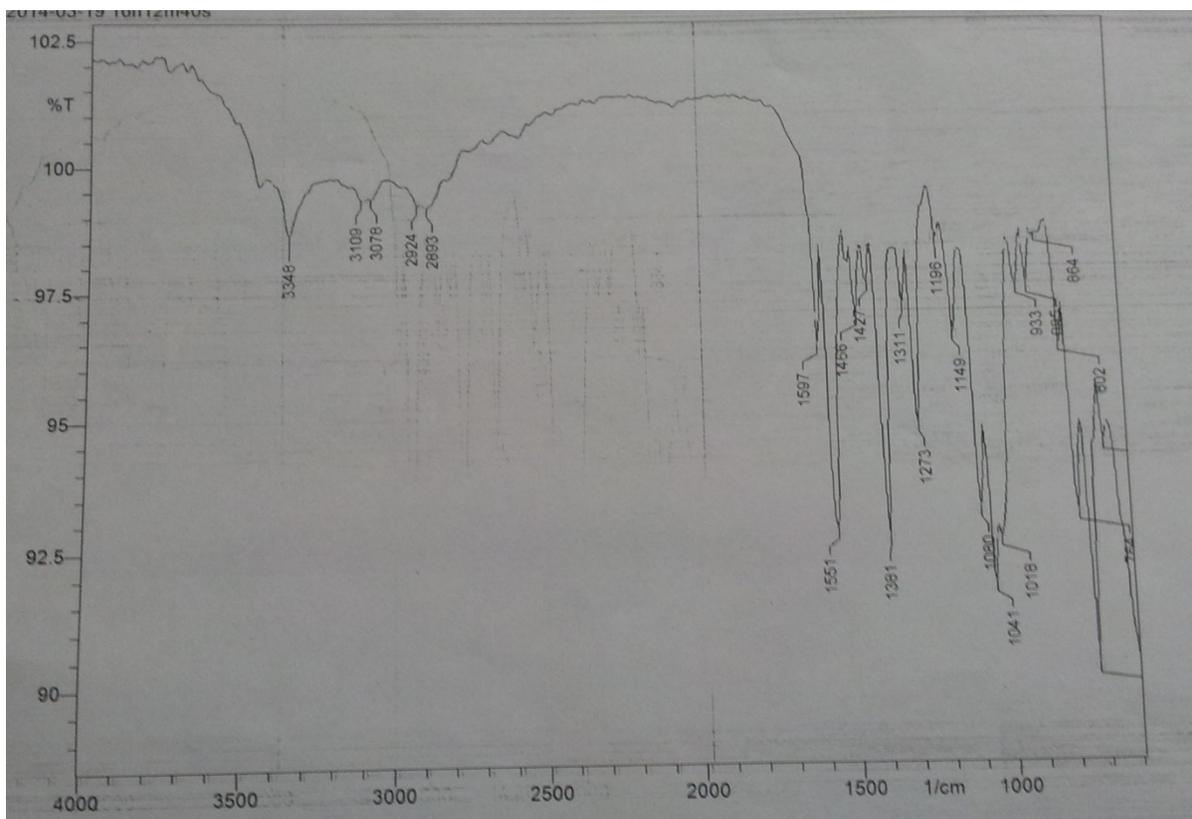


Fig 8 IR spectrum of the compound PC-5 from *Z.officinale* rhizome.

NMR Spectroscopy:

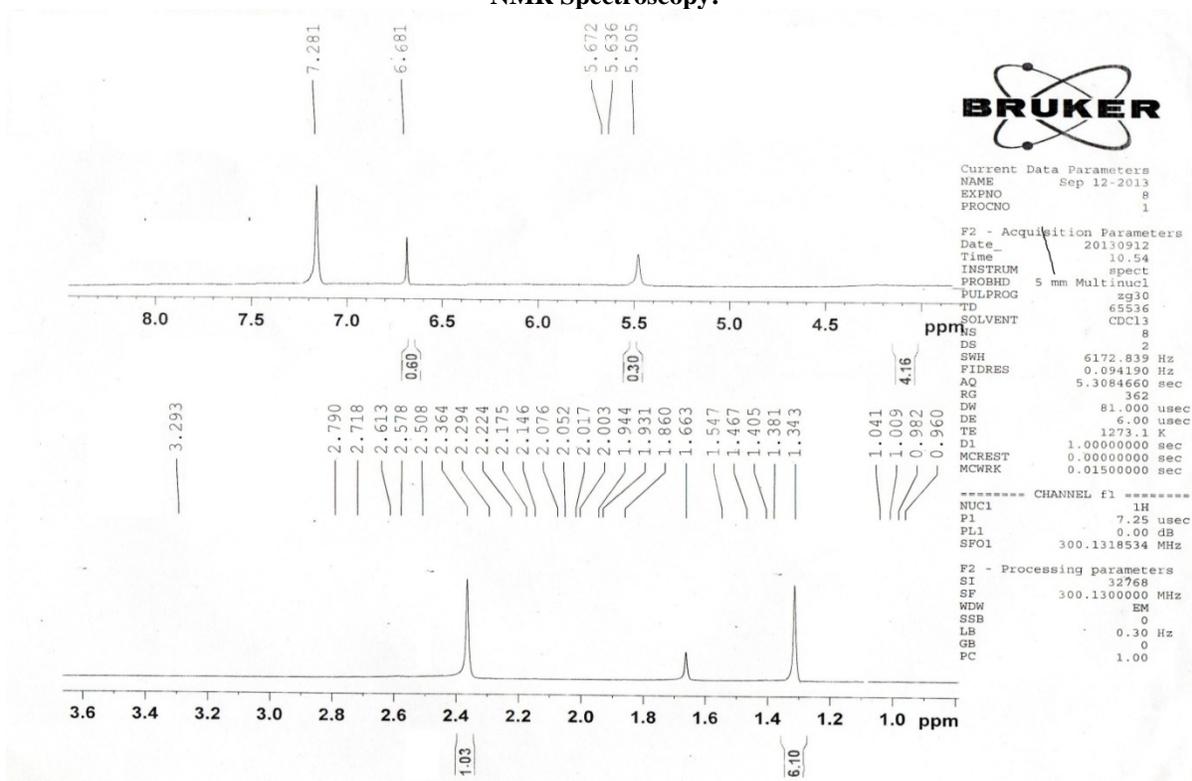


Fig 9 NMR spectrum of the compound PC-5 from *Z.officinalis* rhizome

### Mass Spectrometry:

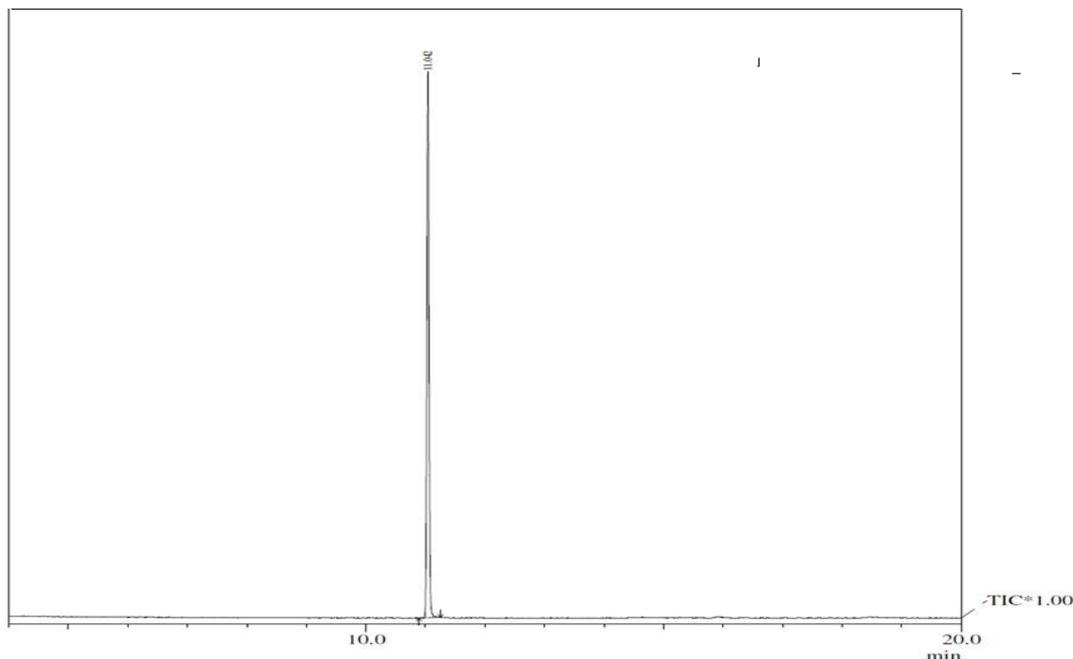


Fig 10 GC chromatogram of the compound PC-5 from *Z.officinalis* rhizome.

Based on NMR and GC-MS spectroscopy, the compound PC-5 from *Z.officinalis* rhizome was identified as p-Cresol, 2,6-di-tert-butyl (Fig.4.53)

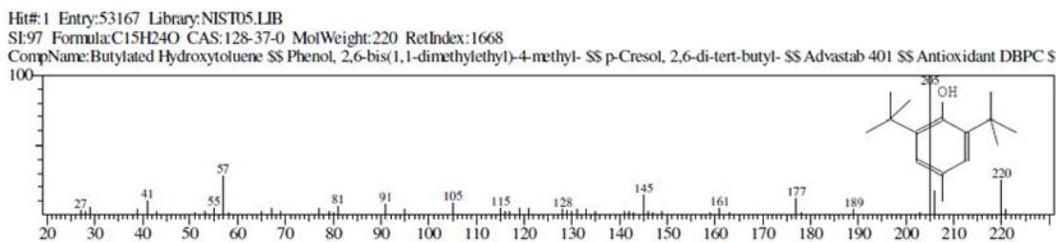


Fig 11 Mass spectrum of p-Cresol, 2, 6-di-tert-butyl phytochemical from *Z.officinalis* rhizome.  
Anticandidal activity of *Z.officinale* rhizome purified compounds

The results of anticandidal properties of *Z.officinale* subfraction p-Cresol, 2, 6-di-tert-butyl and the negative control (DMSO) are presented in Table. The data reveals that it showed activity against all the tested species with zones of inhibition between 13.3mm and 17.6mm, the maximum inhibition against *C.krusei* (17.6mm) followed by *C.glabrata* (16.3mm), *C.albicans* (4748) (14.3mm), *C.tropicalis* (13.6mm) and *C.albicans* (13.0mm).

**Table 7 Anticandidal activity of p-Cresol, 2, 6-di-tert-butyl against *Candida* species**

Purified compounds (mg/ml)	Diameter of zone of inhibition (mm)					
	Ca	Cg	Ct	Ca	Cl	Ck
P-Cresol, 2,6-di-tert-butyl	14.3±0.57†	16.3±1.52	13.6±0.57	13.3±0.57	-	17.6±1.15
DMSO	-	-	-	-	-	-

The compound when tested in combination of 1:1 with the best active (Ketoconazole) and the least active (Neem ras) in order to determine their synergistic/antagonistic effects on *Candida* species through agar well diffusion method, revealed that ketoconazole with the pure compound, reduced the inhibitory effect of the antifungal drug of all the species, showing lesser zones of inhibition (Fig.4.54) after combination than the zones of inhibition produced by ketoconazole individually (Table.4.68). Another antifungal i.e. Neem ras was also evaluated in the same manner. The pure compounds when added in the neem ras showed antagonistic effect reducing the diameter of inhibition of *Candida* growth (Fig.4.54).

**Table 8 Effect of pure compound on the anticandidal activity of Ketoconazole on *Candida* species.**

Purified compounds (mg/ml)	Diameter of zone of inhibition (mm)					
	Ca	Cg	Ct	Ca	Cl	Ck
Keto+ P-Cresol, 2,6-di-tert-butyl	22.6	20.0	25.3	23.3	-	34.6
Keto	40.6	30.6	30.6	30.3	35.6	33.3
DMSO	-	-	-	-	-	-

Ca, *C.albicans* (4748), Cg,*C.glabrata*; Ct,*C.tropicalis* ; Ca-,*C.albicans*; Ck, *C.krusei*; Cl, *C.lusitaniae*, No activity; <sup>a</sup> Values, including diameter of the well (8mm), are means of three replicates. ± † Standard deviation.

\*Anticandidal activity was determined by agar well diffusion method on MEA medium.

**Table 9 Effect of pure compound on the anticandidal activity of Neem ras on *Candida* species.**

Purified compounds (mg/ml)	Diameter of zone of inhibition (mm)					
	Ca	Cg	Ct	Ca	Cl	Ck
NR+ P-Cresol, 2,6-di-tert-butyl	13.3	13.0	12.6	12.6	13.3	17.6
NR	16.6	-	-	17.6	15.3	-
DMSO	-	-	-	-	-	-

#### IV. CONCLUSION

In this study, the crude extract of rhizome of *Z.officinalis* by GC-MS study results in the presence of 142 compounds. Organic extracts of *Z.officinalis* rhizome displayed anticandidal activity against all the tested species. The maximum zone of inhibition was observed in dichloromethane extract with zone of inhibition ranging between 35.6mm and 13.0mm followed by acetic extract (30.6mm and 13.3mm), ethanolic (32.6mm and 14.3mm), petroleum ether (29.6mm and 14.0mm), methanolic (17.6mm and 13.0mm) and aqueous (17.6mm and 12.0mm). The most susceptible strain was *C.albicans* strain-2 (35.6mm).

On the basis of results obtained in the GC-MS analysis, the column chromatography of the plant part was done. The column sub fractions lead to the isolation of one active pure sub fractions PC-5 from *Z.officinale*. The purified compound isolated from the

acetic extract of *Z.officinalis* rhizome namely, PC-5 was crystallized as green coloured oil from the silica gel column after elution with benzene-acetone. Based on spectra obtained through IR, NMR and GC-MS spectrometry, the compound PC-5 was identified as P-Cresol, 2,6-di-tert-butyl.

The results of anticandidal properties of *Z.officinalis* subfraction p-Cresol, 2, 6-di-tert-butyl and the negative control (DMSO) are presented in Table. The data reveals that it showed activity against all the tested species with zones of inhibition between 13.3mm and 17.6mm, the maximum inhibition against *C.krusei* (17.6mm) followed by *C.glabrata* (16.3mm), *C.albicans* (4748) (14.3mm), *C.tropicalis* (13.6mm) and *C.albicans* (13.0mm).

Furthermore, the integration of herbal medicine into modern medical practices must take into account the interrelated issues of quality, safety, and efficacy. Thus, after studying various plants

for their anticandidal activity, the crude extracts and purified compounds from the plant can be incorporated into medications for various antifungal therapy. However, further studies for their incorporation into different preparations, safety and cost-effectiveness has to be conducted.

#### COMPETING INTERESTS

The authors declare that they have no competing interests.

#### ACKNOWLEDGEMENTS

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#### CONFLICT OF INTEREST

With the submission of this manuscript I would like to undertake that all authors of this research paper have directly participated in the planning, execution, or analysis of this study. All authors of this paper have read and approved the final version submitted. The contents of this manuscript have not been copyrighted or published previously. The contents of this manuscript are not now under consideration for publication elsewhere. The contents of this manuscript will not be copyrighted, submitted, or published elsewhere, while acceptance by the Journal is under consideration. There are no directly related manuscripts or abstracts, published or unpublished, by any authors of this paper. My Institute's representative is fully aware of this submission.

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# Effect of Corruption on the Academic Performance of Business Education, Public Administration and English Language Students In Nigerian Universities

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**Abstract-** This paper examines the effect of corruption on academic performance of business education, public administration and English language students respectively in Nigerian universities. It discusses the meaning of corruption in Nigeria universities, contributors to corruption in Nigeria university system. In addition, the paper sort to find out whether corruption is actually the problem in Nigeria university system, the effect of corruption in business education, public administration and English language in Nigeria universities; types of corruption in Nigeria universities were examined. The paper however, examined whether there are lecturers who discourage corruption and ways in which corruption can be eradicated in Nigeria universities. Finally, it discusses the corruption in universities globally, eradication of corruption in Nigerian universities, is corruption applicable to Nigerian universities alone? A historical survey was used to analyze and evaluate the perception of various authors with a view to informing and educating researchers, business educators, public administrators, English language lecturers as well as scholars the current issues relating to state of corruption in Nigeria universities and globally. Conclusion and recommendations were accordingly made.

**Index Terms-** academic, education, business, corruption, universities, Public Admin, English.

## I. INTRODUCTION

This research work is collaboration among office technology education, public administration and English language lecturers in the university system in order to achieve a common goal.

Business education is an academic programme designed to train students which upon graduation are likely to be referred to as business educators or business people. They receive training which will make them to be fully integrated into the society thereby living no missing link between the universities and the various industries in positive ways. Public administration is a department that produces graduates capable of working in any sector in and outside the country and English language graduates are produced to work in both educational institutions and all sections of the economic as without English Language; these sectors communication cannot yield any positive result. These

three departments are components of the university educational system nationally and internationally.

Corruption according to the Pitman (1974) is the process of corrupting, decay, dissolution while Web (2014) stated that corruption is the act of corrupting or of impairing integrity, virtue, or moral, principles, the state of being corrupted or debased, loss of purity or integrity, depravity, wickedness, impurity, bribery.

Johnston (1996) opined the word corruption comes from the Latin word corruption, which in medieval Latin expressed a moral decay, wicked behaviour, putridity, rottenness.

According to Salisu (2000) the simple definition of corruption is that it is the misapplication of public resources to private ends. For example, public Officials may collect bribes for issuing Passports or Visa, for providing goods at sea/airport for awarding contracts or artificial scarcity. Konie (2003) identified two types of corruption, which are, Vertical corruption, and this involves managers and decision makers. It is common in less developed countries and; Horizontal corruption which involves the entire Officials, uninformed and laymen groups in the countries. These two types of corruption, if not seriously addressed and eradicated, will cause retardation in the economic and political state of any nation.

Okole and Raymond (2014) opined that colonialism imported corruption to Africa and by extension Nigeria. It explains corruption from different perspectives and concluded that corruption is innate and deep seated in Nigeria particularly in the public sector.

Corruption evolves from family the smallest part of the system. Even in the bible there was corruption when in Matthew 26 v 14-15, Judas Iscariot went to the chief priests, and said unto them, what will ye give to me and I will deliver Jesus unto you? And they covenanted with him for thirty pieces of silver.

The problem here therefore is that the researchers want to find out the effect of corruption on academic performance of students in business education, public administration and English language. The purpose of this research is to determine whether there is corruption in Nigeria and other countries universities system, those who are contributors to corruption in university system, whether corruption is actually the problem, whether corruption has effect in business education, public administration and English language students in Nigerian universities, whether there are types of corruption in Nigerian universities, determine

whether there are some lecturers who dislike corruption and whether corruption can be eradicated in Nigeria and other countries universities.

The findings of this research is hoped to be of immense benefit to both Nigerian and other countries governments. It will enable the governments to monitor the corruption in their countries universities systems and their countries at large. It will help lecturers to focus on the right attitude in performing their duties professionally. It will also help the students to work hard and also put confidence in them. It will help researchers for literature materials. It will help the universities authority to check lecturers' excessiveness. It will help to improve qualities of graduates' educational standard both nationally and internationally

## II. CORRUPTION IN NIGERIA UNIVERSITIES

Corruption was imported into Nigeria because before the colonial masters came into Nigeria there was none corruption because people were made to swear an oath for suspected act of corruption therefore, various cultures do not accept corruption/stealing. When someone stole anything and committed adultery he/she is made to dance round the village or a cause will be placed on the subject entire family until the cause is reversed by appeasing the gods. In Nigeria the Edos, Yorubas, Igbos and the Hausas all have institutions that fight corruption for instance the Yoruba of Oyo-mesi the king making body, acted as a check against the abuse of power by the Alafin (the Oba) or the King of Oyo. The Alafin was constrained to rule with caution and respect for his subjects. When he is proven to have engaged in acts that undermined the interests of his subjects, such as gross miscarriage of justice for personal gains, the Oyo-mesi would, in the words of Yunusa Salami "present him with an empty calabash or parrot's eggs as a sign that he must commit suicide" since he could not be deposed, according to tradition. Igbo on the other hand, the titled chiefs sat together to address the more difficult issues of governance, and there is a saying among the Igbo that a "titled man does not lie." If one wanted to hear the truth, to be granted pristine justice according to the prevailing standards, he/she only needed to get the impeccable body of titled men to hear the case in question, Okoro and Raymond (2014).

Corruption has manifested in many ways in Nigerian universities. It involves the demanding for money as a "kick back"(Blocking) or making love with the ladies students before a service which employer had already paid for is rendered to such a student. Also financial mismanagement by officers of the university as well as favouritism and nepotism etc. Corruption is a cancer that has eaten deeply into the fabric of Nigeria system.

The principle of honesty existed in the dictionary of some lecturers which school of thought the authors belonged to fight are to and defend the integrity of the university as well as defend the helpless students. While the reversed is in the case of few deviant lecturers who in their dictionary honesty is dead i.e. quick way of making money is what they believed. These categories of lecturers formed a powerful group/click and are closed to management. Management believed them more than the honest lecturers. Once any of the honest lecturers' pick-up any of the dishonest lecturer before you know through their click such honest lecturer is been set-up and he/she suffers for something he/she knows nothing

about. Honest lecturers are rewarded negatively in terms of promotion, opportunities, advancement and position etc. While dishonest lecturers are re-enforced positively by way of promotion, appointment and advancement often undermine their bad attitude to work. This group of lecturers are popularly referred to as "Any Government in Power" (AGIP). They see the honest lecturers as impediment to their success.

Ezeaku (2016) opined that some students are victimised for not buying books published by the lecturers and made mandatory for all students, expressed further that a radio broadcaster recently narrated how he found it very difficult to purchase such books during his university days, when he found out that the compulsory book was the exact work of another foreign author. Academic corruption does not end there, lecturers publishing articles, projects or books written by other lecturers and management turn their eyes away because they are loyalist to them.

Money have been collected for the purchase of equipment and facilities for the training of business education, public administration and English language students and these equipment and facilities were never bought or purchased and even when they are bought, they are either inferior that will not last for two months or short supply that falls below the total number of amount of money that was collected. A business education lecturer who refuses to teach his/her students but set examination for the students is equally corrupted. Also students who do not meet up to seventy five percent class attendance for lectures are not qualified/expected to write such examination and if they are allowed to write such examination, corruption has taken place. When a student is unable to pay his first semester school fee and he/she is not allowed to write his/her first semester's examination by university authority and by second semester, this student has paid for both first and second semester fee but only allowed to write his/her second semester examination, the university authority has committed corruption. This is because that student has paid for the first semester examination which he/she was earlier denied of. Supposing this student is in 300 level that means he/she needs to pay another first semester school fee after the graduating year to come back and write the first semester examination he/she was not allowed to write.

The above enumerated corruption problems are bedevilling the teaching and learning of business education in Nigerian universities by extension affecting the business education, public administration and English language students academic performance calls for this research investigation. This paper sought to find out whether we must continue to be wallowing and swimming in corruption to the detriment of the performance of business education students in Nigerian universities.

## III. CONTRIBUTORS TO CORRUPTION IN NIGERIAN UNIVERSITY SYSTEM

- (a) Government
  - Appointment of Vice Chancellor
  - Lack of fund
  - Policies
  - Insincerity
- (b) University Authority
  - Vice Chancellor
  - Deans

- Heads of Departments
- Lecturers
- Corrupt Practice by Students
- Corrupt Practice by Parents
- Environment
- Secret Court

(c) National University Commission (NUC)

(d) Nepotism – Ethnicism

### Is corruption actually the problem?

Once you have a good system, good leadership, proper supervision, corruption cannot exist in Nigeria and other countries Universities. It is however, authors' categorical statement that corruption is not actually Nigerian's problem rather; it is the bad leadership in Nigeria, as well as in the educational system. During the era of the military reign of General Buhari and Idiagbon, Nigerian citizens' fears corruption though they were military which we the authors do not subscribe to. This equally translated to campuses. The university is a sub-section of the society and whatever that happens in the academic environment is a total reflection of the society itself. Therefore, the university is not isolated from the environment. It is unfortunate as at today that General Buhari and Idiagbon who fought corruption to a standstill in the past but the same Buhari though with Osinbajor are unable to fight the same corruption to a standstill in the present administration. Though many critics claimed that President Buhari is surrounded by corrupt men who brought him to power, in effect, it will be difficult for him to fight the same people. Therefore, fighting corruption is only on the pages of news papers in Nigeria today by extension Nigerian university system is swimming in corruption. Even the very few corrupt people arrested by Economic Financial Crime Commission (EFCC) currently being tried in Nigeria are not being tried the way ordinary person in Nigeria would like them to be tried to serve as deterrent to other. This is a total reflection of the university system.

According to Ibenegbu (2017) the dynamic impact of corruption in Nigeria is felt by every layer of the population. The most fragile social layer is poor households and small firms. Corruption in this sector of economy reduces any chances to increase human investment and capital. Cases of corruption in Nigeria are widely associated with poor public finance management. The increasing number of barriers from public provisions decreases the ability to do business. GDP and jobs in Nigeria Foreign direct investment sector has significantly decreased in the last decade. Foreign investments can provide real growth of GDP and jobs in Nigeria. Still, investors do not like the idea of spending even one cent in vain. Government effectiveness is also damaged due to the situation with corruption. The officials on high levels of Nigeria also get bribes. It means that their interests in creating laws can be strictly lobbied by price. Corruption in Nigeria is associated with low standards of living.

Ibenegbu (2017) further stressed that top 10 banks in Nigeria has a long history of corruption. In 1975, the officials of Gowon Administration were involved in the cement importation scandal. This scandal included almost all officials of the central bank and defence ministry. Nigerian officials were accused of falsifying ships manifestos. Millions of dollars from the budget were lost. - Olusegun Obasanjo administration was a deeply

corrupt government. Even the head of the state was involved in scandals with telecommunication firm ITT. Olusegun Obasanjo was criticized for his Operation Feed the Nation Program. It was mainly associated with land stealing. His famous project Otta Farm Nigeria was supposedly born out of this scandal. Olusegun Obasanjo - The real problem with Nigerian corruption occurred during the administration of Shehu Shagari. Few buildings that contained the financial documents of the government officials were burned down. Few days later, it was shown that the officials transferred money from the country with the help of Asian importers. - Babangida Administration helped corruption to obtain an official status in Nigeria. Ibrahim Babangida was accused of corruption, bribery, power abuse and even drug trade in Nigeria. His reign provided a new class of citizens in Nigeria. They are called nouveau riche. They were mainly the closest friends and family members of the state head. Ibrahim Babangida now lives in an exquisite mansion in Nigeria. Obasanjo administration - Obasanjo established a new trend of corruption during his years in power. It was the first time in the history of the country that FBI and international detectives investigated the case of corruption in Nigeria. It was the first time a U.S. Congressman was involved in Nigeria corruption. - Goodluck Jonathan managed to improve positions of Nigeria in the world corruption ratings. Still, his presidency did not miss scandals. They were mostly connected with secret deals between the NNPC and some people in the administration. According to the American financial researches, if the corruption in Nigeria does not slow down, then by the year of 2030, it will cover about 37% of GDP. It means that every citizen starting from today will lose about \$1000 to corruption every year. By the year of 2030, this number will increase up to \$2000 per person. Still, if Nigeria tackles the problem with corruption in the next decade – Nigerians may expect to have about \$535 billion of GDP by 2030. This tremendous sum can't go without a price. The potential benefits of anti-corruption programs are enormous. It includes increasing number of jobs, conditions of life and wages. Today the numbers provide a completely different picture. Corruption in Nigeria can be dealt with. The desire of eradicating corruption should come not only from politics in high cabinets but also from regular people. Low-income families should be the main power of changes as they are the majority of the population.

#### IV. EFFECT OF CORRUPTION IN BUSINESS EDUCATION, PUBLIC ADMINISTRATION AND ENGLISH LANGUAGE IN NIGERIAN UNIVERSITIES

From the above definitions, we can deduce that corruption in business education, public administration and English language in Nigerian universities does not only refer to bribery alone as may have been contemplated by the view of the general public. Corruption in Nigerian universities therefore include; allocation of business education courses to non-business education lecturers who do not receive training as business education teachers or experts but teach business education courses e.g. Technical education and Home Economic Education lecturers teach business education students in Nigerian universities. Allocation of special courses of interest by heads of departments to their friends and relations in public administration and English language departments. Awarding of unmerited grades to undeserving business education, public administration and English language

students by some lecturers who collect money from the students, popularly referred to as “BLOCKING”. Alteration or upgrading of business education, public administration and English language students scores from lower grades to higher grade e.g. “E” or “D” to “B” or “A” grades. Collection of gifts from their students to influence their grades. Having sex with the female business education, public administration and English language students to influence their grades. Written notes from senior lecturers to business education, public administration and English language junior lecturers to upgrade or pass their girl friends or relations. Cheating in the examination hall by students by way of smuggling in turn text book, or written papers, use of handset, students impersonation, students collecting two booklets, smuggling it out from the examination hall to a friend outside the hall to assist in answering the questions and smuggle back into the hall to submit when others are rushing to submit their answered booklets. Two students coming into the hall to write one examination, at the end of the examination, the most intelligent student will submit his/her booklet in favour of the failed student while the second student will smuggle out his/her booklet. This occurred mostly with the student having carryover courses to write. Students also are in the habit of answering questions and sending the answers through text messages to their friends who are writing examination in the hall.

The university administrators have contributed to corruption in no small way in the sense that they determine whosoever they want to make a Professor. Irrespective of the fact that the lecturer possesses scattered degrees e.g. having first degree in one field of study, second degree in another field of study and third degree Ph.D in different field, yet is being promoted. Again, even when the university authority knows that some of the articles accepted for promotion are plagiarised, yet, these categories of staff are regularly promoted to become Professors.

According to Olaleye-Oruene (2018) The global perception of Nigeria as the ‘black hole of corruption’ should be seen in its proper historical context, where corruption is the vestige of a colonial legacy. Moreover, within the international trade which is dominated by the North, corruption is the norm in Nigeria. With the introduction of corruption into the Nigerian ethos, its tentacles permeate from the highest echelons of government to the lowest level of the Civil Service, both national and local. Any transaction involving a public official must involve a bribe from the corrupter to the corruptee. The proceeds of crime are handled by fences -the financial institutions. The perpetrators of corruption are deemed to have personality defects which are responsible for their deviant behaviour. The victims are the Nigerian public who have been adversely affected by the deprivation which has resulted in underdevelopment and perpetual economic slavery. The myriad corruption control measures adopted have failed essentially because of the protection of vested interests compounded with corruption in the judiciary, guanos and law enforcement agencies.

Corruption reduces the image and low morale of university, lecturers, students, a nation, economic growth, employment opportunity, enhances inequalities and reduces the government’s capacity to respond to people’s needs. Also corruption leads to poverty in the society”. Corruption encourages laziness and weak society, weak economic growth and weak social developments. No wonder why Nigerian President Buhari stated in abroad in 2018 that “Nigerian youths are lazy”. Under paid and overworked over-inflated contract; If an engineer built a bad bridge and the

bridge collapses the highest number of persons that may have been killed may not be up to 100 persons but if a teacher/lecturer inculcate corruption habit into 100 students and these students by extension will destroy the whole word as each of the them will continue to multiply corruption into their students.

Today some business education, public administration and English language graduates cannot produce a simple type-setting manuscript, letters, tabular, memo, balance account, prepare cash book etc. Pedagogically, some cannot teach and they are unable to use teaching aids as well as unable to impact knowledge on their students. While public administration graduates cannot perform their duties in terms of administration and other office duties and the English language graduates cannot write letters without full of errors for instance some of them use the word “world” for sound words and sound words for “world”. Some cannot differentiate between present and past tenses while making sentences. Some of them cannot teach English language or impact knowledge on others. Some cannot express themselves literarily.

#### V. TYPES OF CORRUPTION IN NIGERIAN UNIVERSITIES

1. Impersonation in examination hall
2. Writing examination outside the examination hall and squeezing the paper into the exam hall.
3. Giving and receiving bribes – (blocking)
4. Favouritism in Course Allocation
5. Manipulation of scores/record by Course Adviser
6. Exploitation of students through Faculty Dues
7. Exploitation of students through Departmental Dues
8. Moderation of examination paper
9. Inflation of contracts by university administrators
10. Kick back and payment upfront
11. Abuse of university’s property
12. Lodging university’s fund into private accounts
13. Examination malpractices
14. Adulterated food or hazardous drugs
15. Misappropriation and embezzlement of fund
16. Unexecuted paid contract
17. Manipulation of course form
18. Using proxy names to buy property
19. Admission fraud
20. Over invoicing of items purchased
21. Appointments of qualified/unqualified relations/friends
22. Nigeria University Commission – Accreditation team
23. Diversion of fund by some TETFUND officials
24. Lack of infrastructure
25. Exploitation of Students by university authority

Parents are known to have used unauthorised means to influence their children's or wards' admission to federal government secondary schools, commonly referred to as unity schools. JAMB score has been inflated for admission in to the university in Nigeria, and this has led to cheat by some students and parents. There are some examination centers that have specialised in examination malpractices. Parents and children go for centres where they are been charged exorbitant fees to guarantee a minimum score of 300 in the JAMB score which automatically guarantee their admission into the university of their choices. These centers are popularly referred to as miracle centers.

According to Osipian (2008) embezzlement as a phenomenon of corruption in higher education works in two major directions: embezzlement from the university, committed by university employees, and embezzlement by the university, including misappropriation of research grants from the government. Both of these forms may qualify as white-collar crime.

Furthermore, there is healthcare fraud that takes place in university hospitals, medical centres, and other medical facilities that operate under the auspices of higher education institutions. Healthcare fraud occurs when patients and/or insurance companies are overcharged for the services performed charged for services not performed, or services are not rendered appropriately according to set procedures. This type of fraud is not related to academic process per se, unless medical treatment is a part of training for medical students.

In Nigerian university system today, some students and their parents are in the habit of finding ways of purchasing unmerited marks from very few unprofessional lecturers in order to enhance their grades in their final examination. Students and non-academic staff print fake school fee receipts thereby defrauding the university authority and some unsuspecting students are usually discovered by the audit department.

Osipian (2008) stated that plagiarism is committed both by students in writing academic papers and by faculty in scholarly writing and research. Reports on plagiarism may be found in media sources in the Russian Federation, the US, and the UK. It appears, however, that while the widespread plagiarism in the US and the UK is taken seriously, especially among professors, and becomes an issue of public debate, in the Russian Federation plagiarism is regarded as a normal way of writing papers. While in the US media, corruption in access to higher education is not discussed directly. However, there is a room for corruption in the admissions and some of the corrupt actions are discussed without using terms “corruption” or “fraud”.

Nwaobi (2004) opined that Nigeria must be one of the very few countries in the world where a man's source of wealth is of no concern to his neighbour, the public or the government. Wealthy people who are known to be corrupt are regularly courted and honoured by communities, religious bodies, social clubs and other private organizations. This implies that people who benefit from the largesse of these corrupt people rarely ask questions. Dadajo (2008) stated that the poor salary levels of most public servants have not kept pace with inflation, which has eroded their purchasing power. It is also clear that the process of gaining power in Nigeria is either by armed force or the influence of money.

#### VI. ARE THERE LECTURERS WHO DISCOURAGE CORRUPTION?

In a university environment where corruption is free for all, undermining of norms, rules and regulations are the order of the day, there are still very many Lecturers who hate corruption. They will never be involved in corruption, such group of Lecturers have high moral of self-discipline. Overtime, they have made frantic efforts to change the lives of those corrupt Lecturers, by explaining to them the side effect of corruption that if nemesis elude them, it will definitely catch-up with their children or relations.

There are very many decent lecturers who are not corrupt in the Nigerian university system that the author can still honourably point at today. There are still very many good lecturers today who paid school fee for students who they do not know but as a result of pity, there are still very many lecturers today who gave their text books to students free of charge. There are still very many good lecturers today who provide food for students and there are still very many good lecturers today who have used their personal money to treat sick students in the hospital. It is very sad, wicked, barbaric, satanic, and ungodly to hear that some evil lecturers are involved in corruption. The university system is still the most disciplined institution as compared to the public servant, political sector and other sectors in Nigeria today. This was born out of the fact that none of these sectors has had the political will to sack its staff, but in the past many lecturers have been sacked for various corruption offenses in Nigerian universities. This is in line with Ezeaku (2016) who stated that the Governing Council of university of Calabar will continue to be commended over a bold step taken recently towards the fight against corruption in Nigerian universities.

#### VII. CORRUPTION IN UNIVERSITIES GLOBALLY

Corruption is not applicable to Nigerian universities alone but to other countries universities like U.K., U.S., Russian Federation, Ukraine etc.

According to Osipian (2008) Cheating is yet another phenomenon of corruption, reflected equally in the media in the US, the UK, and the Russian Federation. Cheating is committed by students in tests and examinations and by prospective students in entry examinations and national tests regarded as entry examinations. Cheating should not be considered as a relatively innocent or less explicit form of corruption, as compared with bribery. Buying a term paper online often replaces the need to pay a bribe. In this case the faculty member is not involved in corruption, but the student achieves the same goal of receiving an unearned grade or admission to a college.



Source: Getty

According to Matthews (2017) the scale of student misconduct in Ukraine has been exposed by a survey of undergraduates that found nearly half have paid bribes and almost all admitted to cheating in exams and plagiarism. Of 600 students

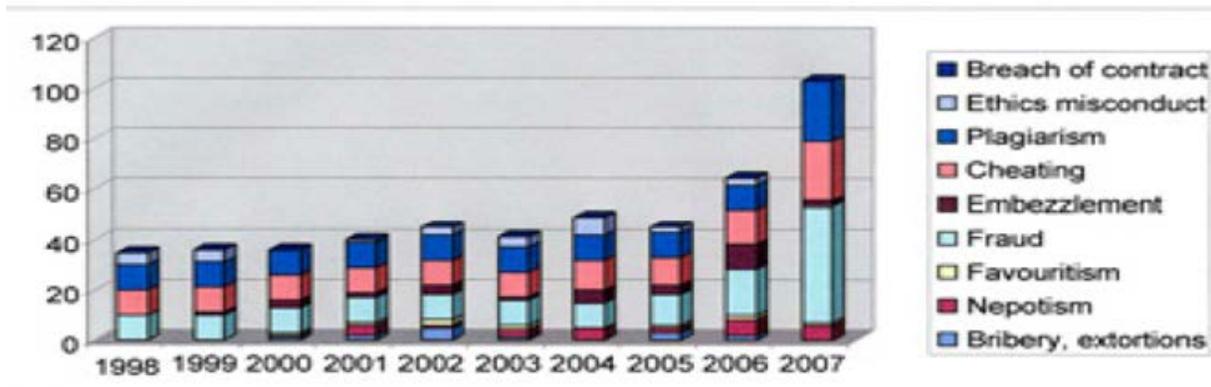
surveyed at public universities in Lviv a city in the west of Ukraine seen as relatively uncorrupt 48 per cent had paid bribes.

Osipian (2008) explained trends in time in each category more or less reflect the trends in the higher education industry. Private education loans in the US, education fees in the UK, and standardized examinations in the Russian Federation are all in the news along with cases of corruption that accompany these changes and reforms. The dynamics of reporting different aspects of corruption in the media are presented in Figures 1-5. The date presented point to the phenomenal growth in the number of media reports on corruption in higher education over the last decade.

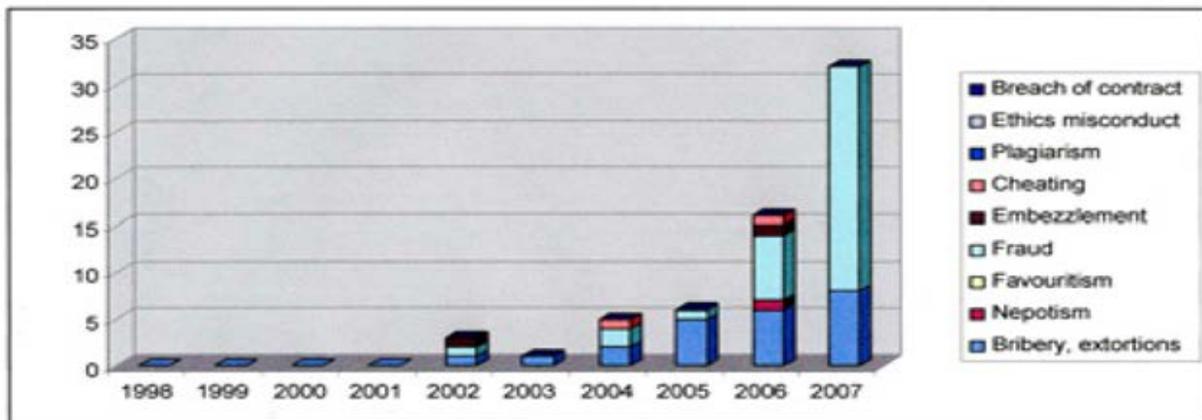
The Chronicle of Higher Education pays most attention to such phenomena as fraud, cheating, plagiarism and embezzlement.

While the Times Higher Education Supplement reports mostly on cheating and nepotism domestically and on bribery and nepotism internationally. And Guardian points to cheating, plagiarism, and fraud in the academic profess, in research, and in access to higher education. The number of reports over the last decade appears to be minimal. Gazeta.ru pays most attention to bribery, extortion, and fraud that takes place in academia, and that may be found in admissions to higher education institutions, in the academic process, in issuing educational credentials, and in licensing and accreditation. Accordingly, most corruption is found in interactions between faculty and students and state and universities.

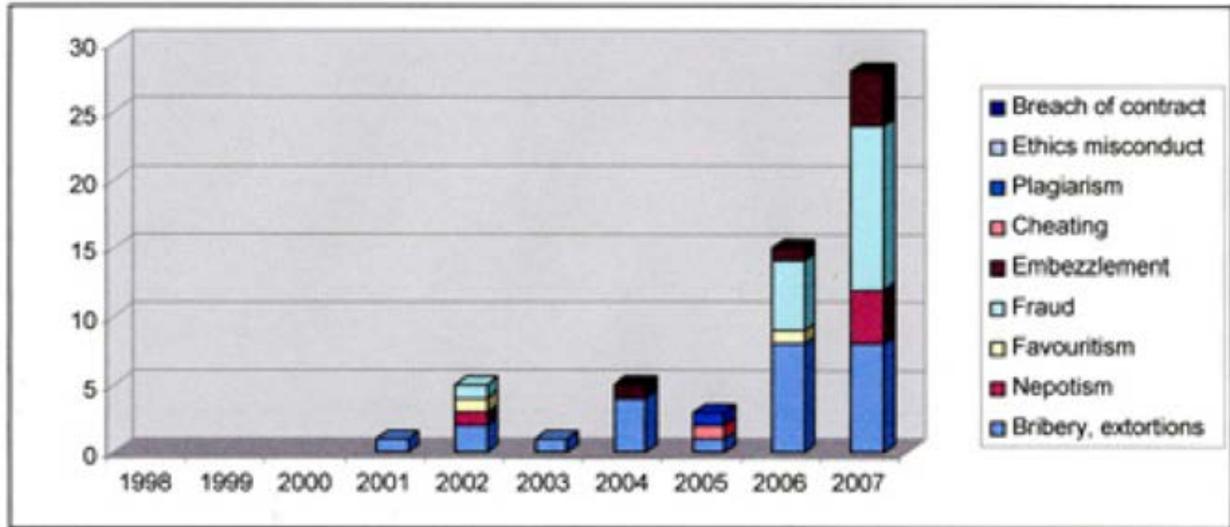
**Figure 1. Dynamics of the Chronicle of Higher Education reports on corruption in higher education by phenomenon, 1998-2007.**



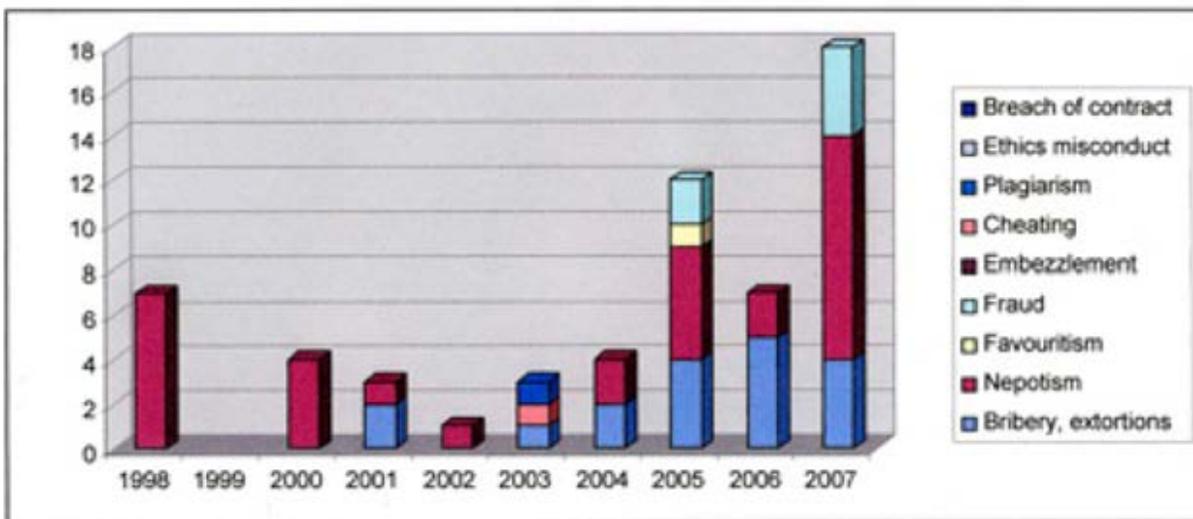
**Figure 2. Dynamics of Gazeta.ru reports on corruption in higher education by phenomenon, 1998-2007**



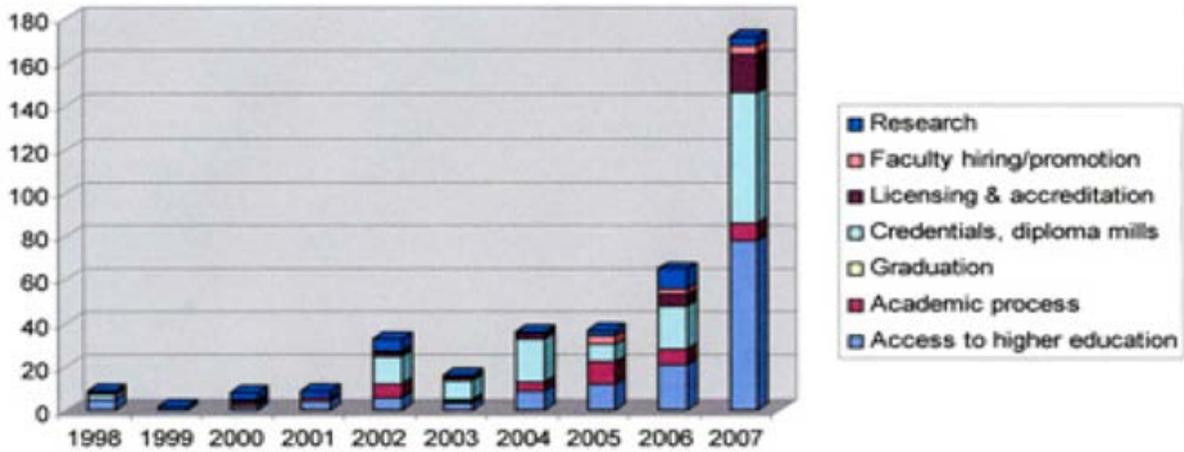
**Figure 3. Dynamics of Newsru reports on corruption in higher education by phenomenon, 1998-2007**



**Figure 4. Dynamics of the Times Higher Education Supplement reports on corruption in higher education by phenomenon. 1998-2007.**



**Figure 5. Dynamics of media reports on corruption in higher education by locus, 1998-2007**



### VIII. ERADICATION OF CORRUPTION IN NIGERIAN UNIVERSITIES

The university is a sub-section of the Nigeria society; therefore it is a total reflection of Nigeria itself. This view is opined because men and women who are Lecturers in the universities came from within the Nigeria society. Pragmatically, corruption must be totally eradicated in the Nigeria society before the war can be totally won in Nigerian universities.

According to Oyinola (2011) some of the things that cause poverty in Nigeria are the Nigerian ruling and business elite. The ruling elite lack the kind of philosophical and ideological vision and orientation that is committed to developing a dream society. They have no dream beyond the satisfaction of desire. This is also a total reflection of university administrators in Nigeria. Though, corruption is a world phenomenon. It is a social problem that has interested many scholars. Ruzindana (1999) asserts that corruption in Africa is a problem of routine deviation from established standards and norms by public officials and parties with whom they interact.

Oyinola (2011) further explained that corruption is turning many young men and women into an uncaring, unnecessarily aggressive, and the devil-may-care kinds of individuals. They have been socialized to believe that might is preferable to civility, that morality and ethics are not important virtues, and that it is important to win at all cost. They have increasingly been socialized to believe that it is proper and necessary to take whatever action, including killing in order to prevail. They learn this behaviour from the administrators and teachers/instructors/lecturers/professional and parents who supposed to mould them into hard-working honourable citizens. Having used to these kinds of behaviour, many university graduates have become a moral. They lie, cheat, manipulate, threaten, exploit, and kill in some cases.

It is unfortunate to state here that corruption is not only traceable to Nigeria universities but all over the world, but the problem here in Nigeria is that corrupt people go without been punished. Corruption cannot be eradicated in the Nigeria university system without firstly eradicating corruption from the Nigeria society. To buttress this fact, the authors hereby categorically made it bold to say that corruption is not only applicable to Nigeria universities but the whole world. In 2015

Blata the FIFA president was involved and tried for corruption. This assertion is a confirmation of Ezeaku (2016) who stated that incidentally, not only those in the citadels of learning are victims of the crime of plagiarism. Many writers, public speakers, public and civil servants, students and others are all victims. They copy the works of others without acknowledging the author. Furthermore, stated that we can still remember the dust raised by Victor Dike, a Nigerian born United States based professor's suit against the former Governor of the Central Bank of Nigeria (CBN), Mr. Sanusi Lamido Sanusi, whom he (Victor) accused of grossly violating his intellectual property rights by extensively plagiarizing his work in two public lectures, he (Sanusi) gave at two Nigeria Universities. The problem with Nigeria is that the Economic and Financial Crimes Commission (EFCC) and other corruption fighting agencies do not focus their investigation tentacles on educational institutions and to compel those who have questions to answer to face the music accordingly without fare or favour. Again, Nigeria is not yet matured in copying the British law rather she ought to implement the traditional law. The British law encourages corruption while the Muslim law discourage corruption e.g. in British law corrupt officers are jailed while the Muslim law either behead the offender or had his/her hand chop-up, and the traditional law made the offender to dance round the village nicked and sometimes what he/she stole is tied to the waist or a cause is placed on the whole family of the person. The British law which Nigeria copied have all laws in place but the government apparatus are there but the courage and will is not there to take a decisive decision against the corrupt officer. Nigeria therefore, needs articulated and fearless leadership who has the political will to take the bull by the horn.

### IX. IS CORRUPTION APPLICABLE TO NIGERIAN UNIVERSITIES ALONE?

According to Altbach (2012) several scandals have recently been widely reported in the United States, including the private unaccredited 'Tri-Valley University', a sham institution that admitted and collected tuition fees from foreign students. That institution did not require students to attend class, but rather funnelled them into the labour market, under the noses of US immigration authorities. In addition, several public universities have been caught admitting students with sub-standard academic

qualifications. Quality assurance agencies in the UK have uncovered problems with 'franchised' British-degree programmes, and similar scandals have occurred in Australia. A prominent example is the University of Wales, which was the second largest university in the UK, with 70,000 students enrolled in 130 colleges around the world. It had to close its highly profitable degree validation programme, which accounted for nearly two-thirds of institutional revenue. With international higher education now a multibillion-dollar industry around the world – with individuals, countries and institutions depending on its income, prestige and access – it is not surprising that corruption is a growing problem.

Lipsett (2007) reported that recent surveys by Unesco have shown that 'ghost teachers' on school payrolls, who had either left their posts or never even existed, represent 5% of salary expenditure in Honduras and 15% in Papua New Guinea. Bribe and payoffs in teacher recruitment and promotion tend to lower the quality of teachers, and illegal payments for school entrance and other hidden costs contribute to low enrolment and high drop-out. Higher education corruption usually takes the form of fake universities, bogus degrees and accreditation fraud. The report found the number of fake universities on the internet offering bogus degree had risen from 200 to 800 in 2000-04. Lipsett (2007) further stated that in Ukraine, top-ranking officials from private universities admitted in 2005 that most licensing or accreditation applications, obligatory for the country's 175 private universities, required some form of bribery for success. In the early 1990s in Uganda, for example, only 13% of the annual amount granted to schools per student actually got to schools.

From the above, it is clear that corruption is not applicable to Nigerian universities alone but a global problem that needs to be fought globally.

According to Lanteri (2017) corruption has traditionally been treated as a legal issue and consequently as a problem for the public sector to solve through lawmaking and law enforcement. This approach has failed. It has proved both ineffective, because public officials are typically on the receiving end of corruption and therefore less likely to effectively oppose it the more corrupt the country is; and inadequate, because corruption does not boil down to law enforcement, but profoundly undermines economic and human development.

According to Mohammedbhai (2016) 42 bogus high education schools in South Africa closed for offering fake programs, including 2 bogus US-based universities awarding degrees in 15 days. Most common cases of corruption in Nigeria: promotions, journals and book publications, money extortion for handouts and marks, sexual harassment. Of 475 students surveyed in 3 East African universities, 1/3 admitted to plagiarism, 25% to collusion in exams, 5% to impersonating another student in exams. Mauritius closing down branch campuses of 2 private Indian universities offering degrees not recognized in India or Mauritius.

## X. CONCLUSION

Conclusively, the research reveals that corruption is not applicable to Nigerian universities alone but a global disease that must be fought nationally and internationally. The number of lecturers involved in corruption in Nigerian universities is insignificant compared to those who are not. Though, that has

rubbed the rest lecturers because when a finger touches oil it rubs others. The university system is not as bad as reported in terms of corruption by various news papers as compared to the corruption in the public places and the political sector. Often time's lecturers have been dismissed from office as a mechanism to check them. This assertion is further confirmed by Ezeaku (2016) that Governing Council of University of Calabar a few days ago reportedly dismissed five lecturers and demoted 10 others for alleged plagiarism, financial fraud and other unwholesome behaviour. This goes to show that the university system is not institutions for training corrupt individual i.e. the leaders of tomorrow. Corruption is not the problem in our university system, the problem we have is lack of good leadership and lack of political will to discipline decisively those found to have been involved in corruption.

## XI. RECOMMENDATION

After a comprehensive review and analysis of corruption in Nigerian universities and other countries, the researchers therefore recommend as follows:

1. Corruption should be included in our educational curriculum and be taught right from primary schools through secondary schools to university level globally.
2. Economic Financial Crime Commission (EFCC) offices should be established in all schools right from primary schools through secondary to university level. The commission will not have any dealing with the school authority but an independent of its own to arrest and prosecute any offender. Including the school authority, lecturers and students that are found to be involved in corruption in any way.
3. Nigeria Christians and Muslims to revert to African traditional religion as it has often helped in the fight against corruption.
4. The teaching of Nigeria's social, cultural, and moral values should be introduced into our education curriculum in both primary schools through secondary to university level in Nigeria.
5. EFCC should be empowered and be granted absolute autonomy to handle cases relating to corruption in all universities in Nigeria. Anti corruption laws, legislations and regulations should be written in simpler language and made accessible to all.
6. The National University Commission in the selection of accreditation team should look for members who are strict to form the visitation panel.
7. The university system needs to be overhauled.
8. Both national and international educational curriculum need to be reviewed with a view to include the teaching of both moral instruction and fraud prevention.

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# Sex Ratio And Length-Weight Relationship Of Snakehead Fish (*Channa striata*) In Tempe Lake Wajo District, Indonesia

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## ABSTRACT

Tempe Lake is one of the lakes that had considerable fisheries resources, one of which was snakehead fish. These fish was a fishery resource that has high economic value and was beneficial to human health because it was rich in albumin. This study aims to determine the sex ratio and the length-weight relationship of snakehead and carried out six months from September 2018 - February 2019. The Stratified Random Sampling method has been used to collect the data. The length weight relationship was analyzed using cubic equations and sex ratio by comparing the number of males and females in the sample. To find out whether the value of  $b$  equal 3 and whether the number of males and females was different is used the student  $t$  test and chi square test respectively. The results showed that 1,594 fish observed by gonad macroscopically had 515 (32.31%) males and 1,079 (67.69%) females, so that the sex ratio was 1: 2.10. The chi square test stated the number of males and females was different. The length weight relationship of male  $W = 0.115 L^{3.060}$ , female  $W = 0.135L^{2.966}$  and the combination  $W = 0.127L^{3.003}$ . Student  $t$ -test results showed that  $b = 3$  which means isometric growth patterns.

Keywords: Lake Tempe, snakehead, length weight relationship, sex ratio

## INTRODUCTION

Tempe Lake is one of the lakes that has high fisheries resource potential in South Sulawesi. This lake was a potential producer of fish for local and regional consumption (Haerunnisaet *et al.*, 2015) [1] and until the late 1960s was still known as the most important center of Indonesian freshwater fisheries production. The annual production of Lake Tempe ranges from 37,000-40,000 tons and had reached 50,000 tons in 1959 so it was dubbed the Indonesian fish bowl, and continued to decline to 400%, even in the last 15 years fish production only reached 10,000 tons yearly (Bachtiar, 2015) [2]. Besides the problem of decreasing production, other that catches are dominated by small-sized fish which are thought to be caused by sedimentation, pollution, use of fishing equipment that is not environmentally friendly, and overfishing (Nasrul, 2016) [3]. The causes of reduced fish are caused by overfishing and habitat damage (Balkhisetal., 2011) [4], and pollution (Qiufenetal., 2013) [5]. One of the primary fisheries resource potentials of Lake Tempe was snakehead fish, *Channa striata* (Samueletal., 2010) [6]. Snakehead fish have high economic value (Mahmud, 2016) [7]. Aside from being a daily consumption of fish, snakehead fish is known to be very rich in albumin, one of the important types of protein needed in the human body (Fitriyani *et al.*, 2013) [8]. The high utilization of snakehead fish causes large scale fishing for snakehead fish. The exploitation of snakehead fish in Lake Tempe is increasingly intensive and leads to destructive capture (Harianti, 2012) [9]. The activity that causes the decline in fisheries resources according to the community was the intensive use of "bungka toddo" and "jabbatroll" (Ramadan *et al.*, 2008) [10]. Increasing the need for snakehead fish will affect stock availability in inland waters and this can threaten its survival in their habitat. This study aims to obtain information about the sex ratio and length weight relationships of snakehead fish in Lake Tempe, Wajo District, South Sulawesi, Indonesia.

## MATERIALS AND METHODS

The research was conducted from September 2018 to February 2019. The research site at Lake Tempe included three main fish landing sites that could represent the population of snakehead fish of Lake Tempe, namely in Tanasitolo, Tempe and Sabbangparu Sub-district (Figure 1).

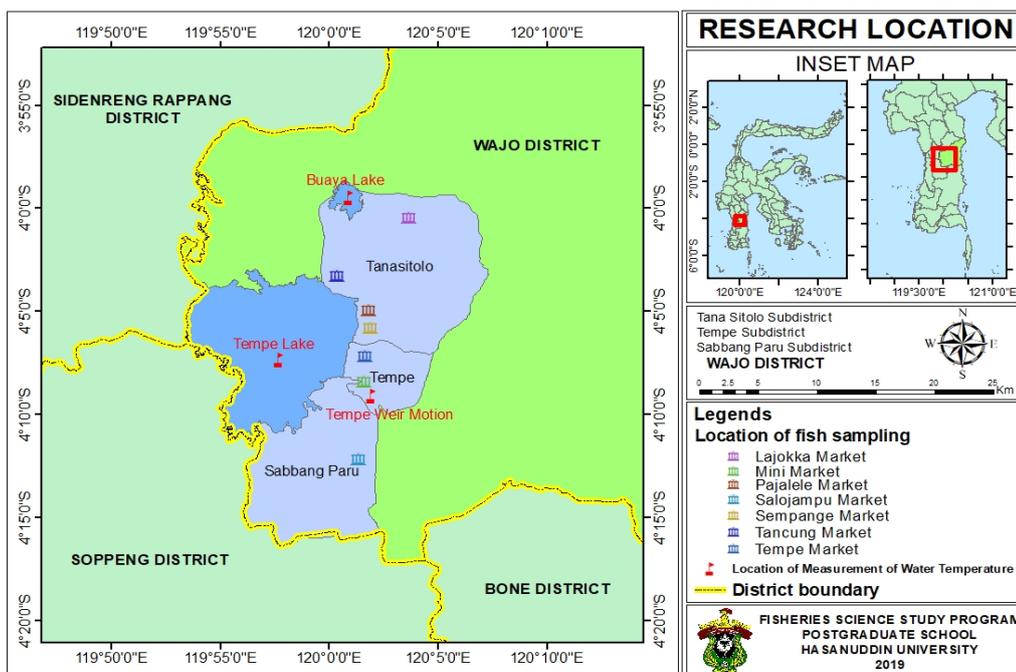


Figure 1. Research location

The materials used in this study were snakehead fish, digital scales, rulers, and surgical scissors. The method used was the survey method and sampling is done four times a month. In this study the measured fish length was total length, which was measured from the most anterior part of the mouth to the most posterior part of the caudal fin in a cm scale and weight with a gram scale. Taking sample fish using the Stratified Random Sampling method (Nasir, 2014) [11]. To find out the sex of the fish, gonadal surgery and observation were carried out morphologically (Lisna, 2013) [12]. Data on body length measurements are grouped based on body length class intervals. The number of fish samples observed during the study were as many as 1.594 fish.

### Sex Ratio

The equation for calculating sex ratio according to Steel and Torrie, 1980 in Selviana., (2017) [13]. that is:

$$X = \frac{M}{F}$$

where :

- X = Sex ratio
- M = Number of male fish (tail)
- F = Number of female fish (tail)

To find out the number of males and females in the population was the same or different, *Chi-Square* Test has been used (Sudjana, 1992) [14]. The *Chi-Square* formula used is as follows:

$$X^2 = \frac{(|X - n\pi_0| - 0.5)^2}{n\pi_0(1 - \pi_0)}$$

Where,

- X = number of male fish
- $\pi_0$  = chance of foreign type (= 0.5)
- n = total fish

### Length Weight Relationship

The length-weight relationship will be analyzed using a cubic equation, namely that the weight of the fish is a power of three in length (Effendie, 2002) [15]. The equation is:

$$W = a L^b \text{ or } \log W = \log a + b \log L$$

where :

- W = individual weight (grams)
- L = total length (cm)
- a = intercept (the intersection between the regression line and the y-axis)

b = regression coefficient (line slope angle)

Next from the above equation, when b was equal to 3 (b = 3) it shows that fish growth does not change its shape or the increase in length fish was balanced by the increase in weight (isometric growth). If b was greater than 3 (b > 3) it is called positive allometrics, which was the growth of weights faster than length increments. If b was less than 3 (b < 3), it is called negative allometric, which was a length increase faster than weight gain (Ricker, 1975) [16]. To reinforce the value of b equal to or not 3, then testing the value of b with the t-test. t calculated can be obtained by equation

$$t_{\text{calculated}} = \left| \frac{3 - b}{Sb} \right|$$

where :

Sb = standard deviation from value b.

The criteria for this test are if: t calculated < t 0.05; its means that b = 3 and if t calculated > t 0.05; its means b ≠ 3

## RESULTS AND DISCUSSION

### Sex ratio

The results of this study indicate that snakehead fish obtained as many as 1,594 tails consisted of 515 male and female 1,079 tails. The size of the male fish was 19 - 57 cm and for females 16 - 57.7 cm. The number of males and females obtained at each observation was always different as shown in Table 1. The sex ratio of snakehead fish at Lake Tempe was 1: 2.1. The sex ratio obtained statistically different significantly (p < 0.05), it means that number of male and female was not the same, where in this research the number of female of snakehead fish is more than male. This was in accordance with the research of Aida (2016) [17] that the monthly sex ratio of snakehead fish showed a higher proportion of female than male fish, possibly this is caused by different types of spawning between male and female of fish. Olurin (2011) [18] reported that the sex ratio of snakehead fish was 1: 4. This shows a significant difference between male and female sexes. Nikolsky (1969) [19] reported that the sex ratio of one species of fish can vary from year to year in the same population, if there are differences in size in waters and differences in the number of one sex this may be due to differences in growth patterns from the fish itself and the difference in age of fish maturity of the first gonad fish.

### Length-weight relationship and growth pattern.

The results of observations on the length and weight of snakehead fish found that the length and weight of the combined male and female were 16,0 – 57,7 cm and 30 – 1.954 gram respectively. The length and weight of male snakehead fish were 19,0- 57 cm and 40 – 1.840 gram respectively, and the length and weight of female were 16,0 – 57,7 cm and 30 – 1.954 gram respectively. From the results of this study the distribution of the length of snakehead fish (*Channa striata*) is the total length is 16,0 cm – 57,7 cm and body weight ranges from 30 - 1954 grams. Based on these data, it was found that the relationship between the length of the weight of the snakehead fish of Lake Tempe combined with female males, male and female as presented in Table 1. and Figure 2- 4.

Table 1. Parameters of relationship between length and weight of snakehead fish (*Channa striata*) in Lake Tempe, Wajo District

Parameters	Combine	Male	Female
N	1.594	515	1.079
a	0,127	0,115	0,135
b	3,00	3,0601	2,966
W = aL <sup>b</sup>	W = 0,127L <sup>3,00</sup>	W = 0,115L <sup>3,0601</sup>	W = 0,135L <sup>2,966</sup>
R <sup>2</sup>	0,899	0,911	0,920
T – test	b = 3	b = 3	b = 3

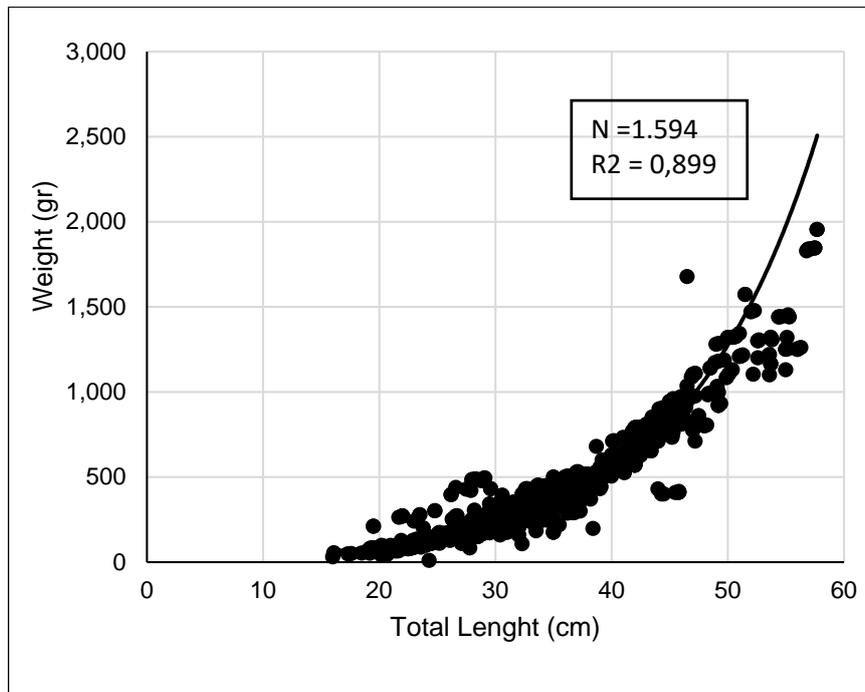


Figure2. Length weight relationship combined male-female of snakehead fish in Tempe Lake Wajo district.

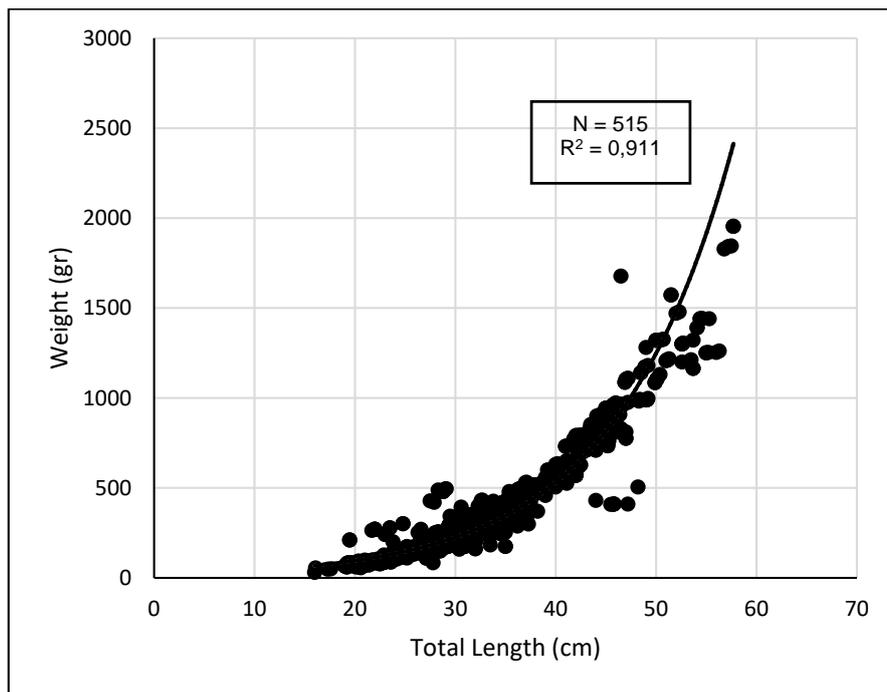


Figure 3. Length weight relationship of snakehead fish male in Tempe Lake . Wajo District.

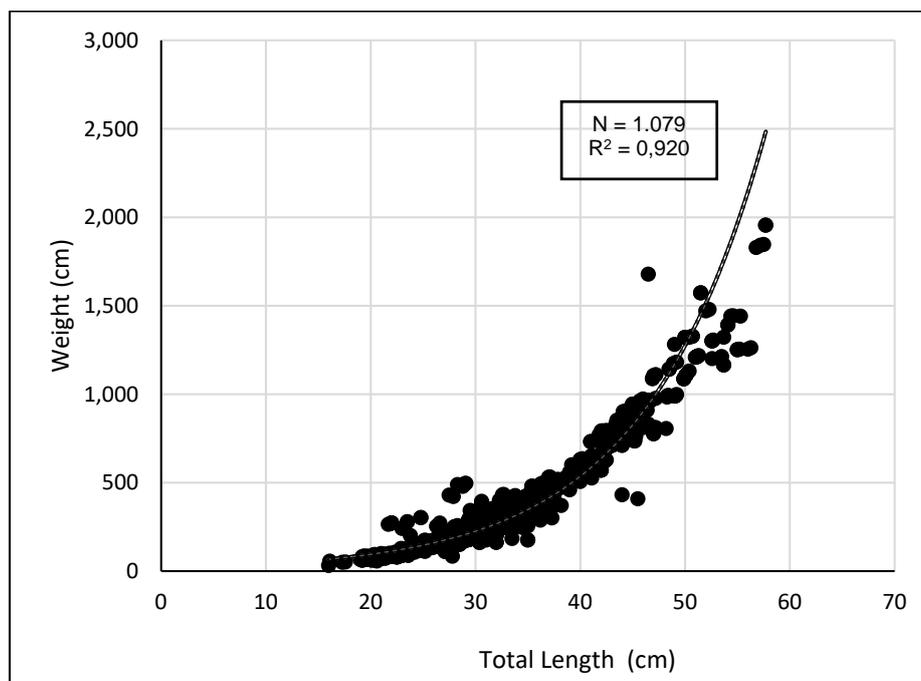


Figure4. Length weight relationship of snakehead fish female in Tempe Lake Wajo District

Student t-test results found that the value of  $b$  obtained in the equation of the relationship between the weight of the combined male and female of snakehead fish  $W = 0,127L^{3,003}$ , the relationship of the weight length of male of snakehead fish  $W = 0,115L^{3,060}$ , and the relationship between the weight of female snake fish  $W = 0,127L^{2,966}$  were not significantly different from three or  $b = 3$  ( $p > 0.05$ ) so that it can be said that the growth pattern of the combined snakehead fish of female males, male, and female was isometric. Isometric growth patterns can be interpreted that the increase in length and increase in weight both in snakehead fish male and snakehead female fish were the same. Based on the values of the correlation coefficient ( $r$ ) which approaches one showed the relationship between the length and weight was high significantly. This was in accordance with the opinion of Andy Omar (2011) [20] which stated that the correlation value ranges from 0.70 - 0.89 means that the correlation is strong and the correlation value ranges from 0.90 to 1.00 means a very strong correlation. The closeness of this relationship proves that the total length of fish influences the body weight of snakehead fish. Generally the length increase will always be followed by the increase in body weight of the fish. Length-weight relationships are important tools in fisheries management (Lawson et al., 2013) [21]. The equation of the relationship between the length of the weight of snakehead fish has a very close correlation. Based on the value of the correlation coefficient ( $r$ ) obtained close to one. The magnitude of the correlation value indicates that fish length increments are followed by weight gain.

The growth pattern of snakehead fish in Lake Tempe was generally isometric, the increase in length is equal to the increase in weight, this is probably due to fish caught generally gonad mature. This is in accordance with the statement of Arzita *et al* (2012) [22] that there was a relationship between the condition of gonadal mature fish and fish body weight where body weight will increase with the level of gonadal maturity. The growth pattern of some species has a tendency to grow negatively in allometrics, this is related to the morphology of their bodies which tends to elongate, so the growth in length is faster than the weight (Riyadi, 1998 in Sofarini *et al.*, 2018) [23]. The growth of snakehead fish in each waters will be different, many factors that influence differences in fish growth include habitat differences, eating habits, fish activity, season, temperature, food availability, and trophic level (Cia et al., 2018) [24]. The growth of snakehead fish in several locations shows results that are not much different from the results obtained from Lake Tempe.

This is in accordance with the study of Vodounnou *et al.*, (2017) [25] reporting that the growth pattern of snakehead fish in Takon Rawa is isometric with the equation  $W = 0.0087 TL^{3.0128}$ . Cia et al., (2018) [23] that the growth pattern of male snakehead fish in Aopa Swamp waters is isometric ( $b = 3$ ). Another study conducted by Aida. (2016) [17] that in the Banjiran Swamp of Lubuk Lempan waters in South Sumatra, the growth pattern is negative allometric with the equation  $W = 0,0003L^{2,671}$  with a closeness level close to one (1), presumably the fish caught are in the size of young fish. Bolaji et al., (2016) [26], reported that snakehead fish in Nigerian Swamp followed negative allometric growth ( $b < 2,807$ ). Kusmini et al., (2015) [27] reported the growth of snakehead fish (*Channa striata*) was negative allometric where the value of  $b = 2.875$ , this value indicates that the growth of fish length is faster than the growth of weight.

### CONCLUSION

The male and female sex ratio is different, where the number of female fish is more compared to the number of male fish in the snakehead fish population at Lake Tempe. Growth patterns of snakehead fish in Lake Tempe in a combined population of female males, male snakehead fish populations and female snakehead fish populations are isometric or increase in length and weight gain is equal or comparable.

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# Economic Effects of Libya's Development Strategy in the Period from 2003 to 2013

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**Abstract-** The Economic Reform Program (ERP) is a new phenomenon in the last two decades that has affected countries such as Libya, Egypt, Tunisia, Jordan and Saudi Arabia, as well as most developing countries. All of them are trying to implement the same program in order to achieve stabilization of their economy. Many of these countries did so because they had to earn enough foreign exchange to protect their currencies. Indeed, many of these countries have begun to transform their economies from socialist, state-owned, to market-oriented economies. The beginning of ERP was the Law 8 for the year 1988 on a number of economic activities, and the Law 9 for the year 1992. However, these laws were not sufficient to motivate the private sector. They only caused a small growth in the services and crafts sectors. More important sectors, as oil sector, stay on hold.

**Index Terms-** Economic, developing, program, sufficient, market.

## I. INTRODUCTION

During the 1950s, the economic sectors of Libya went through a period when the agricultural sector was primary, despite the poor quality of the land, the lack of water and severe weather conditions. In the industrial sector, the production process was limited due to the inaccessibility of raw materials, the lack of qualified labor, the local market constraints, and the inability to produce the processing. The economy was unable to provide the necessary investment for change and promotion. However, when oil is discovered, Libya begins to export it in 1962, and the development problem in Libya is focused on looking for development alternatives, especially in relation to the sustainability of capital and working environment. During the 1950s, the economic sectors of Libya went through a period when the agricultural sector was primary, despite the poor quality of the land, the lack of water and severe weather conditions. In the industrial sector, the production process was limited due to the inaccessibility of raw materials, the lack of qualified labor, the local market constraints, and the inability to produce the processing. The economy was unable to provide the necessary investment for change and promotion. However, when oil is discovered, Libya begins to export it in 1962, and the development

problem in Libya is focused on looking for development alternatives, especially in relation to the sustainability of capital and working environment. Since the early 1980s, when oil revenues have been reduced due to problems in the international oil market, the problem of growth in Libya is causing other difficulties, such as the lack of modern technology and efficient labor. Since the early 1980s, when oil revenues have been reduced due to problems in the international oil market, the problem of growth in Libya is causing other difficulties, such as the lack of modern technology and efficient labor. Colonel Muammar Gaddafi ruled the Libyan Arab Jamahiriya since 1969, when he and a group of officers were thrown out of the throne of King Idris. Libya then adopted Arab socialist ideas, after capitalism. In the early 1970s, led by the Green Paper, Libya decided to be a socialist country with the state economy. All investments were in the jurisdiction of the state, as well as trade, price control, and state subsidies were common for many products and services. Mixing the government into the economy has created an unfavorable business climate. Following the freezing of the UN sanctions in 1999, Libya gradually began to implement measures to introduce the reform and open its economy in order to strengthen the role of the private sector in the economy. On June 28, 2004, the United States renewed diplomatic relations with Libya. On September 20, 2004, President Bush lifted extraordinary measures against Libya. These decisions eliminated most of the economic sanctions imposed on Libya, which led to the release of Libyan assets frozen in the United States. Economics and politics play a major role in the development of the structure and reform of the Libyan economy. Fulfilling the society's needs for goods and services, on the one hand, and reducing dependence on oil revenues and the use of natural and human resources, on the other hand, have characterized political and economic development in Libya throughout history.<sup>1</sup>

## II. LIBYAN ECONOMY

The Libyan economy is unique in North Africa. While Algeria, Egypt, Morocco, Tunisia and all have large populations, great agricultural potential, and affirmed industrial bases, Libya has quite a few of these advantages. Libya, however, has

<sup>1</sup> A Review of Libyan's Economy, Structural Changes and Development Patterns. (2013) Bus Eco J 4: 083. doi: 10.4172/2151-6219.1000083 Volume 4 • Issue 2

significant energy resources: an attractive resource for crude oil, as well as natural gas. Given the small population of that country (3.6 million in 1984) and the significant income of oil derivatives, the Libyan economy has more in common with those countries that export oil from the Persian Gulf than with neighboring countries in North Africa.<sup>2</sup> Because Libya is heavily dependent on oil revenues, the general level of Libyan economy is closely linked to the situation in the petrochemical industry. Despite massive investments in agriculture and non-peripheral industries, the percentage of Libya's gross domestic product (GDP) has remained fairly constant since the early 1970s, ranging between 50 and 60 percent by 1982, when the decline in oil revenues caused him to fall below 50 percent. The Gross Domestic Product (GDP) in Libya was expected to expand 55 percent in 2017 from the previous year due to recovery in oil production. GDP Annual Growth Rate in Libya averaged 4.95 percent from 2000 until 2017, reaching an all time high of 104.37 percent in 2012 and a record low of -62.10 percent in 2011 because of starting of revolution. As we can see in this period from 2003 to 2013 there was couple of vary extreme situations: first, period of stabile, but not to big GDP growth rate (from 2003 until 2010), and then big fall of growth in 2011. After that from 2011 until 2013 there are 2 opposite situations high growth rate in 2012 and another fall in 2013. From the end of this turbulent period comes stabilization of GDP growth rate.

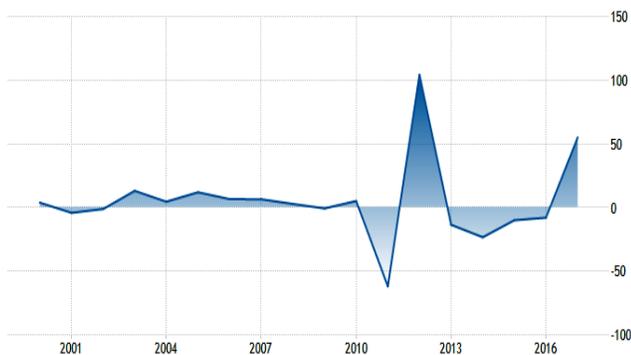


Figure 1. Libya GDP Annual Growth Rate<sup>3</sup>

### Strategic economic policy of Libya

This paper aims to explain the strategic economic policy of Libya in the period 2003-2013. The effects on the financial market and economic growth determine the success of various production

projects, so that they can be the basic factor that we will explore in this paper. The UN's economic expert, Farley, said the Libyan economy was a lagging economy before oil discovery, as there was no indication of economic growth. Due to higher oil export revenues, Libya experienced strong economic growth in 2003, with a real 8% increase in GDP, compared to 0.2% to 1.5% in 2002. In 2004, real GDP growth was 2.4% with consumer price inflation of 1.9%. Despite strong economic growth in Libya, unemployment was high as the country's population grew rapidly, and new jobs were not created fast enough. In addition, Libya has poor infrastructure (i.e. roads and logistics), an unclear legal structure, arbitrary government decisions, an oversized public sector (as much as 60% of state spending going to pay salaries of public sector employees), major public works programs, that is, a project "Great River built by human hands", and various structural obstacles set for foreign investment and economic growth. As the Libyan economy was on the brink of collapse in 1999, primarily due to UN sanctions, the government has undertaken harsh reforms of the economic system that transformed the Libyan economy from a socialist, state-planned economy into a capital-based economy. This economic reform program set the Libyan economy in parallel with the market economy. The Libyan government tried to transform the vital sectors of the economy into the program, aiming at training workers, finding new jobs, fostering investments, and selling public companies in order to minimize public spending. In fact, Libya, like many other countries, has long been suffering from shortcomings in the economy, especially in areas such as inflation, balance of payments deficit, employment rate and growth, which has created an imbalance in the economy. Problems of irregularities in supply and demand had a negative impact on the balance of payments. Similarly, fiscal policy had a tendency to exceed the level of expenditures, resulting in an imbalance between the density of population and economic growth and employment, and structural distortion in the labor market occurred. Diversification is a very important issue for Libya economy because in the coming decades the production of Libyan oil is expected to fall because the reserves have their end. Thus, the long-term preservation of the Libyan economy depends on the development and self-sustainability of the non-chemical-related industry. Otherwise, when the oil reserves are reduced, Libya will become as it was before oil boom, undeveloped farming country.

<sup>2</sup> Alfaitori E (2003) Nationalisation and Economic Development in Libya, Difficulties and Expected Economic Effects. Economic Magazine for Economical Researches (in Arabic) 4: 1-25.

<sup>3</sup> Source: <https://tradingeconomics.com/libya/gdp-growth-annual>

**Table 1. Number and classification of units that are transformed from 2004 to 2008<sup>4</sup>**

Stages Activity	First stage	Second stage	Third stage	Total
Industrial	145	41	18	204
Agricultural	28	4	24	56
Live stock	11	-	11	82
Marine fisheries	16	1	1	18
Total	260	46	54	360

III. LIBYAN GOVERNMENT ROLE IN ECONOMIC POLICY

The General National Board (GNO) is responsible for the principles and objectives of the transfer of ownership, since this is one of the reform economic programs aimed at expanding the ownership base and restructuring economic activities. In this direction, the Libyan government takes measures through re-examining state-owned companies and replaces them with partner companies and joint stock companies. The launch of these reforms began in the late eighties and early nineties, when state socialism became a replacement for national socialism in Libya.<sup>5</sup> Senina and Shamiya explained that the privatization in Libya was the result of local conditions characterized by a fixed economic foundation and dependence on purely economic resources such as oil.<sup>6</sup> General indicators that usually measure the efficiency of the economy, such as income, loss, return on investment and the possibility of competition in foreign markets, show that in 1987, the percentage of losses in the food production unit reached 89%, in the construction sector 100%, and in the engineering and electricity sectors 50%. This process was halted following the decree of the General National Board No. 313 of 2003, when a public sector restructuring program and the strengthening of the ownership base were approved.<sup>7</sup> GNO also issued a list of public companies that should start the transformation process. 360 private units were then privatized in agriculture, industry, livestock and fisheries. The total assets of these units amounted to 8 million Libyans, and over 100,000 employees worked in these units. The program took place in the period of 5 years from 2004 to 2008. Law 1 for the year 2004 on the addition and adjustment of a number of rulings of the Law 21 for the year 2001 on different economic activities. This law facilitated the establishment of shareholding companies.<sup>8</sup>

IV. CONCLUSION

This article gave a short analysis of Libya's macro environment and the performance and evolution of the development of the economic sector in the Libyan economy. Since 1969, after the revolution, the Libyan economy has gone through three main systems: the nationalist and socialist period, through a period of open economic policy and reform programs. The Libyan

economy experienced rapid expansion during the late 1970s and early 1980s when real GDP grew averagely by more than 10% a year. This expansion was largely financed by the sector from the proceeds of oil sales. In the mid-1980s, economic growth slowed down and the Libyan government began introducing anti-recession measures due to a collapse in oil prices and the 1990/1991 Gulf War. Following the abolition of the economic embargo against Libya in 2003, Libya entered a new economic phase of economic openness and freedom.

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# Synthesis of bone cement from a natural mineral for biomedical industry

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**Abstract-** Study carried to find out chemical and structural suitability of newly synthesized Eppawala Hydroxyapatite composite as bone cement, by comparing and contrasting it with human bone as well as commercially available bone cement, which is currently used in orthopedic surgeries. Therefore, a mixture of commercially available bone cement and its liquid monomer, commercially available Methyl Methacrylate (MMA) and a mixture of Solid State synthesized Eppawala Hydroxyapatite powder with commercially available MMA were prepared as the direct substitution for bone cement. Then physical and chemical properties including composition, crystallinity, presence of functional groups, thermal stability, surface morphology, and microstructural features were examined compared to human bone. Results show there is a close similarity between synthesized product and human bone while crediting high thermal stability, good crystalline, and porous properties than the commercial product. Finally, study concluded newly synthesized composite can be applied directly as a substitution for commercial bone cement.

**Index Terms-** Bone cement, Human bone, Hydroxyapatite, Methyl Methacrylate, Orthopedics,

## I. INTRODUCTION

Hydroxyapatite is widely used as a bioceramic due to its close chemical and structural similarity with human hard tissues. It performs several outstanding properties biocompatibility, non-inflammatory in nature, osteoconductivity, non-toxicity, bioactivity etc.<sup>[1-6]</sup> As a result it has a range of biomedical applications mainly in the fields of orthopedics and dentistry.<sup>[7-20]</sup> Here in this study we have synthesized Hydroxyapatite by converting Chloroapatite using a Solid State Sintering method considering its ability to replace chlorine with other groups at high temperature due to the increase of reactivity as its chlorine positions are under strain in the structural framework.<sup>[21,22]</sup> Chloroapatite were collected from Sri Lankan Eppawala apatite deposit, which usually contains 34-40% total phosphorus expressed as percentage of Phosphorus pentoxide (P<sub>2</sub>O<sub>5</sub>).<sup>[21-25]</sup> Further synthesized Hydroxyapatite is reinforced with a reactive resin, Methyl Methacrylate. It is a methyl ester of methacrylic acid. Polymerized forms of synthetic methacrylate resins used as cements in Orthopedic and dentistry applications. Also it is able

fix prosthetic devices to bones and to cement bone to bone in difficult fractures as adhesives.<sup>[26]</sup>

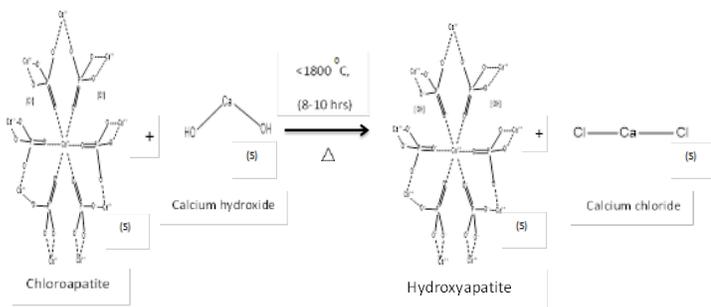
Selected commercial product containing two main parts as bone cement majorly consists of Zirconium Dioxide and a liquid monomer Methyl Methacrylate (MMA), is currently used as fast curing bone cement in Sri Lankan government hospitals which indicates for stable attachment of total or partial joint endoprostheses in bone, filling and stabilization bone defects within the scope of internal fixation treatment or for endoprosthesis revision surgery and primary and secondary coverage of skull bone defects. It is prepared directly before use by mixing its powder component with liquid monomer component clinically. As a result ductile dough forms which cure within a few minutes.<sup>[27]</sup>

As this study designed only to find out the possibility of substituting newly synthesized ceramic composite into human bone, we are only focusing to find out structural suitability of ceramic composite as bone cement.

## II. EXPERIMENTAL PROCEDURE

### A. Sample preparation

Natural raw apatite mineral were collected from the Eppawala Apatite site. Then they were sorted as High Grade Rock Phosphate by the visual appearance of less coated apatite. After removing mud, collection of Apatite rocks were dried under sunlight, crushed using a jaw Crusher (Serial no: 1720011, China) into small crystals /powder, grind further into micron/Nano level HERP powder using a planetary Ball Mill (XQM – 4.0A) and sieved using sieve set (A060\_01AC/0219, Scotland). Less than 63 micron range particle size powder were collected and oven dried at a temperature less than 150 °C for 5 hrs to prepare Moisture Removed HERP powder (MHERP). MHERP was taken as the raw material for synthesizing Hydroxyapatite. Samples were prepared using Solid state sintering technique as mentioned below. MHERP powder was added with needed weight of Ca(OH)<sub>2</sub> powder, after well mixing, sieving and high temperature heat treating Solid State Sintered Eppawala Hydroxyapatite powder (SSHAp) was synthesized according to equation (1) given below.<sup>[12,21]</sup>



Then the synthesized ceramic powder was mixed with commercial Methyl Methacrylate (MMA) liquid monomer, until the ductile dough forms. As the second step, commercial cement powder and liquid monomer were mixed together until the ductile dough forms.

### B. Sample characterization

Before mixing with the liquid monomer, Commercial bone cement, and raw Eppawala Hydroxyapatite was examined under X-ray fluorescence Spectroscopy (Rigaku XRF Spectrometer) to find out its elementary composition and presence of impurities liquid monomer was examined with Fourier Transform Infrared Spectroscopy (Bruker – Alpha FTIR Spectroscopy) ATR mode to confirm its composition. Then Sample mixture of newly prepared bone cement and the sample mixture of commercial bone cement were characterized using XRD, FTIR, TGA, and SEM with EDS techniques together with the human bone sample. The crystallographic phases of samples were determined by X-ray diffractometer (Rigaku – Ultima. IV diffractometer) in reflection mode with Cu K $\alpha$ 1: 0.154 nm radiation. 1.50 min<sup>-1</sup> scanned speed was used to collect data within a 2 $\theta$  range from 15<sup>o</sup> to 80<sup>o</sup>. The presence of functional groups was confirmed by using Fourier Transform Infrared Spectroscopy (Bruker – Alpha FTIR Spectroscopy). The FTIR spectra were obtained over the region 400-4000 cm<sup>-1</sup> using KBr pellet technique. The resolution of the spectrometer was 4 cm<sup>-1</sup>. The surface morphology and microstructural features of samples were studied using Hitachi SU6600 Analytical Variable Pressure FE-SEM (Field Emission Scanning Electron Microscope) and Oxford Instruments EDX with AZtec software. Furthermore, Thermogravimetric analysis (TGA) was done using a Thermal Analyzer (SDT Q600) with N environment, 10 °C min<sup>-1</sup> heating rate, and 1450 °C maximum temperature to find out the thermal stability of samples.

### III. RESULTS AND DISCUSSION

Synthesized Solid State Sintered Eppawala Hydroxyapatite (SSHAp) powder contains Ca, P and O include in higher weight percentages and Fe, Al and Si as the impurities with hexagonal crystal structure showing a close similarity with mammalian bones and consists of many correlated, microcrystalline structures/particles/ spherulites with micro pores while credenting good thermal stability [12,21]

Table 1. XRF results for Commercial Bone cement

Element	Spot 1	Spot 2	Spot 3	Spot 4	Spot 5	Spot 6
	Mass %					
16 S	8.84	-	-	10.32	-	-
40 Zr	87.65	96.19	96.43	86.00	96.56	96.45
72 Hf	3.51	3.81	3.57	3.67	3.44	3.55

Commercial bone cement sample contains Zr and S present in higher amounts and Hf in fewer amounts as mentioned in the Table 1. When comparing to the literature, there is a difference between commercial bone cement with bone ash meal, as it contains 54.14% CaO, 38.03% P<sub>2</sub>O<sub>5</sub> and 0 to 0.9 % Fe<sub>2</sub>O<sub>3</sub>, SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>. [27] and Previous research findings show that Solid state sintered Eppawala Hydroxyapatite (SSHAp) and bone ash has a similarity in composition. [12, 21]

Table 2. SEM with EDS results for SSHAp with MMA mixture, Commercial bone cement with MMA mixture and Human bone

Element	SSHAp with MMA mixture			Commercial bone cement with MMA mixture			Human bone		
	Spot 1	Spot 2	Spot 3	Spot 1	Spot 2	Spot 3	Spot 1	Spot 2	Spot 3
	Wt %	Wt %	Wt %	Wt %	Wt %	Wt %	Wt %	Wt %	Wt %
O	56.5	56.8	49.8	72.5	72.2	71.4	61.1	57.2	71.0
Ca	20.3	19.8	28.4	0.2	0.0	0.1	14.2	19.2	1.9
C	14.2	14.4	11.7	27.1	27.0	26.5	17.5	14.1	25.7
P	8.1	8.1	8.7	0.1	-	-	6.5	8.9	1.0
Cl	0.8	0.8	1.2	0.0	-	-	-	-	-
Zr	-	-	-	0.1	0.7	1.9	-	-	-
Fe	0.1	0.1	0.1	-	-	-	-	-	0.1
S	-	-	-	0.1	-	0.2	-	-	0.1
Na	-	-	-	-	-	-	0.4	0.4	-
Mg	-	-	-	-	-	-	0.2	0.2	-

Results OF SEM with EDS Analysis for SSHAP with MMA mixture, Commercial bone cement with MMA mixture and Human bone are indicated in the Table 2. According to those results; SSHAP with MMA mixture sample contains O, Ca in higher amounts and then P, C, Cl in order. Fe also found in very

less amount as an impurity. In the Commercial product mixture O, and C carried in higher amounts and then Ca, Zr, S, and P in order. When consider human bone O presence as the highest amount and then C, Ca, P and Na presence in descending order. Na, Mg, Al, Si, S, Fe presence in very fewer amounts. It performs composition similarity with the mixture of SSHAp and MMA.

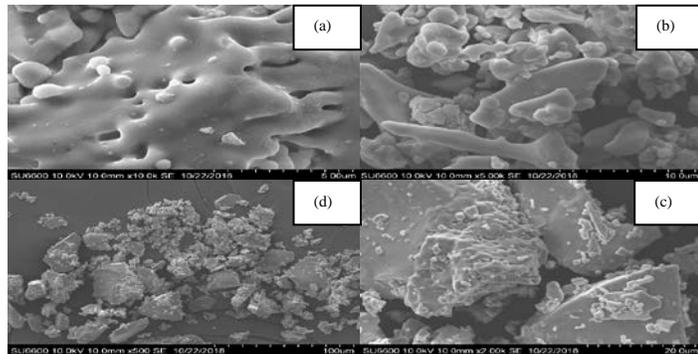


Figure 1. SEM images for SSHAp ceramic+ MMA mixture, 10.0 kv, a) 10K b) 5KX c) 2KX d) 500X

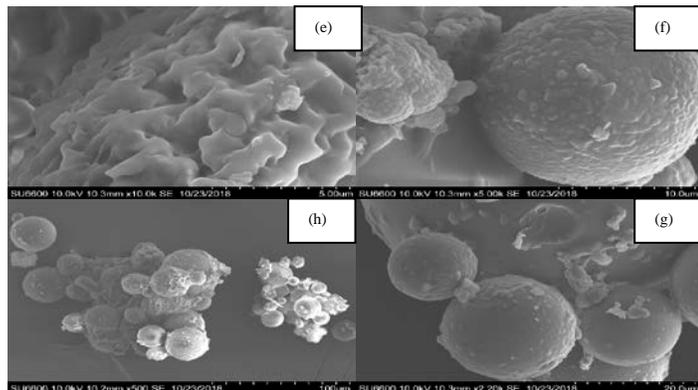


Figure 2. SEM images for Commercial bone cement + MMA mixture, 10.0 kv, e) 10K f) 5KX g) 2.2KX h) 500X

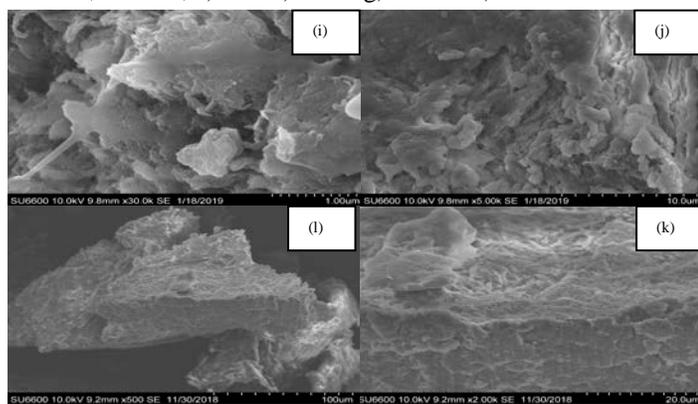


Figure 3. SEM images for Human bone, 10.0 kv, i) 30KX j) 5KX k) 2KX l) 500X

Considering Figure 1-3; SEM images of all mixtures and human bone show that there are good correlations of particles. SSHAp with MMA mixture and human bone only carried out micropores as shown in the Figure 1. Porosity would be helpful for bone ingrowth as well as for good blood circulation. Presence of some

different particles shaped in ball with some rough surface, was found in Commercial bone cement mixture which may lead to have higher surface area as mentioned in Figure 2. According to Figure 3, some crystalline property can be found in both human bone and SSHAp with MMA mixture.

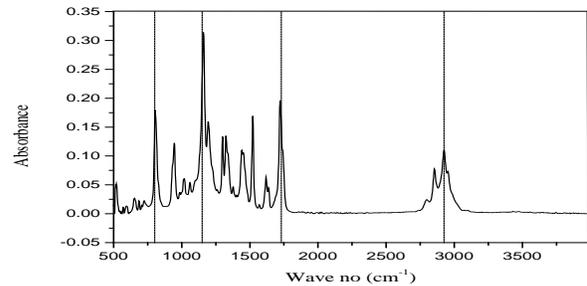


Figure 4. FTIR graph for liquid monomer

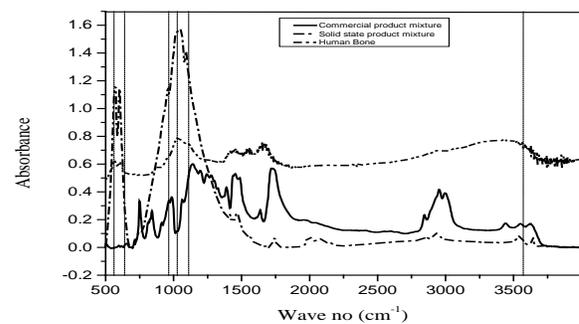


Figure 5. FTIR comparison for Commercial Bone cement with MMA mixture, SSHAp with MMA mixture and Human bone

Figure 4 shows the resulted graph for liquid monomer it has coincided with the FTIR characteristic graph for Methyl Methacrylate monomer. It interprets several peaks related to stretching vibrations including a sharp intense peak at  $1731\text{ cm}^{-1}$  related to the presence of ester carbonyl group, broad peak nearly  $1150\text{ cm}^{-1}$  due to the C-O (ester bond) and a peak nearly  $800\text{ cm}^{-1}$  is due to the bending of C-H. Also literature shows the broad peak ranging from  $3100\text{--}2900\text{ cm}^{-1}$  is owing to the presence of stretching vibration. [28] As shown in the Figure 5, all peaks for phosphate groups in the  $560\text{ cm}^{-1}$ ,  $640\text{ cm}^{-1}$ ,  $963\text{ cm}^{-1}$ ,  $1028\text{ cm}^{-1}$  and  $1110\text{ cm}^{-1}$  wave no range and Characteristic peak for OH/ Hydroxyapatite nearly  $3572\text{ cm}^{-1}$  wave no appeared in the Human bone as well as the SSHAp with MMA mixture. [12, 21] It confirms that even after the mixing with a monomer, the presence of Hydroxyapatite in the SSHAp product. When considering Commercial product mixture, it shows peak nearly  $3572\text{ cm}^{-1}$  wave no range, which may due to the presence of OH group, but that couldn't be identified as Hydroxyapatite characteristic peak, as no peaks found related to phosphate groups. Apart from that, some peaks can be found commonly in both commercial bone cement+ liquid monomer mixture and SSHAp with liquid monomer mixture except in human bone nearly ( $750\text{ cm}^{-1}$ -  $2000\text{ cm}^{-1}$ ) wave no range and  $3000\text{ cm}^{-1}$  wave no range which is also appeared in Figure 4, they are the related peaks for Methyl Methacrylate monomer. As a result it can be

concluded that both commercial bone cement and SSHAP mixed well with the liquid monomer.

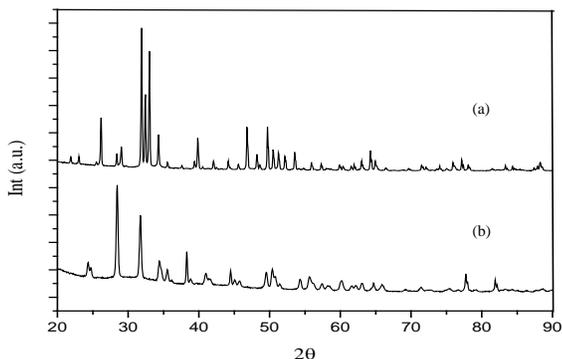


Figure 6. XRD pattern for (a) SSHAP with MMA mixture (b) Commercial bone cement with MMA mixture

Figure 6(a), explains even after mixing MMA monomer, XRD results of SSHAP mixture all characteristic peaks related to the crystallographic phases 002, 210, 211, 112, 300, 202, 310, 222, 213 and 004 of hexagonal Hydroxyapatite, which shows similarity to Human bone.<sup>[12, 21, 29, 30]</sup> Also, it interprets 96% crystallinity. Figure 6(b), carries the XRD results for Commercial bone cement and it has interpreted all the peaks related to 110, 111, T11, 002, 200, T02, Z11, 022, 122, 300, 013, 302, T13 and Z22 crystallographic phases of monoclinic Zirconium Dioxide crystal structure with 84.1% crystallinity. Comparing those results with the literature for human it can be confirmed that both human bone and synthesized composite has structural similarity via consisting Hexagonal Hydroxyapatite except for commercial product.

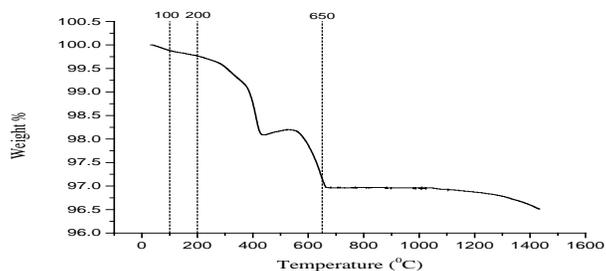


Figure 7. TGA curve for SSHAP with liquid monomer mixture

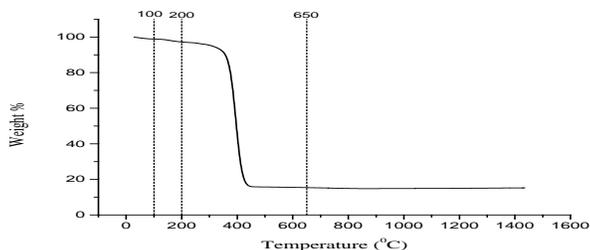


Figure 8. TGA curve for Commercial bone cement with liquid monomer mixture

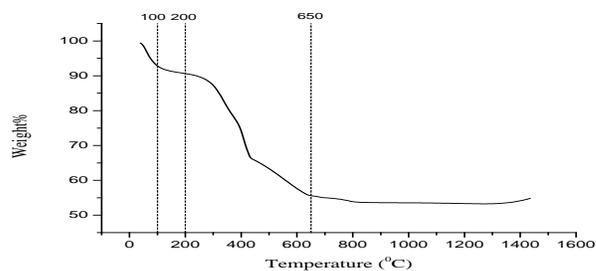


Figure 9. TGA curve for Human bone

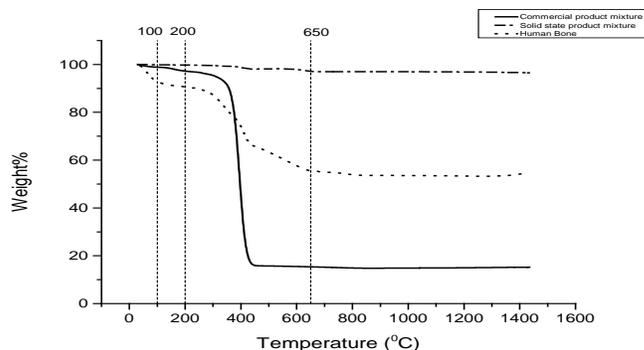


Figure 10. Comparison between TGA results of Human bone, Commercial bone cement mixture, and Solid state product mixture

12.9850 mg SSHAP with MMA sample mixture was subjected to TGA as shown in the Figure 7 First significant weight loss which occurs in between 100 °C- 400 °C (0.2449 mg) representing 1.886 %, may associate with the dehydration of the sample. Following that interval the sample reduced its weight nearly 0.1511 mg at 772.07 °C; it may occur due to the gas elimination. Then again from 772.07 °C to 1432.97 °C there is a weight loss indicating 0.45% (0.0584 mg) which has occurred due to the incipient transformation of produced HAP in  $\beta$  – TCP. Therefore, it indicates the formation of Hydroxyapatite in products. At 1432.97 °C 96.51 % of the original weight has remained.

As figured in Figure 8, 14.0710 mg of Commercial product mixture was subjected to TGA. Nearly 200 °C to 400 °C considerable amount of weight loss was occupied representing 85.14% from initial weight (11.96 mg). Basically up to 400 °C weight losses may occur due to the dehydration of sample/moisture removal. Therefore, it can be predicted first weight loss may occur due to moisture removal of the product, but there may be some other reasons also such as structural degradation or deformation. After that, weight loss rate has become slower and then a constant value. At the end 1435.98 °C, 15.23% of initial weight was remained.

According to the Figure 9, 10.115 mg human bone sample was subjected to TGA. As mentioned in the literature; first significant weight loss which occurs nearly at 200 °C (0.9112 mg) representing 9.008 %, may associate with the dehydration of the sample. Following that interval the sample reduced its weight nearly 5.6358 mg at 650 °C; it has occurred due to the bone structure collagen elimination. This reaction continues up to 936.88 °C, with a lowered rate. Above that temperature, a fine TGA curve descending slope is observed up to maximum

analyzed temperature of 1432.97 °C with the total weight loss of 54.79%, this being associated with the collagen remains removal & the incipient transformation of Hydroxyapatite in  $\beta$  – TCP. [12, 21, 29, 31]

When comparing Human bone with Commercial bone cement with MMA mixture and SSHAp with MMA mixture, according to Figure 10, Human bone and the SSHAp mixture have shown the same pattern of weight loss, which was slightly different from Commercial product mixture. That may happen due to the composition similarity of Human bone and SSHAp with MMA monomer mixture, as they were containing Hydroxyapatite. Also due to the least amount of weight loss in synthesized SSHAp mixture sample than bone and commercial product mixture, it can be concluded that the synthesized SSHAP with MMA monomer mixture perform high thermal stability and good material stability in nature and application.

#### IV. CONCLUSION

The study concludes that SSHAp with MMA composite has a chemical and structural similarity with human bone and performs high thermal stability and good material stability in nature. Also interprets microporous structure with less than 50 micron range particles and 96% crystallinity which may lead to osteoconductive properties. Therefore, it can be used as a direct substitution for bone cement.

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# Difficulties Encountered in Solving Quadratic Equation of the Grade 9 Students: Basis For Constructing Instructional Materials

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**Abstract-** The study focused on the difficulties encountered in solving quadratic equation of the grade 9 students in Taligaman National High School. This study aimed to determine the difficulties encountered in solving quadratic equation of the grade 9 students. This study used descriptive research procedure which tested the hypothesis or answer question concerning the current status. In gathering the data needed, a survey questionnaire was used to 121 respondents randomly selected from grade 9 students in Taligaman National High School. The researcher used the random sampling design. On the analysis of data some statistical measures were used. The percentage were utilized to answer the respondent profile and the mean which was used to determine the level of student learning attitudes and teacher competency. In the level of determine difficulties encountered in solving quadratic equation the percentage statistical tool were used. This study concluded that the student profile, student learning attitude towards mathematics and teacher competency is not merely contribute to the difficulties encountered by the student in solving quadratic equation. Thus, the topic quadratic equation alone is difficult for some students or there is probability that the greater effect of the difficulties encountered by students are not included in the study. Based from this conclusion, the researchers suggested that the teacher may adopt the enhanced instructional materials provided by this study to decrease or enhance the skills of the students in the difficulties encountered in solving quadratic equation of the student.

**Index Terms-** Quadratic equation solving, least learned competency, Instructional Materials.

## I. INTRODUCTION

Most of the people have persistent trouble with basic mathematics because people like different things. There is nothing that is universally liked by every human being. Math is no exception. Many people do not believe Mathematics is essential to living a modern life and resent being forced to study an abstract science. Some students feel like math is a foreign language in which they can't orient themselves since math is cumulative and they forgot something they learned a while ago and now becomes totally lost.

One of the most thing to do is teach children how important Mathematics in the modernization of the society. Explain to them that mathematics serves as a fundamental foundation that is used in real life situations. It is also a way to interpret and evaluate ideas, considered as a method of logical reasoning unique to man. Mathematics as a school subject, it must be learned expansively and with much depth but unfortunately most of the students find mathematics difficult to deal with. Usually, students lack the ability to easily connect the conceptual concepts of mathematics in reality.

Math requires deductive reasoning, and passive learners often struggle with this kind of active problem solving. Students with memory and attention problems also may struggle as both skills are necessary for mathematical aptitude (Cadiz 2016). Through the years, and probably through the centuries, teachers have struggled to make math meaningful by providing students with problems and examples demonstrating its applications in everyday life.

Sometimes, teacher has a great influence why students hate mathematics because math teachers often do not inspire their students with an appreciation for the beauty of mathematics, instead teaching by rote memorization. Educators are foremost believes in the old cliché: "Experience is the best teacher." A natural part of learning if this be true is the occurrence of personal knowledge or personal involvement. So teaching Mathematics is necessary to the teacher to have the capacity to deal with the learner, instruct, mold, and facilitate them in order to learn best.

There is another instruction we can use in teaching Mathematics, the Direct Instruction. Direct instruction is a teaching model which is aimed of helping student master basic skills and knowledge that can be taught in a step-by-step fashion. Often times it is described as "Straight forward and can be mastered in relatively short of time" on how to solve math problems using mathematical equations (Salandanam, 2000). The teacher should taught the students how to solve problems by following a step-by-step process. By that, they will have the idea on how to solve problems easily and perform well.

Mathematics instruction give the students opportunity to learn and to be able to perform Math problems easily. They can understand and can do Math by following instructions. Teachers and students must have cooperation, for them to understand each other well. Difficulties can be avoided if they will learn how to follow simple instructions that you gave them. Instructions shall

be follow, for them to have wide understandings and can help them lessen their difficulties in Mathematics.

## II. CONCEPTUAL FRAMEWORK

This study was anchored on the theory of Bruner's that there are factors that influence the performance of the students in Mathematics. This study theorize further that students' profile, student learning attitudes, and the teachers competency as perceived by the students are contributory factors to the learning difficulties of the students. This was supported by various theories.

Constructivism has become a mainstream theory in educational policy and practice scene and as a result national standards documents influencing the curriculum, are affected. Realistic mathematics education builds upon the principles of the constructivist learning theory. Central within realistic mathematics education is the assumption that mathematics is a human activity which contrasts with mathematics as a well-organized deductive system. In other words, mathematics is viewed as a process in which the student is engaged.

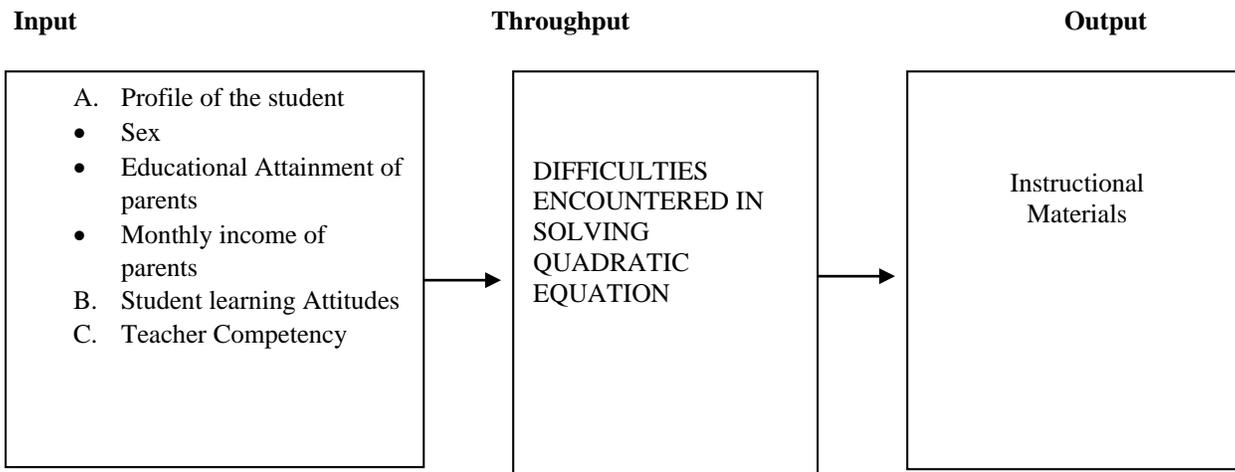
Experiential learning as advocated by David Kolb is learning that occurs by making sense of direct everyday experiences. Experiential learning theory defines learning as "the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience "(Kolb, 1984, p. 41). Students' experiences on learning mathematics in school and in their homes will really affect the students' knowledge acquisition of the subject. The mathematics curriculum allows for students to learn by asking relevant questions and discovering new ideas. Discovery and Inquiry-based learning (Bruner, 1961) support the idea that students learn when they make use of personal experiences to discover facts, relationships and concepts.

Jerome Bruner's theory rest on the theme that learning is an active process in which the learners create new ideas based on their prior knowledge. The learner selects and transform details, constructs hypothesis, and makes decisions to do so. According to Tall (2003) students have difficulties with mathematics. He classified these difficulties as genitive difficulties in learning analysis. Students experienced difficulties in learning math because of their computational weaknesses, their inability to create meaningful connections, and analyze word problems; how to translate it and effectively visualized math concepts.

A favorable attitudes of a student towards a particular subject influence a lot on his interest to learn. She/he learns faster in areas that she/he is interested most and takes for granted the subject that they like best. In addition the teacher academic trainings increases there is a possibility that she/he would prefer to be alone in her/his task, while teacher with lower educational level might prefer to close supervision and explicit instruction from the supervision to be able to perform well in their teaching task. The teacher has the basic responsibility in translating and implementing educational objectives into functional and valuable learning experiences for the student. The success of a student is usually measured in terms of achievements in classroom work particularly in his academic subject (Acero, 2004).

Learning outcomes of the students reflect the quality of teaching learning process. Their relationship with learners, the materials they used and procedure they follow can be observed and used to the advantages of uplifting the teaching learning process. The classroom, which is the formal learning area, must be managed effectively by the teacher in order to achieve the desirable attitudes and behavior of learners. Teaching methods as well as communication skills by the teacher greatly enhance the teaching learning process. Such could be cited as the variables that would indicate the teaching performance of the teacher. However, the nature of the learners must be also considered as there is fact that each individual is unique. (Exclamador 2006).

**Schematic Diagram**



*Figure 1. The schematic diagram showing the variables of the study*

**III. METHODOLOGY**

The descriptive research was used in this study. It seeks to determine the learning difficulties of student in solving quadratic equation. It involves collecting data in order to answer the question concerning the current status of the subject of the study.

This study was conducted at Taligaman National High School as one of the popular public schools in Butuan City. The school is located at P-1 Taligaman, Butuan City near in National Highway of Butuan to Davao road. Taligaman National High School teaches students in junior and senior high school. It has a total of 33 rooms – 29 of which are for instructional purposes and the remaining 4 for non-instructional purposes. All in all, the

school has at least one canteen, clinic, computer lab, general academic classroom, home economics, industrial/workshop, laboratory, library, and office plus the senior high school building that is currently under construction. The all of the instructional rooms are standard rooms, meaning they meet the DepEd’s guidelines for safety and usability. As to school year 2016-2017 Taligaman National High School is awarded as Top 3.

This study involved all 241 students from five sections. The student who were considered as participant of the study were randomly selected from different section having a sample size of 121. Sample size is the 50% of the population of the Grade 9 students in Taligaman National High School.

**Table 1. The Total Number of Participants**

Section	Population	Sample Size		Total
		Male	Female	
Dalton	48	16	8	22
Avogadro	48	7	17	24
Lavoisier	49	16	8	22
Chadwick	47	11	13	24
Rutherford	49	4	21	25
<b>Total</b>	<b>241</b>	<b>54</b>	<b>67</b>	<b>121</b>

The researchers aimed to have all the Grade 9 students of Taligaman National High School as the population of the sample. Therefore, the researchers get 50% of the population which 121 as the sample size. The participants were randomly selected in every five section.

The main instrument used to obtain the needed data and information in this study is survey questionnaire. The questionnaire consists of profile of the student, learning attitude of the students towards mathematics and the teacher competency as perceived by the students. The participants were required to answer all the questions involving quadratic equation. On the validity and reliability of instrument the questionnaire was

validated by our adviser. The pilot test was conducted at Basag National High School and Ampayon National High School and the data gathered was undergone series of statistical analysis and obtain .825 of reliability index.

Before the questionnaire was given to each of the participant, a letter made by the researchers noted by the adviser and the college dean was given to the principal of TNHS requesting permission for the researchers to gather the data needed for the study. The principal guided the researchers to the math teachers and to the five section of Grade 9.

The researchers then made a short presentation about the study, and then provided each student with survey questionnaire.

Participant filled out the questionnaire assuming that they have answered it truthfully with the guidance of the researchers.

**Scoring and Quantification of Data**

The data was gathered from the respondents were quantified for statistical treatment. The following quantification was utilized:

- A. Educational Attainment of Parents were group according to:

Level	Verbal Description
1	Elementary Level
2	High School Level
3	College Level

- B. Student learning attitudes and teacher competency

Level	Mean Interval	Verbal Description
1	1.00-1.50	Disagree
2	1.51-2.50	Moderately Disagree
3	2.51-3.50	Moderately Agree
4	3.51-4.50	Agree
5	4.51-5.00	Strongly Agree

- C. Difficulties encountered in solving quadratic equation of the students

Level Description	Verbal
1	Very Easy
2	Easy
3	Moderately Difficult
4	Difficult
5	Very Difficult

**Statistical Tools**

In analyzing the gather data, the following statistical tools were utilized in the study: The percentage is used to describe the profile of the respondents and the level of difficulties encounter in solving quadratic equating of the respondents. The Mean use to describe in perception of the Grade 9 students on their learning attitudes towards Mathematics and the teacher competency.

**IV. PRESENTATION, ANALYSIS, AND INTERPRETATION OF DATA**

**Problem 1.** What is the profile of the student in Taligaman National High School in terms of Sex, Educational attainment of parents and Monthly Income of Parents?

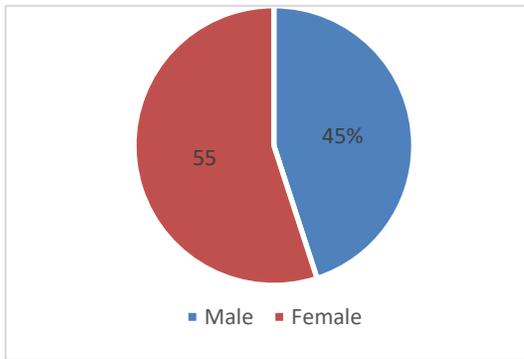
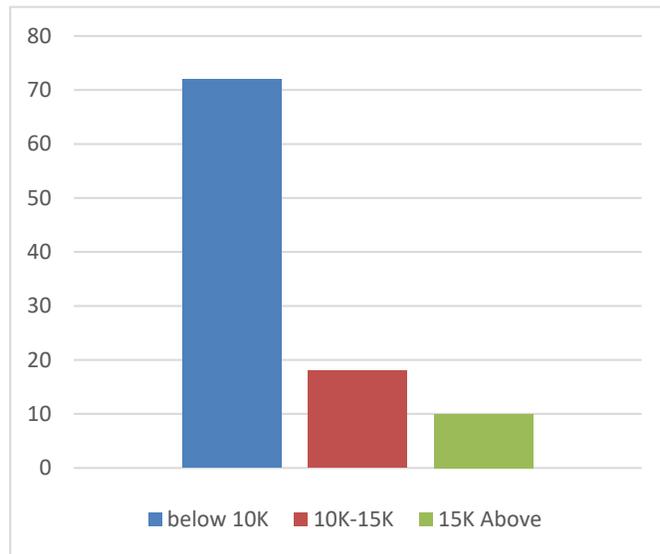


Figure 1 showed the percentage distribution of the sex profile of the respondent. Most of the respondents are female with the population of 55% and the rest is the male with population of 45%.

**Figure 1: Distribution of respondents across sex**

Figure 2 showed the frequency distribution of the family income of the respondents. Majority of our respondent family income were on below 10K and only few have a family income of 10-15K Above.



**Figure 2: Distribution of respondents as to average monthly income.**

**Table 1: Percentage of distribution of respondents across Parents' educational attainment**

Mother	Elementary Level	Father High School Level	College Level
Elementary Level	14.88	11.57	0.83
High School Level	13.22	33.06	5.79
College Level	0.83	7.44	12.40

Table 1 presented the percentage distribution of respondents' educational attainment. It showed that most of their parents are high school level which attained the highest percentage of 33.06. It followed both parents are elementary level which is 14.88% and a parents who are college level which gained 12.40% respectively.

**Problem 2.** What is the level of the student learning attitudes towards mathematics?

The below result data shows that the respondents have an average learning attitude towards mathematics that is moderately agree (3.32).

**Table 2: Level of students' attitudes towards mathematics**

Variable	Mean	Verbal Description
1. like working out a concrete everyday application of math.	3.29	Moderately Agree
2. I like working with friends and classmates on Math assignments.	3.80	Agree
3. I feel good in getting ready for Math test.	3.50	Moderately Agree
4. I like to know the Math result on which I expected to do well.	3.69	Agree
5. I always look forward to learn more about Mathematics.	3.50	Moderately Agree
6. I like solving on Mathematics assignment.	3.26	Moderately Agree
7. I take down notes during lectures/discussion.	3.92	Moderately Agree
8. I study at night before the Math examination.	2.98	Moderately Agree
9. I do review and study on a particular topic in Mathematics.	2.71	Moderately Agree
10. I spend much time to study my Math lesson every night.	2.58	Moderately Agree
<b>Overall</b>	<b>3.32</b>	<b>Moderately Agree</b>

As to willingness to learn mathematics the above data tells us that the students like working with friends on Math assignments (3.80), they also like to know the Math results on which they expected to do well (3.69). However, students hesitant in working out a concrete everyday application in Math (3.29) because most of them said that not all topics in Mathematics has a concrete application. The student feel good in getting ready on Math (3.50) because not all student prepared in taking Math examination and according to them "dili sila ganahan mag study mao ra gihapon lisod ang mga question naihatag sa ilang teacher", therefore, the questions are not appropriate to the different levels of the students' understanding. The student always look forward to learn more about Mathematics with mean of 3.50 which is moderately agree because student said that "nindot lang mag practice ug solve kung sayon ra ang topic pero kung lisod na gani na topic wala nay gana mag tuon."

As to manner of the student in studying the lesson in Mathematics they take down notes during the discussion/lectures (3.92). Students like solving on Mathematics assignment, they study at night before the Math examination, they do review and advance study on a particular topic in Mathematics and spend much time to study my Math lesson every night with the mean of (3.26), (2.98), (2.71), (2.58) respectively, which is moderately agree because some of the students were too lazy and they need self-motivation and time. "Dili ko mag hatag ug daku nga time sap ag tuon sa Math kay kapoy man gud naa pud uban dile jud ko kabalo mag answer, ganahan lang ko mag tuon ug mag practice kun kabalo ko ana nga topic", student said. Moreover, according to the students not all of them have their own learner's module where they can practice solving that's why Mathematics is

difficult for them. It implies that there are difficulties encountered by the students based on the interview with the students.

**Problem 3.** What is the level of teacher competency as perceived by the students?

Result shows the mean distribution of the teacher competency as perceived by the students. The overall average of teacher competency as perceived by the students is agree (4.45).

**Table 3: Level of teachers' competencies as perceived by the students**

Variable	Mean	Verbal Description
1. My Math teacher presents a particular topic from concept to example and vice versa.	4.52	Strongly Agree
2. My Math teacher presents the lesson logically.	4.52	Strongly Agree
3. My Math teacher explains the lesson very well.	3.74	Strongly Agree
4. My Math teacher cites examples in real life situation in presenting Math.	3.31	Agree
5. My Math teacher is willing to explain a problem in second time if student do not understands.	4.66	Strongly Agree
6. My Math teacher employs a different group activities/work such as problem solving and brainstorming.	4.43	Agree
7. My Math teacher asks question to an individual student.	4.31	Agree
8. My Math teacher is aware of our diverse needs.	4.26	Agree
9. My Math teacher is aware of the variety of IT/resources.	4.09	Agree
10. My Math teacher assesses our learnings at the end of the topic.	4.65	Strongly Agree
<b>Overall</b>	<b>4.45</b>	<b>Agree</b>

Student responded strongly agree that their Math teacher presents a particular topic from concept to example and vice versa (4.52), presents the lesson logically (4.52), explains the lesson very well (4.47), willing to explain a problem in second time if

student do not understands (4.66) and assesses their learnings at the end of the topic (4.65). It reveals that Math teacher competency as perceived by the student has the capability to present the particular topic definitely and clearly. From concept to example, logically and well explained. Passionate teacher reflected also in the table, in a way that the teacher willingly to explain a problem in second time if student do not understand and assesses the learning's of the student in every topic.

Somehow the students are also agree that when citing examples in real life situation in presenting Math (4.31), employing different group activities/work such as problem solving and brainstorming (4.43), asking question to an individual students (4.31), aware of student diverse needs (4.26) and aware of the

variety of IT/resources (4.09) as the respond of the student in each indicator. It implies that the level of teacher method of teaching was moderately effective as perceived by the student and the teachers' strategies had a big impact to the students learning towards Mathematics.

**Problem 4.** What is the level of difficulties encountered of the Grade 9 students in Taligaman National High School in solving quadratic equation?

Note that easy to very easy when compressed less than 50% of the student participants, hence the majority found the topic at least moderately difficult.

**Table 4: Percentage Distribution on the level of difficulties in solving quadratic equations**

Difficulties	Extent of difficulty				
	Very Easy	Easy	Moderately Difficult	Difficult	Very Difficult
1. Solving quadratic equation by (extracting square roots, factoring, completing the square, quadratic formula).	9.09	28.93	28.10	16.53	17.36
2. Solving the nature of the roots of a quadratic equation.	8.26	32.23	33.06	19.83	6.61
3. Solving the sum and the product of roots of quadratic equation.	6.61	35.54	30.58	15.70	11.57
4. Solving equation transformable to quadratic equation.	0.83	23.97	44.64	19.01	11.57
5. Solving word problems involving quadratic equation.	0.00	19.01	35.53	23.97	21.49

Results showed that in solving quadratic equation by (extracting square roots, factoring, completing the square, quadratic formula), most of the student found it moderately difficult. More precisely, the majority found the topic either very difficult (17.36), difficult (16.53) and moderately difficult (28.10). In solving the nature of the roots of a quadratic equation most of the student found it moderately difficult (33.06), difficult (19.83), very difficult (6.61). In solving the sum and the product of the roots of quadratic equation most of the students found it moderately difficult (30.58), difficult (15.70) and very difficult (17.57). In solving equation transformable the quadratic equation most of the students found the topic moderately difficult (44.63), difficult (19.01) and very difficult (11.57). In solving word problems involving quadratic equation the majority found the topic moderately difficult (35.54), difficult (23.97), and very difficult (21.49).

According to the students that the researchers interviewed to make easier for them in solving the above mentioned topic they said that "Ganahan mi mag solve ana nga mga topic kung naa me basihan nga example bisan isa lang para Makita namo ang process kay pag mag quiz man gud me kay ipa close ni maam ang amu ge pang copy", it implies that the students favored in solving equations if detailed example is provided. Moreover, individual worksheet is necessary for them than just post the problem in the board to avoid distractions especially when somebody is roaming around for any reason. They also like to write their output in the provided worksheet.

## V. CONCLUSION

Based on the findings of the study, the following conclusions were drawn:

The respondents of this study were mostly female with 50%. For the educational attainment of parents mostly are in the high school level, the result found out that this indicator did not affect to the learning difficulties of the students in solving the quadratic equation. Furthermore, the parents' monthly income falls in below 10K. This implies that the students in Taligaman National High School belonged to the poor family.

On the level of learning attitudes towards Mathematics of the respondents, it has been found that the students have moderately agree to the statement in every indicator. Thus, it implies that the students have a moderately skillful towards the Mathematics subject. Since the level of teacher's competence as perceived by the students is very high, this means that teacher's effectiveness in teaching was good as perceived by the students.

For the level of difficulties encountered in solving quadratic equation, almost of the student find it difficult this implies that student needs more practice in solving problems involving quadratic equations.

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# Gene Expression of Survivin in Colorectal Cancer

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**Abstract-** Colorectal cancer (CRC) is the third most common cancer type in humans, the fourth most common cause of death annually. Survivin (known as SVV and BIRC5) is the smallest member of the inhibitor of apoptosis protein (IAP) family and it correlates with not only inhibition of apoptosis and a decreased rate of cell death, but also resistance to chemotherapy and tumor aggressiveness. The main goal of this study was to evaluate gene expression of survivin by RT-PCR as well as estimate the level of Oncostatin-M and antioxidants in the peripheral blood of patients with colorectal carcinoma and its relation to metastasis. **Results:** Our study shows high expression of survivin ( $p < 0.001$ ) and Oncostatin-M ( $p < 0.001$ ) in patients with colorectal cancer more than healthy persons. The present study revealed that CEA concentration was increased in colorectal carcinoma patients group compared to control group,  $p$  value was 0.010. Additionally, this study shows high elevation of antioxidants as catalase ( $p < 0.001$ ), malondialdehyde ( $p < 0.001$ ) in patients group than control group. This proves that early detection of survivin and Oncostatin-M has important role in early screening of colorectal cancer.

**Index Terms-** survivin, colorectal cancer, antioxidants, oncostatin-m.

## I. INTRODUCTION

Cancer is an abnormal growth of cells resulting from multiple changes in gene expression leading to dysregulated balance of cell proliferation and cell death and eventually develops into a population of cells. These cells can invade tissues and metastasize to distant sites, causing significant morbidity and death, if untreated[1]. However, colorectal cancer incidence has remained relatively stable in the UK over the last decade[2]. In the past 2 decades, the overall morbidity and mortality of colorectal cancer are higher in city urban and in male as compared with rural district and female[3].

There are common mechanisms for colorectal cancer (CRC) formation. Several are connected with oxidative stress-induced cell apoptosis and others are related to imbalanced homeostasis or intake of drugs/toxins[4]. Survivin (known as SVV and BIRC5) is the smallest member of the Inhibitor of Apoptosis Protein (IAP) family, and it is about 16.5 kDa.

The protein comprises 142 amino acids organized in two domains: an N-terminal baculovirus-IAP repeat (BIR) domain, linked to a C-terminal  $\alpha$ -helix. SVV presents during fetal development, but undetectable in terminally differentiated adult

tissues[5]. The survivin gene locus encodes multiple genetic splice variants with unique properties and functions [6][7].

Survivin accumulates in the centromeres in G2 phase, and then it starts to diffuse to the chromosome arms and is abundant at the inner centromeres in prophase and metaphase of mitosis[8]. In anaphase, survivin re-localizes to the central spindle because it fails to associate with the centromeres[9]. Survivin secreted as a molecule with much expanded role in cellular homeostasis. It is involved in inhibition of apoptosis and regulation of cell proliferation and cell death. Survivin with aurora B and ICP forms a chromosomal passenger complex that bind to their target sites including centromere, midplate and cleavage furrow, where it regulates proper chromosome segregation and cytogenesis[10]. In addition, it correlates with not only inhibition of apoptosis and a decreased rate of cell death, but also resistance to chemotherapy and tumor aggressiveness [11].

Oncostatin M (OSM), an inflammatory cytokine belonging to the interleukin-6 (IL-6) superfamily, plays a vital role in multitude of physiological and pathological processes[12]. OSM is unique in this family as it can signal using heterodimers of gp130 and have a unique helical loop between its B and C helices that is not found on other IL-6 family cytokines [13]. It plays an important role in various biologic actions, including cell growth, neuronal development, and inflammatory responses. OSM decreased fatty acid content in the hepatocytes through expression regulation of several key enzymes of hepatic lipid metabolism which make OSM a novel therapeutic target for metabolic syndrome[14]. OSM can directly or indirectly participate in tumorigenesis and insulin resistance development[15]. Recently, OSM has been emerged as a potent driver of tumorigenesis, metastasis, and therapy failure[16].

Under normal conditions, a balance between both the activities and the intracellular levels of these antioxidants is essential for the survival of organisms and their health. Antioxidant capacity is derived both exogenously (from food, beverage and sunlight) and endogenously (from enzymatic and non-enzymatic pathways)[17]. SOD is known to catalyze the dismutation of superoxide to hydrogen peroxide and oxygen and has a central role in the defense against oxidative stress[18].

Human catalase is a heme-containing peroxisomal enzyme. It breaks down hydrogen peroxide to water and oxygen. Catalase is implicated in ethanol metabolism, inflammation, apoptosis, aging and cancer [19]. Catalase is a key enzyme which its expression and localization is markedly altered in cancer[20]. In colorectal carcinogenesis significant increase in the level of lipid

peroxidation products like malondialdehyde (MDA) was estimated[21].

## II. PATIENTS AND METHODS

### Patients

The study was carried out on 50 pre – treatment colorectal cancer patients of both sexes attending to Mansoura University Oncology Center (MUOC), Mansoura, Egypt, their mean of age was 53.8 years with SD  $\pm$ 13.9 and 50 apparently healthy age & sex matched controls, their mean of age was 52.8 years with SD  $\pm$ 5.8. To confirm the presence of colorectal cancer (CRC), samples were screened morphologically and pathologically. Colorectal cancer patients who received medical treatments, radiotherapy or chemotherapy are excluded.

### Blood collection

Morning blood samples were collected from the study participants to be estimated after applying all the precautions. By using a sterile plastic syringe for each patient, 5 ml of venous blood were withdrawn and divided into 1ml that was put in a tube containing EDTA for survivin and 4ml were put in a clean and dry test tube then allowed to centrifuge to separate serum for estimation of Oncostatin-M (OSM), superoxide dismutase (SOD), catalase (CAT), malondialdehyde (MDA) and glutathione(GSH).

## III. DETECTION OF SURVIVIN BY REAL TIME PCR

**Total RNA** was extracted from venous blood by using Thermo Scientific GeneJet RNA Purification utilizing the method of **Chomczynski and Sacchi** [22], and **Boom et al.**[23]. The extracted RNA was transcript to cDNA by SensiFAST™ cDNA Synthesis Kit (Bioline USA Inc., USA) based on the instructions of manufacturer. We used the housekeeping gene (GADPH) to normalize mRNA concentrations. Quantitative PCR was to compare expression levels of survivin transcripts. The relative expression levels of reference samples and survivin in the blood samples were determined by quantitative PCR using real time RT-PCR analyses (The Applied Biosystems™ StepOne. RT-PCR were performed using a sensi Fast™ SYBR NO-ROX kit (Bioline USA Inc., USA) in a final volume of 20 ml. An initial PCR activation step was 2 min at 95°C followed by 35 cycles of 5 s at 95°C, 20 s at 61°C, 10 s at 72°C and 5-10 min at 72°C. The sequence of primers used in real-time PCR was designed according to kit of Biosearch Technologies Custom Oligonucleotide Synthesis. The sequence of primers used in real-time PCR are shown in **Table (1)**.

Full Name of the gene	Sequences (5' _3')	Reference number
(GADPH )	F: GAAGGTGAAGGTCGGAGTC R: GAAGATGGTGATGGGATTC	SS368309 -13 SS367846 -54
Survivin	F: AGAACTGGCCCTTCTTGGAGG R:CTTTTTATGTTCCCTCTATGGGG TC	SS367846 -52 SS367846 -51

**Table (1).** It was used to reverse transcribe and expand the RNA template for 35 cycles so finally CT was estimated.

### Assessment of the biochemical parameters

Quantitative determination of Oncostatin M (OSM) was done by using Abcam’s Oncostatin–M Human ELISA Kit based on **Croci DO et al** [24], Ltd. ,USA based on the manufacturer’s instructions. Determination of serum catalase activity was done by the method of **Aebi** [25] and **Fossati et al** [26] by using a commercially available kit (Biodiagnostic, Dokki, Giza, Egypt), by adding 0.5 ml of reagent 1 (chromogen buffer) to 50  $\mu$ l of serum sample then 100 $\mu$ l of reagent 2 (H<sub>2</sub>O<sub>2</sub>). Then adding 0.2 ml of reagent 3 (catalase-inhibitor) and 0.5 ml of reagent 4 (peroxidase enzyme). Measure the pink colour that appeared at 510 nm.

Determination of blood reduced glutathione content was done by the method of **Beutler et al** [27] using a commercially available kit (Biodiagnostic, Dokki, Giza, Egypt), by adding 0.5 ml of reagent 1 (trichloroacetic acid) to 0.1 ml of blood sample, then centrifuge. Then adding 1.0 ml of reagent 2 (buffer) to 0.5 ml of supernatant. After that, add 0.1 ml of reagent 3 (5,5'-dithiobis(2-nitrobenzoic acid)). Measure the colour at 405 nm.

Malondialdehyde was determined by the method of **Ohkawa et al** [28]by using Thiobarbituric acid (TBA) by adding 1 ml of it to 0.2 ml of serum then heat in boiling water bath for 30 minutes, cool and read the absorbance of the pink product at 543nm. Superoxide dismutase (SOD) was determined by using **Nishikimi et al** [29]method which relies on the ability of the enzyme to inhibit the phenazinemethosulfate (PMS)- mediated reduction of nitroblue tetrazolium dye.

## IV. STATISTICAL ANALYSIS

Data obtained from the present study were analysis using SPSS versions 20. Continuous data were expressed in the form of mean  $\pm$  SD while categorical data were expressed in the form of number and percent. Student t test, ANOVA and regression analysis by utilizing univariate and multivariate were applied for continuous data. Whereas, categorical data were done using Chi-square test.

## V. RESULTS

Our study shows significant differences in patients group compared to control group according to carcinoembryonic

antigen (CEA), catalase, superoxide dismutase (SOD), no significant difference between patients group compared with malondialdehyde (MDA), and Oncostatin M (OSM) control groups. concentration. Whereas, glutathione concentration (GSH) shows

**Table (2). Comparison of some laboratory data between CRC patients and control groups.**

<b>Variant</b>	<b>Control group (N=50)</b>	<b>Patients group N=50</b>
CEA(ng/ml) Mean±SD <i>P</i>	2.5±0.8	3.3±1.1 0.010*
SOD (U/ml) Mean±SD <i>P</i>	332.4±90.8	54.9±15.3 <0.001**
Catalase (U/L) Mean±SD <i>P</i>	288.7±86.2	539.2±149.7 <0.001**
GSH(mg/dl) Mean±SD <i>P</i>	1.2±0.4	0.9±0.3 0.190
MDA(nmol/ml) Mean±SD <i>P</i>	2.4±0.6	9.4±3.1 <0.001**
OSM (pg/ml) Mean±SD <i>P</i>	4±1.1	11.5±3.3 <0.001**

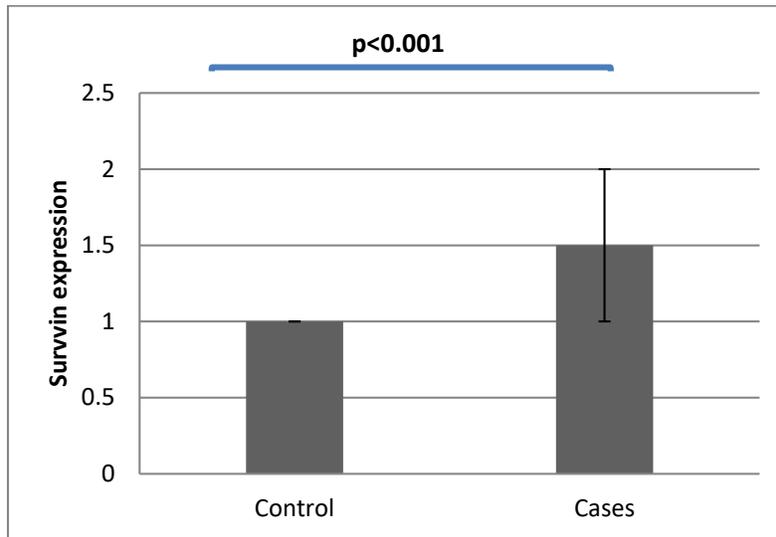
**\*\*P <0.001**, highly significant. **CEA**: Carcinoembryonic antigen & **SOD**: Superoxide dismutase **GSH**: Glutathione & **MDA**: Malondialdehyde & **OSM**: Oncostatin-M

**Table (3)** shows that mean survivin expression was 1.5. Cases showed significantly higher survivin concentration (upregulation) when compared to control group.

		<b>Control N=50</b>		<b>Cases N=50</b>	<i>P</i>
<b>Survivin expression</b>	Mean±SD	1	0	1.5±0.5	<b>&lt;0.001<sup>T***</sup></b>
	Median (min-max)	1	(1-1)	1.2 (0.9-3.3)	

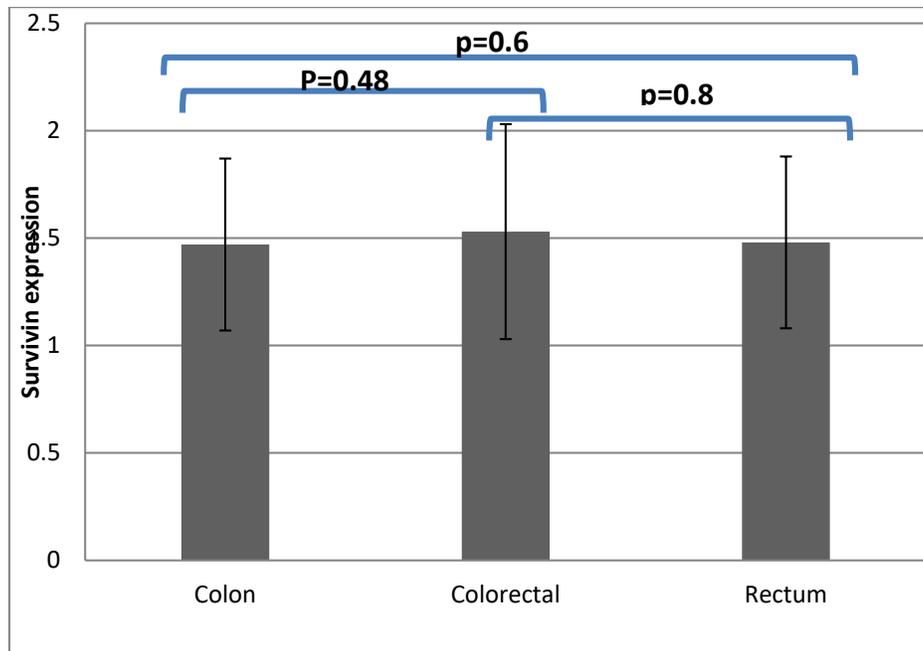
**SD**: stander deviation, **T**:Student T test, Survivin expression is expressed as mean±SD.

**Table(3)** Comparison of survivin expression between CRC patients and control groups.



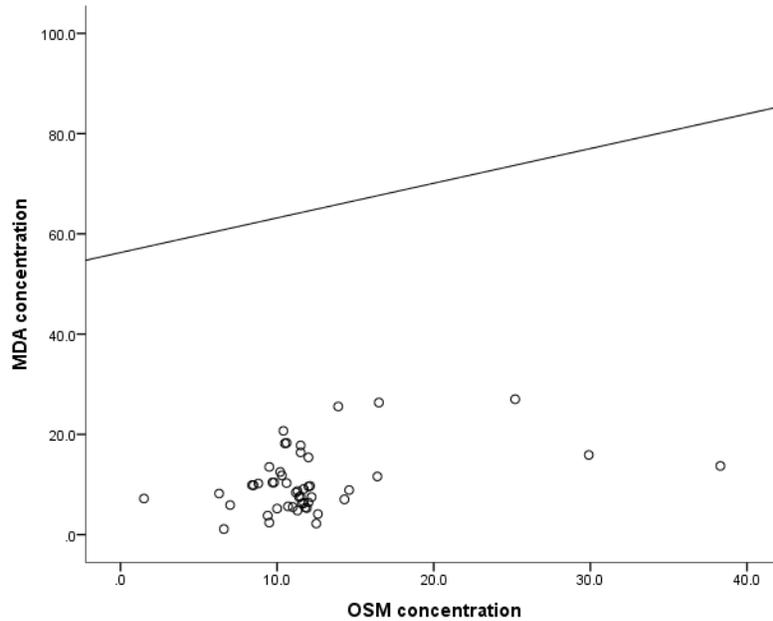
**Fig.1 clarifies survivin concentration. It was significantly higher in patients group compared with control group,  $P < 0.001$ .**

The patients group was divided according to the location of cancer into 3 groups: colon cancer (25 patients), colorectal cancer (14 patients), and rectum cancer (11 patients). **Fig.(2)** reveals that there were no significant differences in survivin expression between colon cancer subgroup,  $p$  value was 0.6

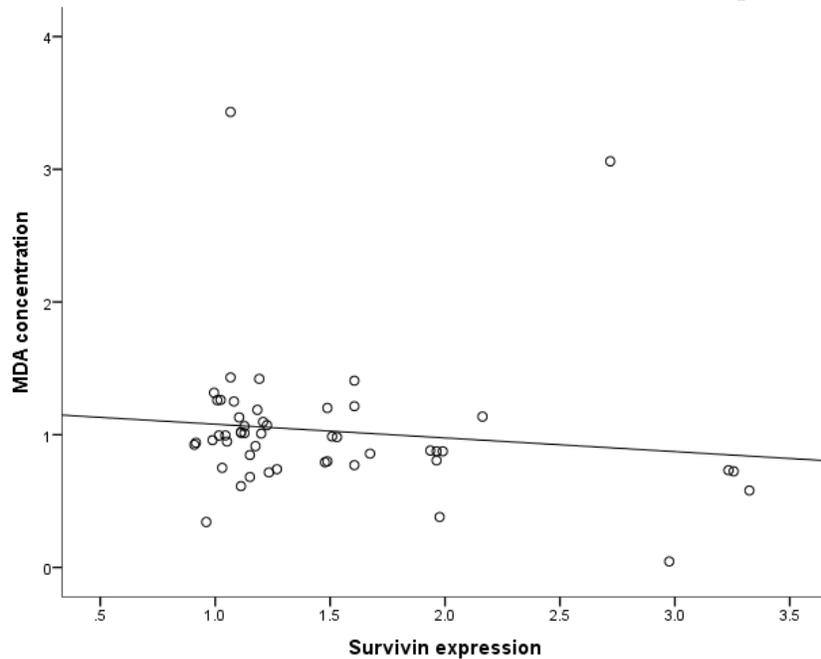


**Fig.(2) Survivin expression in colon cancer, colorectal cancer and rectal cancer patients.**

MDA concentration showed significant positive correlation with OSM concentration and negative correlation with survivin expression as shown in **Fig(3)** and **Fig(4)**.



**Fig (3). Linear Pearson correlation of MDA with OSM concentration in patients group.**



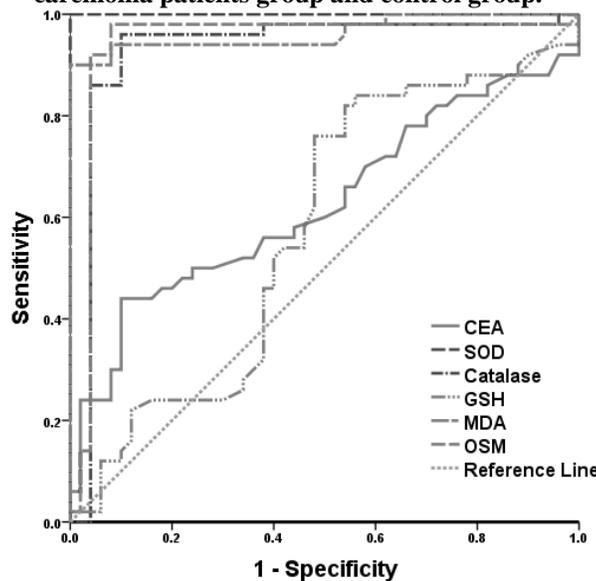
**Fig(4) Linear Pearson correlation of MDA with survivin expression in patients group.**

ROC curve for some laboratory markers were conducted for discrimination between cases and controls. GSH AUC failed to discriminate, while CEA showed poor discrimination between both groups. On the other hand, SOD, catalase, MDA, OSM showed excellent AUCs. AUCs of SOD, catalase, MDA, OSM showed significant increase when compared to CEA AUC. GSH AUC did not differ significantly than CEA AUC for discrimination between cases and controls. Performance characteristics and best cut off values are shown in **Table (5)**.

	CEA	SOD	Catalase	GSH	MDA	OSM
AUC	0.626	1	0.929	0.576	0.963	0.942
Cut off	4.3	<164.7	350.3	<1.2	4.7	6.25
Sensitivity (%)	44	100	96	76	90	98
Specificity (%)	90	100	90	52	100	92
PPV (%)	81.5	100	90.6	61.3	100	92.5
NPV (%)	61.6	100	95.7	68.4	90.9	97.9
Accuracy (%)	67	100	93	64	95	95
P	-	<0.001	<0.001	0.211	<0.001	<0.001

AUC, area under the curve; CI, confidence interval; PPV, positive predictive value; NPV, negative predictive value; p1, probability for discrimination between colorectal carcinoma cases and control group; p2, comparison between AUC of CEA and AUC of each marker

**Table (5) Performance criteria, AUC and cut off values of some laboratory markers for discrimination between colorectal carcinoma patients group and control group.**



**Fig (5).** AUC and cut off values of some laboratory markers for discrimination between colorectal carcinoma cases and control group.

Regression analysis was conducted for prediction of colon, rectal and colorectal cancer within healthy control subjects, using age, gender, and laboratory data as covariates. Higher catalase, MDA, OSM, survivin expression and lower hemoglobin concentration, SOD expression were associated with risk of colon, rectal and colorectal cancer development in univariate analysis. While in multivariate analysis, only higher MDA, OSM and survivin expression were considered as independent risk factors for colon, rectal and colorectal cancer development, these data were explained by **Table (6)**.

	Univariable				Multivariable			
	p	OR	95% CI		p	OR	95% CI	
Age	0.376	1.207	0.120	1.699				
Gender	0.198	0.987	0.198	2.198				
Total leucocytic count	0.123	2.024	0.459	2.806				
Hemoglobin	<b>0.001</b>	0.206	0.109	0.389	0.072	0.601	0.435	1.832
Platelet count	0.889	1.000	0.995	1.004				
ALT (U/L)	0.898	0.998	0.964	1.033				
AST (U/L)	0.194	1.028	0.986	1.072				
Bilirubin	0.202	1.663	0.761	3.633				
Albumin	0.071	1.445	0.101	4.817				
Creatinine	0.087	1.456	0.287	2.198				
CEA	0.157	1.005	0.998	1.012				
SOD	<b>0.005</b>	0.998	0.997	0.999	0.130	2.824	0.180	8.731
Catalase	<b>0.002</b>	1.004	1.001	1.006	0.224	1.001	1.000	1.001

GSH	0.525	1.031	0.939	1.132				
MDA	<0.001	3.499	1.988	6.156	<b>0.009</b>	5.235	1.517	18.060
OSM	<0.001	1.555	1.325	1.826	<b>0.002</b>	1.085	1.030	1.143
Survivin expression	<b>0.014</b>	1.407	1.199	1.832	<b>0.006</b>	1.365	1.198	1.873

OR, odds ratio; CI, confidence interval.

**Table (6).** Regression analysis for prediction of colon,rectal and colorectal cancer .

## VI. DISCUSSION

In the current study, the mean age of patients group was 53.8 ±13.9 years, while in control group was 52.8±5.8 years. There was no statistically significant difference between mean ages in our study groups. This is in line with **Chernyavskiy et al** [30] who found colon cancer was increased at younger ages (20-54 years). The relative different in age between our series and other studies may be attributed to different nature of daily behaviors, habitats, and time of correct diagnosis.

Regarding the sex in the current study, (34%) of patients were females and (66%) were males in patients group, while control group (40%) of patients were females and (60%) were males. There were no statistically significant differences between sex distributions in our study. This near-equal sex distribution was also reported by the studies of **Gies et al** [31] who determined 60% of patients were male and the study of **Ng et al** [32] the authors were noted not statistically significant in terms of age, gender.

Our results clarify hemoglobin concentration was significantly lower in patients group compared with control group (p <0.001). This is in agreement with **Al-Saeed et al** [33] who found that right-sided CRC had significantly low hemoglobin levels ( P = 0.001) and it can be utilized as a prognostic markers in CRC patients. This is may be due to the exits of blood with human wastes (stool).

In addition to, mean values of white blood cells, and platelets were 8.35 +/-SD 2.44, and 311.6 x 10<sup>3</sup> /mL +/-SD8.54, respectively which also was in line with previous studies. Mean values of white blood cells, and platelets were 11.9 +/- SD 2.3, 7.67 10<sup>6</sup> /mL +/- SD 2.44, and 343 x 10<sup>3</sup> /mL +/-SD 164.4, respectively (**Al-Saeed et al.,**).The relative increased platelet count may be explained by it has an important role in metastasis of circulating tumor cells (CTCs) (**Liang et al** [34]).

On the other hand, no significant differences were found regarding to clinical chemistry data that is comprised with **Park et al** [35] and **Tsai et al** [36] . This may be explained by none of our patients presented with colorectal liver metastasis. Furthermore, our results are in accordance with the study of **Launay-Vacher et al** [37] that found all colorectal patients have normal creatinine level.

The present study revealed that CEA concentration was increased in colorectal carcinoma patients group compared to control group, p value was 0.010. This is agreement with the study of **Yoo and Yeo** [38], that proved that CEA expression is evaluated to be higher in colon cancer cells , and is associated with response of rectal cancer to radiotherapy.

In respect to superoxide dismutase, lower SOD level was determined in patients group compared to control group, p value <0.001. Moreover, SOD concentration showed significant positive correlation with AST concentrations. This is in harmony with the aforementioned studies. Cancer cells have lower

antioxidant enzyme activity (Superoxide dismutases, catalase and glutathione peroxidases) when compared with their normal counterparts (**Janicka et al** [39]).

In the current study, increased catalase concentration in patients group compared to control group, p value was <0.001. In agreement with, concentrations of catalase in the colon cancer group are significantly higher than controls (**Martin Mateo et al** [40])

**Bhagat et al** [41], revealed a significant increase in the level of serum lipid peroxide such as malondialdehyde (MDA) as an oxidant (P<0.001) which had an important role in progression and pathogenesis of colorectal cancer. Similar findings were noted by the current study which determined significant increase of MDA concentration in patients group as compared to control group (P<0.001).

Regarding the OSM assessment, there was significant increase of OSM concentration in patients group compared to control group, p value was <0.001. This is in accordance with the former study of **Gurluler et al** [42], who noted significant higher serum OSM concentrations were detected in colon cancer patients than in controls (p < 0.001).

Our study clarifies survivin expression in colorectal cancer patients. It was determined significantly higher in patients group compared with control group, P <0.0001. Also, the study of **Gunaldi et al** [43], found that serum survivin levels were significantly higher in cancer patients than healthy subjects (P = 0.019) and these patients had 4 times increased risk of cancer. The study of **Shojaei et al** [44], showed that survivin is overexpressed in almost cancer types and has a crucial role in cancer progression, cancer cell resistance to anticancer drugs and ionizing radiation. Survivin has unique characteristics which make it a negative prognostic factor for patients with cancer (**Li et al** [45]).

Our results clarified that regression analysis was conducted for prediction of colon, rectal and colorectal cancer using age, gender, and laboratory data as covariates. Higher catalase, MDA, OSM, survivin expression and lower hemoglobin concentration, SOD were associated with risk of colon, rectal and colorectal cancer development in univariate analysis. While in multivariate analysis, only higher MDA, OSM and higher survivin expression were considered as independent risk factors for colon , rectal and colorectal cancer cancer development..

## VII. CONCLUSIONS

Survivin expression is considered one of mechanisms utilized by cancer cells in order to progress. It has a key role in promotion of cell proliferation as well as inhibition of apoptosis in cancer cells. Moreover, counter act of survivin may be inhibit tumor growth and enhance cell apoptosis. Therefore, our study shows early detection of survivin, OSM and serum concentration of antioxidant mainly MDA have important role in early

screening of CRC. Additionally, their overexpression is conducted for prediction of colon, rectal and colorectal cancer within healthy control subjects.

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# Phonics Teaching Techniques: A Mixed Method Study with Lower Primary English Teachers in Malaysia

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**Abstract-** This paper presents and discusses a study on effective techniques employed by teachers in teaching early reading through phonics approach. The study aimed to describe the implementation of these techniques to determine teachers' perception on the techniques that impacted their students' reading comprehension. An explanatory sequential mixed method research design was employed and conducted in two phases. Quantitative data were collected in Phase I through a survey questionnaire responded by 289 Year 1 and Year 2 English teachers. The respondents were selected via chain-referral sampling. Qualitative data were then collected in Phase II through e-interviews and documents gathered from five purposively chosen participants from the respondents in Phase I. Findings revealed that majority of the respondents constantly employed a controlled technique during their teaching and learning process which may have negative effects on students' performance. However, findings from the e-interviews indicated that the participants combined three categories of effective techniques – controlled, semi-controlled and free techniques which may have contributed to students' reading comprehension. This indicated that the techniques employed by teachers in teaching early reading through phonics had an influence on students' reading performance. This suggests that teachers should not depend on one category of techniques when teaching early reading through phonics approach. Teachers should explore and try new techniques. A combination of controlled, semi-controlled and free techniques could be implemented by teachers during the teaching and learning process including other reading comprehension strategies.

**Index Terms-** early reading, mixed method, phonics, teaching techniques

## I. INTRODUCTION

Reading is a skill that is able to help someone to be successful throughout their life (Roe & Smith, 2012). However, learning to read is a daunting task as Sousa (2014) asserts that it is a long and complicated process. Phonics is a systematic way that allows students to decode a word. Students are taught the letter sounds first, followed by letter-sound correspondences, syllables, words, and sentences. Gough and Tunmer (1986) affirm that students would be able to decode any words and become good readers who could read isolated words quickly, accurately, and silently if they are

taught using phonics approach. Abundant studies on the effectiveness of phonics in teaching reading have been conducted in first language environment (Finnegan, 2012; Johnston, McGeown, & Watson, 2012;) and second language environment (Dixon, Schagen & Seedhouse, 2011; Khairul Azhar Jamaludin, Norlidah Alias, Roselina Johari Mohd Khira, Dorothy DeWitta & Husaina Banu Kenayathulaa, 2015; Su & Hawkins, 2013; Yeung, Siegel, & Chan, 2013). Based on these studies, it is proven that phonics is an approach that is able to make students read fluently.

Hence, in 2011, the Malaysian Ministry of Education (MOE) introduced phonics in the Primary School Standard-Based Curriculum as an approach to teach early reading. However, after several years of phonics implementation at schools, statistics showed that 29.8% Year 1 and 21.7% Year 2 students in Malaysia still could not attain basic reading skills (PADU, 2014). The results were disturbing as inability to read impacts access to education (Ardila & Rosselli, 2013) which consequently may affect their economic development and life outcomes in the future. More alarming, studies uncovered that teachers in Malaysia need training and coaching in using phonics approach (Nadiah Yan Abdullah, Napisah Kepol & Mariyatunnitha Shari, 2014; Prasad, Nooreiny Maarof & Hamidah Yamat, 2016; Nee & Nooreiny Maarof, 2017). Nadiah et al. (2014) highlighted that teachers need to explore and try new methods. Meanwhile, Nee and Nooreiny Maarof (2017) added that teachers need to be exposed to more creative ways in teaching phonics.

Therefore, this study was aimed to investigate the techniques employed by Year 1 and Year 2 English teachers in teaching early reading through phonics approach to disclose the effective techniques. The research questions underpinning this study were:

- What are the techniques used by teachers to teach early reading through phonics approach?
- How do teachers implement the effective techniques?
- How do teachers perceive the effective techniques that impacting on the students' reading comprehension?

The findings of the study could enlighten teachers on effective ways to teach phonics. Consequently, they could discover and try out the techniques to assist their students to become fluent readers.

## II. LITERATURE REVIEW

### Teaching Techniques

Anthony (1963) defines technique as various activities that teachers or students perform in the classroom. Meanwhile, Brown (2001) claims that there are three broad categories in the taxonomy of techniques for language teaching as adapted from Crookes and Chaudron (1991); namely, controlled technique, semi controlled technique and free technique. He clarifies that controlled techniques involve activities that are teacher-centered, manipulative, structured, predicted student responses, have pre-planned objectives and set curriculum. Conversely, free techniques are activities that are student-centered, communicative, open-ended, unpredicted responses, negotiated objectives and cooperative curriculum. Meanwhile, semi controlled techniques are the combination of both techniques stated above. Sometimes, it is difficult to categorize the techniques according to its category. However, it is important to note that many techniques can fit in more than one category (Brown, 2001).

### Studies on Phonics Teaching Techniques

Recent research found that teachers use a variety of phonics program in their teaching and learning process. Each program has outlined its own techniques or activities. In a survey research conducted by Chapman, Greaney, Arrow and Tunmer, (2018) on 666 primary school teachers in New Zealand, they found that 51 phonics programs are being used by the teachers. However, based on extensive literature review, the most commonly phonics program used by teachers and researchers is Jolly Phonics (Ariati, Padmadewi, & Suarnajaya, 2018; Campbell et al., 2011; Dixon et al., 2011; Farokhbakht & Nejadansari, 2015; Khairul Azhar Jamaludin et al., 2015; National Reading Panel, 2000).

Jolly phonics suggests 9 weeks of intervention program. Jolly Phonics promotes playful, imaginative and adaptable teaching that fits well with whole language practice (The National Reading Panel, 2000). Students are taught to recognize the letter sounds at the beginning of the program. One letter sound is introduced per day. A variety of techniques have been arranged in the program as Lloyd (1998), the inventor of Jolly Phonics believe that young children learn quickly particularly when there is activity involved. The program employed a multi-sensory approach where students use their body movement, ears, eyes and speech to help them learn and remember better.

Songs and actions are among the techniques that could be used to teach letter sounds. Ariati et al. (2018) studied effective techniques to enhance students' literacy. In their study, they witnessed a female teacher in Bali, Indonesia teaching her

students the letter sounds using Jolly Phonics song. The students learn the letter sounds by singing the Jolly Phonics song with action. For example, the students learn the sound /a/ by singing and wiggling their fingers on their elbow, as if ants are crawling on them. Similarly, Chapman et al. (2018) also discovered in their survey study that teachers are using YouTube videos in order to teach letter sounds.

Next, Lloyd (1998) emphasizes that one of the effective ways of learning is through playing games. She suggested few activities to teach letter sounds like *Hunt the Letter Sound* and *Pair Game*. In *Hunt the Letter Sound*, students are required to search for the targeted sounds in the storybook around the classroom whereas students are required to match letter cards that have the same sounds in *Pair Game*. Meanwhile, students could play board games in order to practice blending sounds to read words.

Book reading is another technique that has been frequently implemented by teachers and researchers. In a survey study conducted by Campbell et al. (2011), they discovered that 95% of their samples are teaching phonics using picture book reading. Besides that, in a quasi-experimental study conducted in India, Dixon et al. (2013) implemented book reading as one of the interventions to practice decoding skills. Meanwhile, McGeown, Johnston and Medford (2012) exploit the use of big book and story time in their experimental study.

Teachers and researchers also use a lot of flashcards and lettercards in teaching early reading through phonics approach. A variety of activities could be implemented with the use of flashcards and lettercards. For instance, a teacher in a study conducted by Ariati et al. (2018) utilizes flashcards as the main material in teaching blending. Usually, she plans a list of words needed to be blended by the students to make it easier during the teaching and learning process. Then, she explains how to blend the letter sounds. After that, the students practice to blend in a small group where teacher will give one flashcards to each student to be blended.

Modelling is another technique frequently employed by teachers and researchers in teaching early reading through phonics approach. Johnston and Watson (2004) teach students to blend the letter sounds through modelling. They claim that the experimenter demonstrated how the words could be read through blending. The students will then join the letter sounds together smoothly without pausing between each sound by saying each letter sound in a word distinctly from left to right. Instead, Beck and Beck (2013) strongly recommend modelling using a technique called successive blending. Compared to Johnston and Watson's sound by sound technique, in successive blending, students say the first two sounds in a word and immediately blend those two sounds together. Then they say the third sound and immediately blend that sound with the first two sounds. Meanwhile, Hines (2009) found onset-rime technique helpful in assisting students with reading

difficulties. Using onset-rime technique, students learn to read by breaking the syllables into onset (everything before the vowel) and rime (the vowel and everything after it) first before they blend them into recognizable words.

### III. METHOD

#### Research Design

This study employed an Explanatory Sequential Mixed Method design. It was conducted in two phases. Quantitative data was collected in Phase I through a survey questionnaire. Meanwhile, qualitative data was collected in Phase II through email interviews and documents.

#### Samples

There were two groups of samples in this study which were the respondents for the survey questionnaires in Phase I and the participants for the email interviews in Phase II. All Year 1 and Year 2 English teachers in Malaysia were the target population in this study. According to Education Performance and Delivery Unit (PADU), there are 15,516 Year 1 and Year 2 English teachers in Malaysia. It is impossible to study all members of the target population. Hence, the respondents of the survey questionnaire in Phase I were selected via chain referral sampling. By referring to Krejcie and Morgan's (1970) estimation of sample size, the chain referral sampling was stopped when 382 respondents had responded to the online survey. Meanwhile, the participants in Phase II were purposively chosen from the respondents in Phase I based on the criteria that they were: TESL trained, trained to use phonics approach and had experience teaching struggling readers who have developed to emergent or successful readers.

#### Instruments

The instruments employed in this study were a survey questionnaire, interview protocol and documents. The survey questionnaire was developed using PollDaddy software. It is a 3-point Likert Scale questionnaire which was adapted from Pressley, Rankin & Yokoi (1996). The questionnaire comprised of 15 items. 11 items were close ended questions whereas 4 items were open ended questions. It focused on the techniques that teachers had employed in teaching reading through phonics approach. The survey questionnaire was shared on Facebook and Telegram. Two experts in the field of Teaching English as a Second Language (TESL) were consulted to obtain their expert opinion on the content validity of the survey questionnaire. Amendments were made accordingly based on the experts' comments and suggestions. The internal reliability of the questionnaire was determined through Cronbach Alpha reliability test. The Coefficient Alpha Value was 0.826. Nunnally (1978) asserts that reliabilities of 0.70 or higher was considered as a reliable measure.

The interview protocol for this study was adapted from Prasad (2016). A semi-structured e-mail interviews were conducted with the participants using the interview protocol. Meanwhile,

two documents were collected from the participants which were their lesson plans and their students' Literacy and Numeracy Screening (LINUS) results which are in the form of checklist. The internal validity of the e-mail interviews and the documents were established through member checking and triangulation of data.

#### Data Analysis

A total of 382 Year 1 and Year 2 English teachers responded to the survey questionnaire. However, there were 93 incomplete responses. Thus, only 289 responses were analysed. Data obtained from the questionnaire for item 1 to 5 and 8 to 13 were analysed using descriptive statistics whereby frequency and percentage were calculated. Meanwhile, item 6,7,14 and 15 were analysed thematically according to the categories in taxonomy of techniques for language teaching as adapted from Crookes and Chaudron (1991). Meanwhile, the data collected from the e-mail interviews and documents were analysed using ATLAS.ti 8.

### IV. RESULTS

#### Techniques used by teachers to teach early reading through phonics approach

Table 1 demonstrates that 214 respondents (74%) asserted that they would always teach their students how to enunciate each letter sound in order to enhance the students' phonemic awareness. 243 respondents (84%) declared that they would always teach letter sounds by asking their students to repeat the sounds orally. Only 5 respondents (2%) admitted that they would never teach their students the letter sounds by asking the students to repeat the sounds orally. Besides that, 151 respondents (52%) established that they would always use hand gestures to help the students remember the letter sounds. Most of the respondents would use songs to help their students remember the letter sounds. Only 14 respondents (5%) would never use songs to help their students remember the letter sounds. Meanwhile, majority of the participants would use a variety of videos to teach the letter sounds occasionally.

**Table 1 Techniques in raising students' phonemic awareness**

Item	Question	Category	N	S	A
1	I teach how to enunciate each letter sound.	C	0 0%	75 26%	214 74%
2	I teach the letter sounds by asking the learners to repeat the sounds orally.	C	5 2%	41 14%	243 84%
3	I use hand gestures to help the learners remember the letter sounds.	C/SCF	20 7%	118 41%	151 52%
4	I use songs to help the learners remember the letter	C/SC/F	14 5%	137 47%	138 48%

	sounds.				
5	I use a variety of videos to teach the letter sounds.	C/SC/F	34 12%	178 62%	76 26%

Note. N= Never, S= Sometimes, A= Always, C= Controlled, SC= Semi controlled, F= Free

Table 2 indicates that 208 (72%) of the respondents verified that they would always teach their students to blend the letter sounds orally in order to enhance their decoding skill. More than half of the respondents revealed that they would always use alphabet cards when they teach the students to blend the letter sounds. Meanwhile, 131 (54%) respondents affirmed that they would always use picture cards when they teach the students to blend the letter sounds. Besides that, 162 (56%) respondents would seldom teach blending through group work activities. In fact, 36 (12%) respondents declared that they would never teach blending through group work activities. 88 (31%) respondents verified that they would always teach blending through kinaesthetic activities. Nevertheless, 56 (19%) respondents admitted that they would never teach blending through kinaesthetic activities. 89 (31%) respondents admitted that they would always teach blending using specific blending worksheet whereas 162 (56%) respondents declared that they would use specific blending worksheet occasionally.

**Table 2 Technique to enhance students’ decoding skills**

Item	Question Items	Category	N	S	A
8	I teach how to blend the letter sounds orally.	C	1 0.3 %	80 27.7 %	208 72%
9	I teach how to blend the letter sounds with the help of alphabet cards.	C/F	10 4%	127 44%	152 52%
10	I teach how to blend the letter sounds with the help of picture cards.	C/F	13 5%	145 50%	131 54%
11	I teach blending through group work activities.	SC/F	36 12%	162 56%	91 32%
12	I teach blending through kinaesthetic activities (e.g.; arm blending)	SC/F	56 19%	145 50%	88 31%
13	I teach blending using specific blending worksheet.	SC	38 13%	162 56%	89 31%

Note. N= Never, S= Sometimes, A= Always, C= Controlled, SC= Semi controlled, F= Free

In the open ended items, 128 (44%) respondents revealed 91 games that they have conducted to enhance students’ ability to recognize letter sounds. Next, 89 (31%) respondents stated 54 other techniques that they had employed to teach letter sounds. Meanwhile, 78 (27%) respondents disclosed 62 games that they had carried out in teaching blending. In addition, 32 other techniques in teaching blending had been listed by 52 (18%) respondents. All the techniques mentioned above were classified as a combination of controlled, semi-controlled and free techniques.

The analysis showed an abundant of techniques that respondents had employed to enhance students’ phonemic awareness and decoding skills. However, it was noted that majority (77%) of the respondents constantly rely on controlled or teacher centered techniques like modelling, demonstration and drilling which may be inadequate to enhance students’ reading performance. In the background information of the survey questionnaire, 63% of the respondents admitted that their students were still struggling to read. This implies that teachers should not employ one category of teaching techniques regularly during the teaching and learning process. Teachers should employ more techniques that are in line with the students’ interest to provide opportunity for the students to practice reading. Sousa (2014) highlights the importance of meaningful practice by stressing that meaningful practice allows the brain to build and strengthen the neural pathways required to learn the targeted skill.

**The implementation of the effective techniques**

The techniques employed by five participants that were purposively chosen from the respondents in Phase 1 were perceived as effective techniques because their students who were struggling to read had developed into emergent or successful readers. This study discovered that all five participants had implemented a combination of controlled, semi-controlled and free techniques during their teaching and learning process as display in Table 3. The findings demonstrated in Table 3 were triangulated with the participants’ responses in the survey questionnaire, e-mail interviews and their lesson plans.

**Table 3 Effective Techniques implemented by the participants**

Participant/Technique	Controlled Technique	Semi-controlled Technique	Free Technique
T1	modelling, sound by sound blending, drilling, songs	Ladybird book series (find the letter/words), flip cards, alphabet cards, songs, sound by sound blending	hopscotch, big dice throw, 3 dices, flip cards
T2	modelling,	group/individual	Chinese

	sound by sound blending, drilling, songs	guide, Simon Says, phoneme booklet, songs, sound by sound blending	Whisper, snake and ladder, listen and rearrange Simon Says
T3	modelling, successive blending, drilling, songs	one to one guide, songs, charade, successive blending, worksheets	hopscotch, puzzle matching, charade, worksheets
T4	modelling, onset-rime blending, drilling, songs, videos	songs, onset-rime blending	reading buddy, word search puzzle
T5	modelling, successive blending, drilling, songs, video clips with audio	Simon Says, songs, successive blending	find your friends, car blending, Simon Says

All participants taught their students to read through modelling. Students learn better through modelling since the students are not familiar with the letter sounds and blending as those skills are something new to them. Hence, the teachers assisted through *modelling, demonstrating and teaching*. T1 declared that *“through phonics, [she taught] pupils to blend the sounds orally... model them [on] how to blend the sound”*. Besides that, T2 stated that *“at first, [she] taught the learners to blend the phonemes by drilling them to sound out each phonemes and then combine the phonemes”*. Similarly, T4 said that *“every Friday, [they] practiced blending one-word family. Usually, [she] blend[s] the phonemes and [her] pupils will repeat after [her]. Then, they will practice blending the words in groups”*.

Besides that, all participants except for T1 conveyed that they provided different level of supports for their students during the teaching and learning process. T2 indicated that she would guide her students in groups or as an individual if she noticed that they were having difficulties to blend the phonemes or read on their own. In the same way, T3 also did one to one teaching to help her students practice blending. She had a huge advantage to conduct one to one teaching as she was teaching in a low enrolment school. She had only 6 students in her class. In contrast, T4 has 27 students in his class. So, he provided support to his struggling readers using the successful and emergent readers in the class. He created a ‘Reading Buddy’ system where the successful and emergent readers assisted the struggling readers to read. The implementation of

the Reading Buddy system is clearly outlined in his lesson plans.

In enhancing students’ phonemic awareness, all participants used songs. They agreed that the use of songs could help their students to remember and recall the letter sounds. T2 usually started her lesson by asking her students to sing the phonics songs with action or gestures to recall all the basic sounds. She claimed that it only took 3 minutes to conduct the activity. Similarly, T3 and T5 employed the use of actions or gestures in their lesson. Their students were taught to do an action for each letter sounds. The students could recall the letter sounds by either do the actions or sing the phonics songs with the actions at the same time. T3 and T5 revealed that they taught their students the actions or gestures as outlined in the LINUS module prepared by the Ministry of Education.

All participants also conducted games in order to enhance their students’ phonemic awareness. Some participants conducted games that are quite similar. For instance, T1 and T3 allowed their students to play hopscotch in order to recall the letter sounds that they have learnt. T1 explained that she *“also let them play hopscotch by stepping on the letters that represents the sounds”*. At the same time, T1 also used big dices with letter cards on each side of the dices where pupils can throw the dice and say the sounds. On the other hand, T3 also prompted her students to play puzzle in order to recall the letter sounds. In addition, T2, T4 and T5 frequently conducted a game called ‘Simon Says’. T2 explained that in playing ‘Simon Says’, she *“would do the action/gestures and the pupils had to say aloud the sounds and vice versa”*. In contrast to other participants, T2 conducted a game called ‘Chinese Whisper’ in her classroom to teach the letter sounds and also oral blending and segmenting. She claimed that *“pupils took turn to whisper the sound to their friends. The last person in the line would come to the front and say aloud the sound. [She] used the same steps like [she] stated above for blending and segmenting activities”*.

Other than the techniques explained above, there are few other techniques that the participants had implemented in the classroom that vary from one another. Firstly, T1 utilized levelled books called Ladybird Books as a tool to introduce the letters and letter sounds. She declared that she *“also used the Ladybird series...introduced letters/sounds by asking the pupils to find words that have the same letter/sounds in the book”*. Besides that, T4 exploited YouTube videos as a tool for his students to blend orally. He affirmed that his students watched YouTube videos to practice blending by repeating what was presented in the videos. Lastly, T5 used flashcards not only during the teaching and learning process as he stated in his lesson plans where his students play a game called ‘Listen and Show’ by listening to a sound and pick the correct flashcards and show it to their friends. He also pasted the flashcards around the classroom as a reference for the students to recall the sounds.

Next, all participants have their own techniques to enhance the students' decoding skills. T1 and T2 taught the students to blend the letter sounds using the usual blending technique which is sounding out each letter sound and blend them from left to right. T1, encouraged her students to practice blending using flip cards. However, she discovered that the blending technique that she had implemented could not help all of her students to read. She discovered that some of her students could not blend the sounds. Thus, she decided to teach those students who still could not read using a whole language approach where she would insert the targeted words that the students should learn during big book reading. Meanwhile, T2 thought her students to blend the letter sounds by drilling them to sound out each letter sound and then combine the letter sounds one by one. Then, she conducted variety purposive activities like Chinese whisper game and phonemes booklet to assist her students to practice blending deliberately.

T3 and T5 taught their students to blend using a technique that resembles successive blending technique as suggested by Beck and Beck (2013). Students are taught to combine the first two phonemes. Then, they combine the first two phonemes with the last phoneme. For instance, in order to read the word 'mat', students have to blend /m/ and /a/ first. Then, they have to say aloud /ma/ for several time before they combine it with the last sound which is /t/. T3 stated that her students practice blending by playing puzzle matching game where students picked any pieces of jigsaw puzzle at random, blend the phonemes as stated behind the jigsaw puzzle, read the word aloud and match them on the puzzle. Besides that, her students also played hopscotch where students hop on any spaces, blend the phonemes stated on the word cards and read them aloud. Later, they completed a worksheet by matching the word that they have blended to the correct pictures. Meanwhile, T5 encouraged his students to practice blending through car racing activities. Usually, he conducted the car racing activity as an enrichment activity after the students have learnt to blend the words using successive blending technique as stated above. Students participated in the activity in pairs.

In contrast to other participants, T4 applied the onset-rime technique in order to enhance his students' decoding skills. T4 asserts that students have to sound out the last phoneme followed by the phoneme in the middle. Then, they need to combine it with the first phoneme. For example, in order to read the word 'cat', the students need to combine 'a' and 't' to form 'at'. After that, they will combine 'c' and 'at' to read the word 'cat'. He used word families' module prepared by a local teacher and made it a routine for his students to practice blending using the module every Friday.

The findings revealed that the participants also rely on modelling, demonstration and drilling as the main teaching techniques. However, they provided opportunity for their

students to get involved in meaningful practices through other activities that are in line with their students' needs and interest. They also emphasized on collaborative learning during the teaching and learning process. This implies that teachers should vary the teaching techniques to develop the students' reading performance. Teachers should also conduct activities that allow students to cooperate and learn from their friends.

### **Impact of effective techniques on the students' reading comprehension**

The findings reveal that all participants agreed that the techniques that they employed had positive contribution towards students' reading performance. Their responses in the interviews were triangulated with the analysis of their students' LINUS results. It was evident in the LINUS results that their students had gradual development in the second screening compared to the first screening.

All participants except for T4 believe that the techniques implemented had positive impact on their students' reading comprehension. The participants recognized that the techniques implemented helped their students to decode the printed word. They asserted that their students' capability to recognize and read the words contributed to their ability to comprehend the words. This finding is in agreement with Gough and Tunmer (1986) idea that improving decoding or word reading skills may lead to an increase in reading comprehension. Besides that, T1 and T2 agreed that their students' reading comprehension developed when they used pictures during the teaching and learning process.

However, T4 was unsure of the effect of his techniques towards his students' reading comprehension. He is confident that his teaching techniques were able to help his students to read as he noticed that his struggling readers had developed the ability to read. But, he could not decide whether the technique could contribute to his students' reading comprehension because he witnessed that some of his students could not match the sentences that they have read to the correct pictures. Lack of vocabulary may be one of possible explanation for this result. Armbruster (2010) emphasizes the importance of vocabulary in reading comprehension. She declares that some vocabulary must be taught directly to enhance the students' reading comprehension. This implies that teachers need to teach new vocabulary from time to time to expand the students' vocabulary together with other reading comprehension strategies to enhance the students' reading comprehension.

### **V. CONCLUSION AND RECOMMENDATIONS**

This study has found that generally teachers have implemented a variety of teaching techniques in teaching early reading through phonics approach. However, the implementation of one category of teaching technique is insufficient to enhance the students' reading performance. The

evidence from this study suggest that teachers should explore and try new techniques that are in line with students' interest and needs. It is recommended that a combination of controlled, semi-controlled and free techniques should be implemented to enhance students' reading performance. In addition, the findings of this study suggest that other reading comprehension strategies should be included to further enhance students' reading comprehension. Although the study demonstrated that the effective techniques implemented by the participants seemed to contribute positive impacts towards the students' reading comprehension, the findings of this study are limited to only five participants that participated in the second phase of this study. Therefore, it is recommended that further explorative or experimental study on techniques to enhance students' reading comprehension involving more participants could be conducted.

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# 1 Year CBCT Follow up Using Laser Biostimulation and Bone Graft In Treatment of Periapical Lesion

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## ABSTRACT

Nonsurgical endodontic treatment is a definitive predictable treatment option in most cases, but endodontic surgery may be indicated for teeth with persistent peri apical pathosis unresponsive to non-surgical approaches. This paper reports the case of post surgical bone healing using laser biostimulation and hydroxyapatite bone graft using CBCT analysis. Pre operative CBCT evaluation was done for each case. Post treatment evaluation was done clinically, radiographically and by CBCT analysis.

**Keywords:** Periapical Lesion, Laser Biostimulation, Bone graft, CBCT

## INTRODUCTION

Apical surgery is the surgical management of a tooth with a periradicular or periapical lesion that cannot be resolved with an orthograde endodontic treatment. Apical surgery is often considered as a last resort to preserve a tooth when conventional endodontic retreatment is not feasible or is associated with therapeutic risks (Kim and Kratchman, 2006). The treatment alternative for surgery would be tooth extraction, or in multi-rooted teeth, root or tooth resection<sup>1</sup>.

When periapical surgery is indicated it removes diseased soft tissue and with application of different graft material enhances new bone formation at the defective site. Formation of new bone can occur with regeneration or repair. The most commonly used technique for regeneration is the use of bone replacement grafts. The ideal bone replacement material should be easy maneuverable, inert, noncarcinogenic, and should be dimensionally stable. One of the promising biomaterials for bone healing and regeneration is Biphasic calcium phosphate ceramic.

The goal of surgical endodontic treatment is to eradicate any associated extraradicular infection such as periapical granulomas and cysts<sup>2</sup>. Low intensity laser Therapy accelerates the repair process and has bio-stimulating effects on stem cells of bone<sup>3</sup>. Application of Laser is painless, non invasive and without adverse effects<sup>4</sup>.

Recently, cone beam computed tomography (CBCT) has been introduced as it eliminates some of the most prevalent problems, such as superimposition and distortion and is a method of gaining an unabridged view of dental anatomy. CBCT is rapidly replacing other radiographic techniques in diagnosis, quality control of treatment methods and techniques, and outcome assessment and reduces false diagnosis<sup>5</sup>.

In this case report Periapical surgery was conducted and healing was observed. In this Case Laser Biostimulation was done and followed by placement of Hydroxyapatite bone graft .

## CASE REPORT

A 35 year old patient reported to the department with a chief complaint of discolored tooth in the upper front tooth region since 4-5yrs. The patient had reported trauma in the same region 7 years back. Patient revealed history of RCT irt 11. The past medical history of the patient did not reveal any significant finding and the patient was systemically healthy and was not on any medication. Patient revealed no history of alcohol, smoking and other deleterious habits. On examination, there was pain of palpation irt 11,12 and Ellis class IV fracture in relation to 12. The tooth appeared to be discolored.(Fig.: 1)The pulp vitality tests revealed that the tooth was non-vital while the radiographic examination of the concerned area in the form of an intra-oral peri-apical radiograph (IOPAR) revealed that it had a large peri-apical radiolucency.(Fig.: 2)Peri-apical surgery was planned for this patient. Blood heamogram tests were

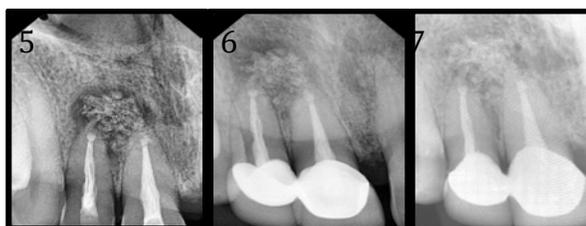
On the day of surgery patient was administered local anesthesia. Full thickness mucoperiosteal flap was reflected by giving two horizontal incisions and a horizontal incision. Osteotomy will be performed under copious water spray using straight micromotor handpiece with bone cutting bur. Root was resected up to 3mm. Removal of granulation tissue was done using curettes. Retro cavity preparation was done using micromotor contra angle handpiece and round bur. Retrograde Root filling was done using MTA at root end with the help of MAP system. After MTA placement, Laser Biostimulation with soft tissue diode Laser in non contact mode was used in elliptical manner. Three cycles of laser biostimulation was done of 10 seconds each. The power in first cycle was 1.5 watt with 3 cm away from the lesion site. In second cycle the power was increased to 2 watt with decrease in the distance to 2cm and third cycle was performed with maximum power up 2.5watt and minimum distance of 1 cm. Each cycle had interval of 10 seconds which was rest phase.(Fig.: 3)After Laser Biostimulation, Hydroxyapatite bone graft was placed in the bony cavity. (Fig.: 4) The Flap was sutured back in position.



FIGURES-1:Pre-operative clinical picture, 2: Preoperative Radiograph, 3:Laser Biostimulation, 4: Placement of Bone Graft

Post operatively Radiograph and CBCT Scan was taken immediately after the surgery (CBCT I) for the measurement of the bone defect. Mesio-distally, superioinferiorly and labiopalatally the defect measured 9.4 mm, 11 mm, 7.4 mm respectively. CBCT II was taken after 1 year for the measurement and CBCT II revealed reduction in the size of the defect up to mesio-distally, superioinferorly and labiopalatally as 9.2 mm, 7.9 mm, 5.1 mm.

Also, Patient was recalled after 1 month, 6 months, and 1 year for evaluation for radiographic and clinical evaluation (Rud et al Criteria). Radiographs also revealed healing of the periapical bone defect. (Fig.: 5-7)



FIGURES- 5:1month follow up, 6: 6 months follow up, 7: 1 year follow up

## DISCUSSION

Nonsurgical endodontic treatment is a highly predictable treatment option in most cases, but endodontic surgery may be indicated for teeth with persistent periradicular pathosis unresponsive to non-surgical approaches. Surgical root canal therapy including root-end resection has been practiced since at least the mid 1800s. When indicated, periapical surgery involves removal of diseased soft tissue, root resection followed by retrograde root filling and application of different graft material, which enhance new bone formation at site of defect.

In the present case Mineral trioxide aggregate (MTA) as a root-end filling material is shown to promote osteoblast activity and have excellent sealing ability. It was less cytotoxic than amalgam, IRM, amalgam, or SuperEBA and had an antimicrobial effect. Results of MTA studies in dogs and monkeys showed that significantly less inflammation was seen than in amalgam. More importantly, cementum bridges formed directly over the MTA confirming the tissue friendliness of the material and its potential cementogenic property as root-end filling material<sup>6</sup>.

In present case Laser biostimulation was done followed by hydroxyapatite bone graft. Hydroxyapatite is a cheap and easily available bone substitute. Hydroxyapatite is a apatite of calcium phosphate,  $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$ , a ceramic naturally found in tooth, vertebrae and bone. The compound has a Ca/P mole ratio of 1.67, and is formed by precipitation of calcium nitrate and ammonium dihydrogen phosphate. Each pore is 100-140  $\mu\text{m}$  with constant interporous distance<sup>7</sup>.

The use of ceramics based hydroxyapatite Bone graft, which is osteointegrative and osteoconductive; and in some cases, osteoinductive<sup>8</sup>. Hydroxyapatite is used in a process wherein the bone is formed by osteoprogenitor cells from the recipient bed into, around, and through a graft and the in-growth of capillaries. These Hydroxyapatite crystals when used acts as a scaffold upon which new bone is deposited, which is then followed by a slow resorption of the graft. The ceramic materials are sufficiently adaptable to lend themselves to the management of defect pattern encountered in the individual patient<sup>7</sup>.

The bone grafts containing hydroxyapatite gets more rapidly incorporated into the host bone, because of presence of biological apatite in its surface. This is one of the rationale for employing bovine bone as a graft material<sup>9</sup>.

Kenney et al. in their study used porous hydroxyapatite on periodontal defect, found bone formation from the 3rd month examination onwards and connective tissue infiltration through the pores<sup>10</sup>.

The follow up examination of this case was done after 1 month, 6 months and 12months and periapical healing was observed. which was checked radiographically and by CBCT. On comparing pre operative CBCT with 1 year follow up it was observed that endodontic surgery performed with laser bio stimulation followed by Placement of Hydroxyapatite bone graft showed promising results of periapical healing.

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# Circle as a Means of Increasing Cognitive Activity of Students

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**Abstract-** This paper reveals the mechanism of the group as a means of enhancing students' cognitive activity. Working with students in a circle, the teacher contributes to the activities of research work, improves the quality of training of qualified specialists.

**Index Terms-** circle, student, research work, cognitive activity, independent work.

## I. INTRODUCTION

Multiple researches of pedagogies, psychologists, sociologists and expert-sociological study showed, that one of the most radical ways of educating the students, allowing them to effectively solve a wide range of educational tasks, are to involve them to creative activities, that organically connected with their professional education, that in scientific-research, design, project works.

Involvement to the system of upbringing of students of "resource" creativity, it will allow to affect and activate the creative potential as a fundamental quality of personality and through it comprehensively, to carry out the educational work by naturally and radically in a variety of ways, and substantially neutralizing some negative manifestations in consciousness and behavior of students and catalyzing the growth of positive emotions and activities [1,2].

Forms of the organization and conduct of research work of students, implemented outside of school time, include:

- Scientific circles of students,
- Problem groups
- Scientific and technical associations of students.

One of the directions of higher education is the achievement of such a level of development of students, when they are able to independently set a goal of activity, can plan their actions, correct their implementation, that to carry out independently the educational activities. The student must learn - this is often more important than arming them with specific subject knowledge. In this direction, one of the most important places belongs to the scientific circle of students.

Scientific circles of students are the main and most popular form of attracting students to scientific work outside of school time [3].

A research group of students named after "Teacher of Biology of the 21st Century" works at the department of "Biology and its teaching methodology" on the course of "Methodology of teaching biology". Members of the circle are students of 3-4 courses, if desired, and students of 1-2 courses of the Faculty of Natural Sciences can attend.

The purpose of the circle is to assist in the research work of students on improve the quality of training of qualified specialists.

**The tasks of the circle** are the formation of motivation for research work and assistance to students in mastering the scientific methods of knowledge, immersed and creative development of educational material, and education of creative attitude to their profession. The most diverse forms of work are used: reviewing and annotating of domestic and foreign literature, deep mastering the research methods, direct implementation of research, processing and analysis of research materials, presentation of research materials in the form of reports, abstracts and articles, participation in scientific competitions and exhibitions of scientifically work of students. Preparation for the conference is an effective manifestation of the communicative activities of teachers and students. Taking into account the wishes of the students, a work plan is drawn up with an indication of the specific topic, time of the meeting and the name of the responsible teacher. The choice of topic is determined by the importance of information. The responsible teacher organizes round tables, debates with the invitation of leading experts. Also videos are presented.

**Independent work of students in a research circle** is a means of enhancing a student's cognitive activity, through which he can carry out his own education, development and professional training in accordance with the set tasks.

An increasing of science role in social progress, its penetration into all spheres of people's life, the dependence of the quality of training of future specialist from research direction of the educational process made the actual problem on scientifically-research training of cadres, which makes the necessary of ensuring from students that a research approach to life and profession.

It is problematic to awaken the scientific interest among young people, orienting them to solving global problems. Maybe it is easy to work with the personality of a scientist, a scientist - a teacher, with whom he wants to communicate, and the culture of

communication of a teacher determines the culture of student knowledge [4, 5].

The conditions, promoting development of the research circle at the department of “*Biology and its teaching methodology*” are:

- *Focus on the formation of the personality of a professional researcher;*
- *Creative freedom in research activities;*
- *The possibility of intellectual communication with scientists;*
- *Popularization of research ideas in educational institutions of the region;*
- *Creation of a bank of students’ creative, research works;*
- *Study of the creative progress of graduates in professional life.*

#### **In our opinion, students are encouraged to research activities:**

- Interest in research activities, research work;
  - The desire to benefit themselves and others;
  - Unselfish interest to cognition;
  - The desire for self-realization, self-cognition of his potential;
  - Introduction to the creative work for the informed choice of the field of activity;
  - Self-education of personal qualities of a specialist-researcher.
- Research work is based on the following pedagogical positions:
- Common approaches to teaching and research activities;
  - unified pedagogical culture in the implementation of the problems of self-determination, self-development of students;
  - Purposeful formation and development of professionally significant research qualities of students;
  - Humanistic and personally oriented relationships in the process of carrying out creative, research work;
  - Systematic development of the creative potential of students: participation in the development of joint innovation projects, in scientific conferences, reviews and others;
  - Democracy, collegiality, openness and willingness to cooperate.

During the many years in plan of scientific research, students have been studying the methods of teaching biology. We conduct the meeting of the scientific circle at the department, and learn circle issues. In addition to this problem, the following topics are discussed at meetings of the scientific community of students:

- a) Evolution of parasitism;
- b) Psycho genetics;
- c) Problems of genome evolution;
- d) Drugs and AIDS;
- e) Genetics and alcoholism, etc.;
- f) Activation of cognitive activity in biology lessons;
- g) Use of interactive methods in biology lessons.

Members of the scientific circle of the department annually participate in the student conference, biology Olympiads by showing high results. For example, in 2017-2018 curriculum years, students participated to the Republican Biology Olympiad from circle and involved second place on biology.

Here, future specialists consolidate and improve the previously acquired knowledge and skills, they develop creative thinking, they study a creative approach to solving specific tasks,

they can make decisions independently, use the gained knowledge in practical work.

The joint work of future specialists in the scientific circle forms for them such important qualities, as the feeling of camaraderie, mutual aid, responsibility for the assigned work; develops mental abilities; brings discipline, dedication and clarity in work, accuracy and perseverance.

As a result, students will receive skills in writing essays, preparing reports for a scientific seminar.

At the second (main) stage, students perform specific studies under the guidance of teachers and research assistants, in the course of which they acquire valuable knowledge and skills, and assimilate research methods.

As a result, students will receive skills in preparing scientific abstracts, preparing course papers with elements of research, and carrying out educational research and laboratory work.

At the third (target) stage, students are entrusted with the implementation of small independent topics, which ends with the preparation of a report or an information at a circle meeting. This independent work can be continued in the form of a course paper or a qualified work.

The interrelation and mutually stimulating development of the educational and research processes is an objective regularity and at the same time this is the life-giving basis of higher education.

**Scientific-research work of students** is a necessary means of formation of the professional image of a specialist on any profile. The participation of students in scientific work is increasingly force for their involvement at creating material and spiritual values. Another facet of scientific creativity is the space of creating by them for the free expression of the individual, the formation of individual inclinations and interests.

In the course of the work of the scientific-research circle in the student community, creative values - the basis for the development of analytical skills on the transformation of the economic, political and social life of the Republic of Uzbekistan are appeared.

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# Antimicrobial activity of three different Probiotic strains and 5.25% Sodium hypochlorite against E.faecalis and C.albicans at two different time period: An in-vitro study

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**Abstract-** AIM: The aim of this study was to evaluate and compare the antimicrobial efficacy of three different probiotic strains and 5.25% Sodium hypochlorite against E.faecalis and C.albicans at 48 hour and 1 week.

**MATERIALS AND METHODS:** Three commercial probiotic strains (L. acidophilus, L. Casei and L. Rhamnosus), 5.25% sodium hypochlorite and normal saline were selected and evaluated for zone of inhibition (ZOI) and colony forming unit (CFU). Pathogenic test organisms used were Candida albicans and Enterococcus faecalis. Phase 1 of the study was conducted by a disc diffusion assay test to evaluate ZOI in millimetres (mm) of the selected groups against C. albicans and E. faecalis for 48 hours and 1 week. Phase 2 was conducted to evaluate CFU/ml counts after samples were incubated at 37°C for 72 hours.

**RESULTS:** Intergroup comparison of mean ZOI showed statistically significant difference among all tested groups for both the microorganisms and at both time intervals. The maximum ZOI was found in Group 4 (5% NaOCl) and minimum in Group 5 (Normal Saline). The mean CFU/ml counts amongst the groups was found to be highest in Group 5 (Normal saline) against both the microorganisms and lowest in group 2 (Lactobacillus Casei) against C.albicans and in group 3 (Lactobacillus. Rhamnosus) against E.faecalis.

**CONCLUSION:** This study suggests that Probiotic strains such as L. acidophilus, L. Rhamnosus, and L. Casei are effective for preventing the growth of E. faecalis and C. albicans.

**Index Terms-** Antimicrobial activity, L. acidophilus, L. Casei, L. Rhamnosus, Probiotic strains, 5.25% sodium hypochlorite, Zone of inhibition

## I. INTRODUCTION

Factors that may contribute to a persistent periradicular infection after root canal treatment include intraradicular infection extra radicular infection, foreign body reaction, and cysts containing cholesterol crystals.<sup>1</sup> The main cause of failure is generally believed to be the survival of microorganisms in the apical portion of the root - filled tooth.<sup>1-2</sup>

Many studies have shown Enterococcus faecalis to be the most common bacteria isolated from teeth with failed root canal treatment.<sup>3</sup> The pathogenicity of E.faecalis has been attributed to its inherent antimicrobial resistance, increased virulence factors

such as adherence to host cells<sup>4</sup>, expression of proteins to ensure cell survival as a result of altered environmental nutrient supply<sup>5</sup>, adherence to collagen in the presence of serum and ability to form calcified biofilm within the root canal.<sup>6,7</sup>

Candida albicans is another microorganism that has been regularly identified in teeth with persistent apical periodontitis after treatment.<sup>8</sup> It can survive as a monoinfection and even invade dentinal tubules.<sup>9</sup>

The ultimate goal of endodontic treatment is to remove bacteria, there by - products and pulpal residues from infected root canals and the entire seal of disinfected root canals.<sup>9</sup> Among the available irrigants, sodium hypochlorite (NaOCl) has been accepted as the main irrigants during the treatment of the root canal for decades<sup>10</sup> and used at different concentrations (0.5% to 5.25% or higher). Its main property is the ability of dissolving organic tissue<sup>11</sup>. Sodium hypochlorite is effective in killing bacteria, spores, yeast and virus in vitro.<sup>12</sup>

Probiotics have recently been introduced in dentistry for treatment or disease prevention. "Probiotics" as defined by the World Health Organization are live microorganisms that provide the host with a health benefit when administered in adequate quantities. Bacteria or yeast may be probiotics, but most probiotics are bacteria. Bacteria with lactic acid are more popular among bacteria.<sup>13-14</sup>

The most commonly used strains of probiotic bacteria belong to the genera Lactobacillus. Species of Lactobacillus help to produce enzymes that digest and metabolize proteins and carbohydrates. Over 100 species of L. Rhamnosus, L. Acidophilus and L. Casei was identified.<sup>13-14</sup>

The potential use of probiotics for oral health has recently attracted several researchers' attention. Although only a few clinical studies have been carried out to date, the results suggest that probiotics may be useful in the prevention and treatment of oral infections, including dental caries, periodontal disease and halitosis.<sup>15</sup>

To the best of our knowledge probiotics pertaining to L.Rhamnosus and L. Casei has not been used against E.faecalis and C.albicans.

Therefore, this study was carried out to assess and compare the effectiveness of three different probiotic strains and sodium hypochlorite against E.faecalis and C.albicans.

The null hypothesis was that different probiotic strains used in this study are not effective in inhibiting the growth of *E. faecalis* and *C. albicans*.

## II. MATERIALS AND METHOD

For the present microbiological study, three commercial probiotic strains and 5.25% Sodium hypochlorite were purchased for utilization in this study.

The probiotic were delivered in wrapped ice packaging in order to preserve viability of the organisms. Upon arrival, the probiotics were stored in a refrigerator at 30° F.

For evaluating zone of inhibition and colony forming unit counts following groups were selected:

- Group 1: Lactobacillus Acidophilus
- Group 2: Lactobacillus Casei
- Group 3: Lactobacillus. Rhamnosus
- Group 4: 5.25% Sodium Hypochlorite
- Group 5: Normal Saline

### Pathogenic strain selection

*Enterococcus faecalis* ATCC 29212 was chosen for this study after extensive literature review, which revealed that this organism possesses multiple properties leading to its key role as an endodontic pathogen.

*Candida albicans* ATCC 10231 was chosen as another pathogenic test organism because of its biphasic nature, which allows it to be the universal co-aggregate in biofilms; it is the most frequently isolated fungus from root filled teeth with apical periodontitis.

**Phase 1:** Testing for Probiotic, 5.25% sodium hypochlorite and normal saline efficacy against *E. faecalis* and *C. albicans*:

*Lactobacillus* strain was isolated from each of the commercially available probiotic. These strains were further evaluated using different microbiological techniques. The three probiotic groups were extracted according to manufacturer's instructions and incubated for 48 hours. Probiotic samples were then placed in 9ml MRS broth (De Man, Rogosa and Sharpe Broth) and vortexed to insure a homogenous mixture and then set to a 2 McFarland standard.

The pathogenic organisms *E. faecalis* and *C. Albicans* were freshly stocked, placed in 9ml MRS Broth vortexed to insure homogenous mixture, then set to a 1 McFarland standard. 500 microliters of *E. faecalis* and *C. Albicans* was plated on 100 mm diameter blood agar plates and spread with a sterile L-Loop. The sample was incubated for 24 hours to allow growth of a bacterial lawn.

### Agar Cup Method/Disc diffusion method:

Twenty microliters of prepared solution of each test Groups 1,2,3,4 & 5 were placed on filter discs and left for 15 seconds to allow the discs to saturate with the probiotics strain, 5.25% sodium hypochlorite and normal saline on sterile blank paper. The discs were then transferred to the previously grown lawns of the pathogenic test organisms, *E. faecalis* and *C. albicans*, according to a 5 group template. The test was conducted three times per group

against the organisms, *E. faecalis* and *C. albicans* to allow proper statistical analysis. Results for ZOI's were measured with a digital micrometre in mm increments at 48 hours and 168 hours (1 week).

### Phase 2: Intra-canal delivery vehicle for probiotics:

The Poloxamer was dissolved in cold MRS broth at a concentration of 30% by a Magnetic stirrer for 10 to 15 minutes until a homogenous mixture was obtained. The Poloxamer was then sterilized and placed in the refrigerator at 4° C until testing was conducted. The MRS broth mixture was utilized for this study.

### Testing for probiotic/pathogenic organism Poloxamer mixture:

Serial dilutions were made by adding 0.1 ml of Poloxamer mix to 9.9 ml sterile saline, followed by serially diluting the mixture by 0.1 ml into 9.9 ml sterile saline three times, reaching dilutions of  $10^{-2}$ ,  $10^{-4}$ ,  $10^{-6}$  respectively. Plating was conducted by adding 500 ml of dilutions onto blood agar plates, followed by incubation at 37° C for 72 hours. CFU (colony forming units) were evaluated for all test groups (groups 1 to 5) and compared to controls based upon the dilutions that were performed to reflect the actual number of probiotics and pathogenic organisms in each group.

Data was analyzed using SPSS version 21. Intergroup comparison was done using Kruskal Wallis test along with post hoc pairwise comparison by Mann Whitney U test. Intragroup comparison was done using Wilcoxon signed rank test. The level of statistical significance was set at 0.05.

## III. RESULTS:

Table 1 shows intergroup comparison of mean zone of inhibition (ZOI) against *C. albicans* and *E. faecalis* at 48 hours and 1 week.

On comparing ZOI between groups at 48 hours and 1 week against *C. albicans* and *E. faecalis*, the maximum ZOI was found in Group 4 (5.25% NaOCl) and minimum in Group 5 (Normal Saline). Intergroup comparison of mean ZOI showed statistically significant difference among all tested groups for both the microorganisms and at both time intervals.

Table 2 & 3 shows intergroup comparison of mean number of colony counts against *C. albicans* and *E. faecalis* respectively. The mean number of colony counts amongst the groups against *C. albicans* was found to be highest in Group 5 (Normal saline) and lowest in group 2 (*Lactobacillus Casei*).

Similarly, the mean number of colony counts amongst the groups against *E. faecalis* was found to be highest in Group 5 (Normal saline) and lowest in group 3 (*Lactobacillus Rhamnosus*).

Intergroup comparison of mean CFU/ml counts against *C. albicans* and *E. faecalis* showed that there was statistically significant difference amongst all the groups.

Intragroup comparison of mean zone of inhibition (ZOI) against *E. faecalis* & *C. albicans* at 48 hours and at 1 week was statistically insignificant.

#### IV. DISCUSSION:

It is known that microorganisms in infected root canals include a limited group of species compared to the rest of the normal flora found in the oral cavity. Enterococcus faecalis and Candida albicans are bacterial strains consistently found in endodontic disease after treatment.<sup>1-3</sup>

In order to maximize the disinfection of the root canal system in infected cases, in particular in the treatment of endodontically treated teeth, the use of intracanal drugs can help reduce the remaining microorganisms and provide an environment conducive to the repair of periapical tissue.<sup>16</sup>

An antimicrobial agent that does not cause toxic effects on periapical tissues must be the ideal irrigation solution.<sup>17</sup> Probiotics have recently been introduced in dentistry to control the growth of some oral microorganisms, including cariogenic species associated with dental caries. In the control of periodontal disease, the oral administration of probiotics was also investigated by reducing plaque levels and inflammation of the gingiva.<sup>15-16</sup> The most commonly used bacterial strains of Probiotic belong to the genera Lactobacillus and Bifid bacterium.<sup>11-16</sup>

In this study, three different probiotic commercial strains of *L. acidophilus* (Group 1), *L. Rhamnosus* (Group 2) and *L. Casei* (Group 3) were used.

In the present study normal saline was completely ineffective against *E. faecalis* and *C. albicans* at both time periods. This finding was similar to Bohora and others findings<sup>17</sup>. As an antimicrobial agent, they found saline to be completely ineffective.

The null hypothesis was rejected in the present study, since all three Probiotic strains (*L. acidophilus*, *L. Rhamnosus* and *L. Casei*) inhibited the growth of *E. faecalis* and *C. Albicans* at both time periods.

The reason could be due to release of organic acid by probiotics into the bacterial cell and disrupting the regular metabolism. They also produce hydrogen peroxide that causes cell wall rupture and bacteriocins that inhibit DNA and other protein structures.<sup>18</sup> Geier<sup>19</sup> reported that Probiotic kills pathogens by producing bacteriocins and acids / peroxides and altering the pH of the local environment. Probiotics also compete with carbohydrates required for metabolism and remove gram - negative bacteria from the organism by producing fatty acids with toxic effects.<sup>18</sup> Fatty acid can disrupt the external membranes of gram - negative pathogens that inhibit the growth of pathogen.<sup>20-22</sup>

Till date very few studies have been done were Probiotics were checked against endodontic pathogens.

Similar to our results, Seifelnasr<sup>23</sup> found three probiotic strains in their study, i.e. *L. acidophilus*, *Rhamnosus* and *Casei* to be effective against *E. faecalis* and *C. Albicans*. Contrary to our results, Hammad<sup>24</sup> has shown that lactobacillus strains have no inhibitory effect on *E. faecalis*. Montecinos and others<sup>25</sup> examined the relationship between *Rhamnosus* probiotic strain during the Biofilm formation. They found that probiotic strain interfered in vitro with the *E. faecalis* biofilm formation, thereby intensifying the growth of *E. faecalis* biofilm. Bohora and others<sup>26</sup> and McGroarty and others<sup>27</sup> evaluated the effectiveness of Lactobacillus strains in preventing the growth of *E. faecalis* and observed that Lactobacilli had an inhibitory effect on the growth of *E. faecalis*. Hasslöf and others<sup>28</sup> investigated the ability of

different lactobacilli strains, to inhibit growth of *C. albicans* in vitro. Their result showed that *Rhamnosus* displayed a slight inhibition of *C. albicans*. Among previous human clinical studies, Lactobacillus *Rhamnosus*<sup>29</sup> could inhibit the oral cariogenic bacteria. In another study it was found that *Rhamnosus* could reduce the prevalence of yeast in elder persons.<sup>30</sup> Similar study was done by Kraft-Bodi and others<sup>31</sup> found a statistically significant reduction in the prevalence of high *Candida* counts in the probiotic group containing Lactobacillus strains but not in the placebo group. Contrary to this study, Ahola and others<sup>32</sup> observed no significant difference between effects of probiotic and those of control cheese on salivary *Candida* counts. Denkova and others<sup>29</sup> in their study observed lactobacilli strains to restrain the growth of *C. albicans* and by the 72 hour of co-cultivation the pathogen retained high concentration of viable cells.

In our study Group 4 (5.25% NaOCl) showed highest zone of inhibition than Group 1, 2, 3 and 5 against *E. faecalis* and *C. albicans*.

This could be due to hypochlorous acid released from NaOCl which is responsible for bacteria inactivation. Hypochlorous acid disrupts oxidative phosphorylation and other membrane-associated activities as well as DNA synthesis.<sup>11,12</sup> Vienna and others<sup>33</sup> showed that resistant microorganism, *C. Albicans*, was killed in vitro in 15 s by 5.25% NaOCl. Siqueira and others<sup>9</sup> using *E. faecalis* infected root canals demonstrated the superior antibacterial affect against root canal bacteria by Sodium hypochlorite in comparison with physiological saline.

#### V. CONCLUSION

Within the limitation of this study, it can be concluded that:

- I. All probiotic strains used were able to inhibit growth of *E. faecalis* and *C. Albicans* at both time periods.
- II. Against *E. faecalis* and *C. Albicans*, 5.25 % NaOCl showed significantly higher zone of inhibition followed by all probiotic strains at both time periods.
- III. There was insignificant difference in zone of inhibition at 48 hours and 1 week.

This in vitro study demonstrated that probiotics show a potential in root canal therapy, but further in vitro and in vivo studies are needed to determine its full potential against different endodontic infections.

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**Table 1 shows intergroup comparison of mean zone of inhibition (ZOI) against C.albicans and E.faecalis at 48 hours and 1 week**

Antimicrobial Agents	C.albicans		E.faecalis	
	ZOI (mm) At 48 hours	ZOI(mm) At 1 week	ZOI (mm) At 48 hours	ZOI (mm) At 1 week
Group1:Lactobacillus Acidophilus	5.6867 <sup>A</sup>	6.2533 <sup>B</sup>	5.1433 <sup>C</sup>	6.6700 <sup>D</sup>
Group2: Lactobacillus Casei	2.4333 <sup>A</sup>	2.2233 <sup>B</sup>	3.8433 <sup>C</sup>	4.9667 <sup>D</sup>
Group3: Lactobacillus. Rhamnosus	1.0067 <sup>A</sup>	1.0333 <sup>B</sup>	1.1633 <sup>C</sup>	3.3667 <sup>D</sup>
Group4: 5.25% Sodium Hypochlorite	9.0267 <sup>A</sup>	9.1367 <sup>B</sup>	11.5267 <sup>C</sup>	10.1467 <sup>D</sup>
Group5: Normal Saline	0 <sup>A</sup>	0 <sup>B</sup>	0 <sup>C</sup>	0 <sup>D</sup>

Values with same letters indicate statistically significant differences

**Table 2 shows intergroup comparison of mean number of colony counts against C.albicans at 72 hours.**

Organisms	GROUP 1	GROUP 2	GROUP 3	GROUP 4	Control Avg cfu/ml
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<b>Candida Albicans</b>	$4 \times 10^4$	$1 \times 10^3$	$1.5 \times 10^3$	$3.8 \times 10^3$	$7.0 \times 10^5$
<b>Log<sub>10</sub> Test Avg</b>	4.60 <sup>A</sup>	3.0 <sup>A</sup>	3.17 <sup>A</sup>	4.57 <sup>A</sup>	5.84 <sup>A</sup>

Values with same letters indicate statistically significant differences

**Table 3 shows intergroup comparison of mean number of colony counts against E.faecalis at 72 hours**

Organisms	GROUP 1	GROUP 2	GROUP 3	GROUP 4	Control Avg cfu/ml
<b>E.faecalis</b>	$10^{-1}$	$10^{-2}$	$10^{-3}$	$4.4 \times 10^3$	$3.5 \times 10^5$
<b>Log<sub>10</sub> Test Avg</b>	-1 <sup>A</sup>	-2 <sup>A</sup>	-3 <sup>A</sup>	3.64 <sup>A</sup>	5.54 <sup>A</sup>

Values with same letters indicate statistically significant differences

**Legends**

**Table 1** shows intergroup comparison of mean zone of inhibition (ZOI) against C.albicans and E.faecalis at 48 hours and 1 week

**Table 2** shows intergroup comparison of mean number of colony counts against C.albicans at 72 hours.

**Table 3** shows intergroup comparison of mean number of colony counts against E.faecalis at 72 hours

**Figure 1:** E.faecalis on blood agar plate (1 a), ZOI's for E. faecalis at 24 hrs (1 b), ZOI's for E. faecalis at 72 hrs (1 c)

**Figure 2:** C.albicans on blood agar plate (2 a), ZOI's for C.albicans at 24 hrs (2 b), ZOI's for C.albicans at 72 hrs (2 c)

# Availability and Utilization of E-Learning Technologies among Science Education Students in Tertiary Institutions in Rivers State.

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## Abstract.

The study investigated the “Availability and Utilization of E-Learning Technologies among Science Education Students in Tertiary Institutions in Rivers State”. The study was specifically based on determining e-learning technologies available in the teaching and learning of science education in Rivers State universities, investigating how e-learning technologies are utilized in the teaching and learning of science education, identifying the challenges encountered in the utilization of e-learning technologies in the teaching and learning of science education in Rivers State Universities. The sample of the study was 15 science education teachers and 30 final year science education students selected from each of the three universities in Rivers State. The instrument used for the study was a questionnaire structured by the researcher based on each of the research questions. The instrument was titled “Availability and Utilization of E-learning Technologies in Science Education (AUETSE)”. The validity of the instrument was carried out by two research experts in the department of science education in Ignatius Ajuru University of Education. The reliability of the instrument was determined using test- retest method which yielded a reliability coefficient of 0.63. The gathered data were analyzed using percentage, mean and standard deviation. The study found that overhead projector, E-books, E-library, E-mail, microphone and mobile phone are available for use in the teaching of science education in Rivers State Universities. Whereas, Wi-fi, audio-visuals aids, educational software, computers, teleconferencing and computer laboratory are not readily available for use. Also, search for learning materials; ease access to online information, public address, enhancing student understanding, broadening students’ view of concepts amongst others. Erratic power supply, inadequacy of e-learning facilities, inadequate technical know-how, lack of ICT competence and others were identified as the challenges encountered in the utilization of e-learning technologies in the teaching and learning of science education in Rivers State Universities. The study recommends science teachers should engage the usage of information and communication technologies in the class in other to get upcoming science fit for the demands of the contemporary society.

**Keywords;** Availability, Utilization, E-learning, Technologies.

## Introduction

The educational system of Nigeria is approaching a significant echelon which traditional norms cannot succeed its competition. The fast approaching educational system rides on the wings of information and communication technology. In other words the invention of various forms of communication and information technologies has brought an innovative phase of educational system to reality. In past decades, not only was formal education limited to the walls of the classroom, access to information responsible for educational revolution was also

denied. Invention of information and communication technologies has conked out the restrictions on formal education system in recent times. The application of ICT in higher institutions is more critical today than ever before since its growing power and capabilities are triggering a change the learning environments in education (Pajo & Wallace, 2001). Teaching and learning through the implementation of information and communication tools has revolutionized beyond the ordinary classroom, teacher, chalk and blackboard.

Education today is evolving around from the traditional system of learning due to the emergence of new technologies in transmitting information and communication. Statistics have shown that more than eighty percent of students in the higher institution of learning are privileged to access smart phones and more than few own laptops which give them unrestricted access to internets, information pertaining to their various discipline is readily available in goggle and other search engines. According to Abiodun-Oyebanji and Omotayo (2012), information and communication technology is the combination of computer and telecommunication system to improve the quality of teaching, learning, research and communication through its gathering, processing, connecting, storing, analyzing data functions and dissemination of information. Information and communication technology resources according to the Nigeria National Policy for Information Technology (2007), includes any equipment or interconnected system or sub-system of equipment that is used in the automatic acquisition, storage, manipulation, management control, display, switching, interchange, transmission or reception of data or information.

E-learning could be regarded as the application of information and communication technologies and electronic media in teaching and learning process. E- learning is the appropriate application of the computer and electronic systems to enhance the transfer of skills and knowledge in a more comprehensive approach not restricted to a particular courses, technologies or infrastructure (Rosenberg, 2001). In a broad sense, Wikipedia (2010) described e-learning as type of teaching and learning which encompasses all forms of educational technologies such as multimedia learning, Computer Based Interaction (CBL), Technology Enhanced Learning (TEL), Virtual Education, Internet/computer Based Training e.t.c. Ajayi (2008) explained that the use of these technological resources include various methods such as systematized feedback, computer-based operation, world wide website (www), teleconferencing (audio and video conferencing) and computer assisted instructions (CAI)..

Okereke (2005) noted that, in the developed countries e-learning technologies such as electronic mail, virtual classroom, teleconferencing, and internet based learning among others has been adopted to aid education for several years. Due to globalization and information revolution, e-learning mechanism is gradually annihilating

traditional teaching and learning methods in schools that intends raising global competitive learners. ICTs are said to help expand access to education, strengthen the relevance of education to the increasingly digital work place, and raise educational quality helping to make teaching and learning an engaging, active process connected to real life and many more (Ike, Iwu and Chimezie, 2006). *ICT, according to Newhouse (2002b) promote active learning as it develops an appropriate level of capability in students making it possible for them to become more engaged with their own learning, and to achieve learning outcomes across the curriculum. He went on to point out that it support pedagogical practices that provide learning environments that are more learner-centred, knowledge-centred, assessment-centred, and community centred. Bozalek (2011) considered this ICT as emerging technologies which usually will influence greatly on teaching, learning, or creative inquiry on learners or those technologies which are on the rise, like podcasts, blogs and e-books etc, have lived up to expectation as it appears to be very vital to education, he stressed further that because of the low cost and its ease of access and usage, podcast is viewed as very useful in education.*

Information and communication technologies represent a new paradigm in education that at onset grows on the edge in relative obscurity and often seems to be of no threat or even of little value to users of the sustaining technology (Sloan, 2011). As time fast approaches, information communication technologies that was once not given proper consideration in education due to the fixation to traditional teaching method has conveyed major advancement to the field of impacting knowledge. *Omatoyo and Umoru (2015) affirmed that e-learning technologies have the potential to innovate, accelerate, enrich and deepen skills, motivate and engage students, help students relate school experiences to work practices, create economic viability for tomorrows workers as well as strengthen teaching.* Application of E-learning technologies in education in recent time has enhanced the momentum of impacting knowledge and values to learners at any particular time and place. E-learning creates an open learning environment for learners without restrictions to the level of available information. Clover (2017) opined that e-learning facilities such as web based learning benefits education in diverse ways which include;

- Efficiency in delivering courses online
- Promotes active and independent learning
- Enhances flexibility and convenience in teaching and learning
- It also enhances repeat and retention of lessons and instruction.

According to Manir (2017)The use of new multimedia technologies and the Internet in learning is seen as a means to improve accessibility, efficiency and quality of learning by facilitating access to resources and services as well as remote exchanges and collaboration. E-Learning incorporates a wide variety of learning

strategies and technologies. It ranges from the way students utilize e-mails and accessing course work or materials online while following a course on campus to programmes offered entirely online (Abbas, Alhasan, & Hamza, 2015)

However, implementation of e-learning technologies is faced with myriads of challenges in teaching and learning especially in developing countries especially Nigeria. Due to so many negatives Nigeria political system, she could not afford broad access to all the emerging technologies in education to enable wide usage of e-learning facilities in universities (Manir, 2017). He further pinpointed that part of difficulties in the implementation of e-learning facilities include difficulties with computer operations, internet access, erratic power supply, inadequate skills, low literacy among others. Olutola and Olatoye (2015) in their study, identified various challenges of e-learning in tertiary institutions in the developing countries they are;

- Inadequate e-learning experts or manpower to train both staff and the students
- Malfunctioning of internet facilities in tertiary institutions
- Inability to afford e-learning technologies for teaching and learning in schools
- Inadequate power supply
- Inadequate funding for tertiary institutions
- Inadequate computers and laptops for teaching and learning.

Based on the standpoint of the information revolution technologies have brought through electronic means, education system which is committed equipping learners with skills for societal competence and survival, should implement use of trending or emerging technologies in curriculum delivery. Most especially in science, extensive research is highly needful for effective transfer of knowledge of learners. However, little of these e-learning technologies are available utilized in educational systems of most developing countries to enhance teaching and learning of science. It is in this regard this study tends to determine the availability and utilization of E-learning technologies among science education students in tertiary institutions in Rivers State

### **Purpose of the study**

The principal purpose of the study was to investigate the availability and utilization of E-learning technologies among science education students in tertiary institutions in Rivers State. In definite terms, the study sought

1. To determine e-learning technologies available in the teaching and learning of science education in rivers state universities
2. To investigate how e-learning technologies are utilized in the teaching and learning of science education

3. Identify the challenges encountered in the utilization of e-learning technologies in the teaching and learning of science education in Rivers State Universities.

### **Research questions**

1. What are the e-learning technologies available in the teaching and learning of science education in Rivers State Universities?
2. In what ways are e-learning technologies are utilized in the teaching and learning of science education?
3. What are the challenges encountered in the utilization of e-learning technologies in the teaching and learning of science education in Rivers State Universities?

### **Hypotheses**

- There is no significant difference between the mean response of science education teachers and students on how e-learning technologies are utilized in the teaching and learning of science education
- There is no significant difference between the mean response of science education teachers and students on challenges encountered in the utilization of e-learning technologies in the teaching and learning of science education in Rivers State Universities.

### **Methodology.**

Due to the fact that this study sought the opinion of a given population based on the research questions, descriptive survey research design was therefore adopted for the study. The sample size for the study was fifteen (15) science education teachers randomly selected at equal proportion from each of the three universities in Rivers State, while thirty (30) final year science education students were also sampled from the three Universities in Rivers State (Rivers State University, University of Port Harcourt and Ignatius Ajuru University of Education). The instrument used for the study was a questionnaire structured by the researcher based on each of the research questions. The instrument was titled “Availability and Utilization of E-learning Technologies in Science Education (AUETSE)”. The instrument was structured in four point rating scale of agreement, i.e (Strongly Agree, Agree, Disagree, Strongly Disagree) excluding research question one that was structured in Yes or No response. The validity of the instrument was carried out by two research experts in the department of science education in Ignatius Ajuru University of Education. The reliability of the instrument was determined using test- retest method. Twenty copies of the instrument were distributed to population of science education

teachers and students who were not included in the study on to different occasions. The result was correlated using Pearson Product Moment Correlation, and yielded a reliability coefficient of 0.63, which indicated that the instrument was reliable. The instrument were administered to the respondents and collected on the spot if it's available. The gathered data were analyzed using percentage, mean and standard deviation

**Result and Discussion**

**Research Question 1:** What are the e-learning technologies available in the teaching and learning of science education in Rivers State Universities?

Table 1: **Mean response of science education teachers and students on e-learning technologies available in the teaching and learning of science education in Rivers State Universities**

S/N	Items	Teachers =15 Total Response (%)	Remark	Students=30 Total Response (%)	Remark
1	Overhead Projector	12 (80.0)	A	22 (73.3)	A
2	E-books	15 (100.0)	A	28 (93.3)	A
3	Wi-fi/internet facilities	5 (33.3)	NA	18 (60.0)	NA
4	E-library	10 (66.7)	A	16 (53.3)	A
5	E-mail	15 (100.0)	A	24 (80.0)	A
6	Audio-visual aids	4 (26.7)	NA	8 (26.6)	NA
7	Microphone	11 (73.3)	A	16 (53.3)	A
8	Mobile phone	15 (100.0)	A	30 (100.0)	A
9	Educational softwares	3 (20.0)	NA	5 (16.7)	NA
10	Computers	4 (26.7)	NA	11 (36.7)	NA
11	Teleconferencing	3 (20.0)	NA	2 (6.7)	NA
12	Computer laboratory	3 (20.0)	NA	5 (16.7)	NA

**Field survey, 2018 \*A- Available, NA- Not Available**

Table 1 contains science education teachers and students' mean response on the availability of e-learning technologies available in the teaching and learning of science education in Rivers State Universities. The study found that overhead projector, E-books, E-library, E-mail, microphone and mobile phone are available for use in the teaching of science education in Rivers State Universities. Whereas, Wi-Fi, audio-visuals aids, educational software, computers, teleconferencing and computer laboratory are not readily available for use in the teaching and learning of science education in Rivers State Universities.

**Research Question 2:** In what ways are e-learning technologies are utilized in the teaching and learning of science education?

**Table 2: Mean response of science education teachers and students on ways are e-learning technologies are utilized in the teaching and learning of science education**

S/N	Items	Teachers=15			Students= 30		
		Mean	S.D	Remark	Mean	S.D	Remark
1	Search for learning materials	3.78	0.77	Agreed	3.86	0.89	Agreed
2	Ease access to online information	3.69	0.65	Agreed	3.60	0.92	Agreed
3	Public address	3.88	0.59	Agreed	3.63	0.88	Agreed
4	Enhancing student understanding	3.54	0.72	Agreed	3.74	0.75	Agreed
5	Broadening students' view of concepts	3.23	0.84	Agreed	3.80	0.92	Agreed
6.	Facilitates teaching and learning process	3.45	0.68	Agreed	3.62	0.72	Agreed
7.	Assignment and Project Works	3.68	0.87	Agreed	3.60	0.69	Agreed
8.	Improving teaching mode	3.59	0.80	Agreed	3.73	0.87	Agreed
9	Sharing of educational information.	3.41	0.68	Agreed	3.59	1.00	Agreed
10	Increase students motivation	3.65	0.77	Agreed	3.62	0.69	Agreed
11	Providing linkage between classroom and the world of work	3.70	0.92	Agreed	3.50	0.78	Agreed
<b>Grand Mean &amp; S.D</b>		<b>3.60</b>	<b>0.75</b>		<b>3.66</b>	<b>0.83</b>	

**Field survey, 2018.**

Table 2 shows the mean responses of science education teachers and students on ways are e-learning technologies are utilized in the teaching and learning of science education. Based on the acceptance mean value of 2.50, both science education teachers and students indicated that; Search for learning materials (3.78 & 3.86), ease access to online information (3.69 & 3.60), public address (3.88 & 3.63), enhancing student understanding (3.54 & 3.74), broadening students' view of concepts (3.23 & 3.80), facilitates teaching and learning process (3.45 & 3.62), assignment and Project Works (3.68 & 3.60), improving teaching mode (3.59 & 3.73), sharing of educational information. (3.41 & 3.59), increase students motivation (3.65 & 3.62), providing linkage between classroom and the world of work (3.70 & 3.50) are ways are e-learning technologies are utilized in the teaching and learning of science education. This is confirmed by the findings of Manir (2017) who observed that the use of new multimedia technologies and the Internet in learning is seen as a means to improve accessibility, efficiency and quality of learning by facilitating access to resources and services as well as remote exchanges and collaboration

**Research Question 3:** What are the challenges encountered in the utilization of e-learning technologies in the teaching and learning of science education in Rivers State Universities?

**Table 3: Mean response science education teachers and students on challenges encountered in the utilization of e-learning technologies in the teaching and learning of science education**

S/N	Items	Teachers=15			Students= 30		
		Mean	S.D	Remark	Mean	S.D	Remark
1.	Erratic power supply	3.56	0.67	Agreed	3.40	1.02	Agreed
2.	inadequacy of e-learning facilities	3.44	0.93	Agreed	3.82	0.76	Agreed
3.	Inadequate technical know-how	3.63	0.80	Agreed	3.55	0.82	Agreed
4.	Lack of ICT competence	3.29	0.71	Agreed	3.53	0.71	Agreed
5.	Lack of basic school electrical facilities	3.65	0.80	Agreed	3.41	0.83	Agreed
6	Ignorance	3.31	0.91	Agreed	3.60	0.69	Agreed
7	High cost of e-learning facilities	3.86	0.74	Agreed	3.09	0.58	Agreed
8	Lack of good maintenance of e-learning technologies	3.50	0.87	Agreed	3.64	1.03	Agreed
<b>Grand Mean &amp; S.D</b>		<b>3.53</b>	<b>0.80</b>		<b>3.50</b>	<b>0.81</b>	

**Field survey 2018.**

Table 3 presents mean response science education teachers and students on challenges encountered in the utilization of e-learning technologies in the teaching and learning of science education in Rivers State Universities. Based on mean level of agreement, respondent showed that erratic power supply (3.56 &), inadequacy of e-learning facilities (3.44 & 3.82), inadequate technical know-how (3.63 & 3.55), lack of ICT competence (3.29 & 3.53), lack of basic school electrical facilities (3.65 & 3.41), ignorance (3.31 & 3.60), high cost of e-learning facilities (3.86 & 3.09), lack of good maintenance of e-learning technologies (3.50 & 3.64), are challenges encountered in the utilization of e-learning technologies in the teaching and learning of science education in Rivers State Universities. This finding is in conformity with Olutola and Olatoye (2015) who identified various challenges of e-learning in tertiary institutions in the developing countries which includes inadequate e-learning experts or manpower to train both staff and the students, malfunctioning of internet facilities in tertiary institutions, inadequate computers and laptops for teaching and learning and inadequate power supply.

**Hypothesis**

**H<sub>01</sub>**; There is no significant difference between the mean response of science education teachers and students on how e-learning technologies are utilized in the teaching and learning of science education

**Table 4. z-test analysis on the mean response of science education teachers and students on how e-learning technologies are utilized in the teaching and learning of science education.**

Groups	Mean	S.D	N	Lev. of z-crit sig	z-cal	Remark
Teachers	3.60	0.75	15	0.05	1.96	Fail to reject
Students	3.66	0.83	30			

Table 4 present the z-test analysis on the mean response of science education teachers and students on how e-learning technologies are utilized in the teaching and learning of science education. It is seen that at 0.05 level of significance, z-critical was 1.96. The comparism of the mean and standard deviation using z-test resulted to z-calculated value of 0.23. Therefore since the obtained z- crit is higher than the z- cal, the hypothesis failed to reject.

**H<sub>02</sub>**; There is no significant difference between the mean response of science education teachers and students on challenges encountered in the utilization of e-learning technologies in the teaching and learning of science education in Rivers State Universities.

**Table 5. Z-test analysis on the mean response of science education teachers and students on challenges encountered in the utilization of e-learning technologies in the teaching and learning of science education.**

Groups	Mean	S.D	N	Lev. of z-crit sig.	z-cal	Remark
Teachers	3.53	0.80	15	0.05	1.96	Fail to reject
Students	3.50	0.81	30			

Table 4 present the z-test analysis on the mean response of science education teachers and students on challenges encountered in the utilization of e-learning technologies in the teaching and learning of science education. It also obvious from the table that at 0.05 level of significance, z-critical was 1.96. The comparism between the means and standard deviations using z-test resulted to z-calculated value of 0.12. Therefore since the obtained z-crit is higher than the z-cal, the hypothesis failed to reject.

### Conclusion

The study concludes based on the findings that certain information and communication technologies that is efficient in the teaching and learning such as computer, computer laboratory, Wi-Fi and soon are not readily available for teaching and learning purposes for science education students. Whereas, ICT tools like microphone, overhead projector, phones, e-library among others are available for use.

Also drawing from the findings of the study, it was concluded that various ways ICT tools are utilized in the teaching and learning of science education involves, search for learning materials, ease access to online

information, public address, enhancing student understanding, broadening students' view of concepts, facilitates teaching and learning process, assignment and Project Works, improving teaching mode, sharing of educational information, increase students motivation, providing linkage between classroom and the world of work and many more

The study also found that certain factors militate against the effective utilization of ICT facilities in the teaching and learning of science education which includes erratic power supply, inadequacy of e-learning facilities, inadequate technical know-how, lack of ICT competence, lack of basic school electrical facilities, ignorance, high cost of e-learning facilities, lack of good maintenance of e-learning technologies.

### **Recommendations**

The researcher recommends the following based on the result of the study.

- Tertiary institutions should make information and communication technologies available for use in the teaching and learning of science education as this will equip learners with updated issues in the fields of science.
- Teachers should engage the usage of information and communication technologies in the class in order to get upcoming science fit for the demands of the contemporary society.
- Tertiary institutions should make learning environment favourable for the usage of information and communication technologies at any given time without any hindrance.

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# Amphibian Decline and Agrocontaminants: A Cause for Concern

## A Review On Amphibian Population Decline

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As a consequence of agricultural, urban and industrial development, the chemical profiles of air, soils and water bodies are being altered. The alteration of the habitat may have deleterious effects on native flora and fauna. As we modify environment for our own needs, the destruction of the habitat of various species occurs that directly leads to the disappearance of many of them. The current global loss of biodiversity is a process generated by such anthropogenic interventions. During the last few decades amphibian decline has emerged as a key example of the global biodiversity crisis. Concern is so great for the phenomenon of amphibian declines, that the International Union for Conservation of Nature and Natural Resources (IUCN) has set up the Declining Amphibian Population Task Force (DAPTF) to investigate the matter in the year 1991.

The impact of environmental contaminants on amphibians is a subject that has received limited attention. It is possible that amphibians are responding adversely to the environmental changes. They were abundant and functionally important elements in many terrestrial and most freshwater ecosystems and constituted a significant component of world's biota. They are the only class of vertebrates that do not include any pests or species harmful to man. Amphibians play key roles in many aquatic and terrestrial ecosystems. As tadpoles they consume vast quantities of algae and other plants, thus regulating aquatic oxygen levels. On land adult amphibians act as excellent biological control agents as they consume large quantities of insects and other invertebrates. The pest control benefits of amphibians have long been recognized. Amphibians also support the many different types of animals that prey upon them; they are important in the diet of many reptiles, birds, mammals and freshwater fishes. Thus in both aquatic and terrestrial food webs, amphibians often play an important role in energy transfer and nutrient cycles.

They have survived more than 300 million years through drastic environmental changes that led to the disappearance of dinosaurs and many other species. Yet scientists are alarmed by the recent rapid decline of amphibians in many parts of the world. In many instances their decline is attributed to adverse human influences acting locally such as deforestation, draining of wetlands and pollution. Among amphibians, anurans, particularly frogs are likely to be exposed to dangerous levels of chemicals because of their higher concentrations in irrigation ditches, ponds and marshes. They are greatly valued as indicators of environmental stress as they are in close contact with water as larvae and have some contact with land as adults. Therefore, they experience both aquatic and terrestrial stressors. In light of their apparent sensitivity, and extremely permeable skin the frogs may serve as early warning systems for environmental degradation. There has been dramatic increase in sightings of deformed frogs all over the world (Blaustein and Bancroft, 2007), and as we choke our streams, ponds and wetlands with lead, mercury, fertilizers and pesticides, frogs are being poisoned and deformed on a massive scale.

Review of literature reveals that they show moderate to high sensitivity in acute and chronic sensitivity tests compared to other aquatic organisms. At present there are no regulatory criteria on toxicants for frogs. Instead, data from fish studies are often assumed to provide knowledge about toxicants on frogs also. This implies that fish and frogs are equally sensitive to the toxicants for which criteria have been established. But Birge *et al.* (2000) compared the toxicity of a variety of toxicants to amphibians and many fish species. In all, 50 metals and compounds were tested. Their results showed that amphibians have lower LC<sub>50</sub> values than fishes. The researcher's overall conclusion was that there exists great variation among amphibian species in their sensitivity to metal and other organic contaminants; they generally are more sensitive than fishes and the water quality criteria established for fish may not be protective of amphibians. Owing to their bimodal life, complex life history, varied reproductive strategies and highly sensitive skin amphibians tend to be more sensitive to chemical contaminants than most other species of vertebrates (Daniels, 2003).

Amphibian population declines were first recognised as a global phenomenon in the early 1990s (Wake, 1991). While pesticides have the potential to affect almost all aquatic species their impact on amphibians are of particular concern because of the apparent global decline of many species in the past two decades. Amphibians are good bioindicators of environmental pollution due to their susceptibility to chemicals during their freshwater life cycles (Venturino *et al.*, 2003). They can be exposed to contaminants in nature through many routes but perhaps the most likely route is agricultural runoffs in amphibian breeding sites (Storrs and Kiesecker, 2004).

Eventhough less in number reports are available on the impact of contaminants on amphibians. Bridges and Christine (1997) studied general activity and swimming performance of *Rana blairi* tadpoles after acute exposure to three sublethal concentrations of carbaryl and reported that there is a reduction in both tadpole activity and swimming performance even at 24th hour of exposure. Loss of equilibrium was reported in bull frog tadpoles treated with malathion (Fordham *et al.*, 2001). A concentration dependent internal abnormality of the liver was reported in the anuran *Xenopus tropicalis* after 90 days of exposure to methoxychlor (Fort *et al.*, 2004). In the frog *Rana cyanophlyctis* treated with the mercurial fungicide, emisan, the testes exhibited a reduction in GSI, diameter of seminiferous tubules and Leydig cell nuclei, number of secondary spermatocytes and spermatids (Kanmadi and Saidapur, 1992). Histopathological changes in the testis of the green frog, *Rana hexadactyla* exposed to sublethal concentration of endosulfan were explained by George and Andrews (1994). Frog *Rana perezii* treated with DMBA, a cytotoxic and immunosuppressive chemical agent caused decrease in alkaline phosphatase activity (Al- Attar, 2004). The effect of Di-n-butyl phthalate, an endocrine disrupting compound on the African clawed frog *Xenopus laevis*, was studied by Lee and Veerramachaneni (2005). The northern leopard frog, *Rana pipiens*, treated with nitrate and atrazine, showed no treatment related effects on the total number of spermatogenic cells. But the ratio of cell types differed in treated frogs exhibiting more spermatogonia and fewer spermatocytes and fewer spermatids than in control (Orton *et al.*, 2006). They also observed that a sublethal chronic exposure resulted in fibrogenesis in tunica albuginea, abnormal configuration of seminiferous tubules, deformed primary and secondary spermatocytes, atrophy in interstitial cells and a significant fall in gonadosomatic index.

The negative impact of anthropogenic activities on bio-diversity is becoming increasingly conspicuous and amphibians are currently the most globally threatened group of all vertebrates (Serrano *et.al.*, 2012). The introduction of chemicals or other anthropogenic modifications to an aquatic habitat can produce profoundly different responses in consecutive life stages of a single amphibian species. Pesticides exposure more likely possible in amphibian as compared to other vertebrates (Islam and Malik 2018). The eggs of amphibians are naked without any protective hard shell and are susceptible to all sorts of aquatic pollution. Their reproductive seasons often overlap with agrochemical applications that affect their reproduction since there is greater probability of exposure, particularly to pesticides in agricultural landscapes. Studies show that pollutants at environmentally relevant concentrations are important threats to amphibians and may play a role in their present global decline.

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# Underwater Craft Articulation System Using Visible Light Elucidation Technique

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**Abstract**—The development of advancements in nowadays is extremely high. It is continually expanding in each segment. We have seen a ton of mishaps happening in our everyday life. Among these mishaps, the one where we are unfit to give a prompt emergency treatment is mishaps caused in the ocean. Among these marine mishaps, the general population who experience scuba plunging are encountering mishaps which devours more opportunity to give emergency treatment. So we propose a framework for giving a caution at whatever point the body parameters are unusual additionally a live simplex correspondence is performed between the jumper to the individual over the ocean. A non-imaging recipient configuration diminishing the relationship of channel grid for indoor different info numerous yield (MIMO) noticeable light correspondence (VLC) frameworks. In opposition to past works, our proposed mirror assorted variety collector (MDR) not just hinders the gathering of light on one explicit bearing yet in addition improves the channel gain on the other heading by accepting the light reflected by a mirror sent between the photograph finders. We investigate the channel limit and ideal tallness of mirror as far as most extreme channel limit with respect to a  $2 \times 2$  MIMO-VLC framework in a 2-dimensional geometric model. We demonstrate that this useful and damaging impacts in channel framework coming about because of our proposed MDR are progressively gainful to get all around molded channel grid which is appropriate for executing spatial-multiplexing MIMO-VLC frameworks so as to help high information rate.

## I. INTRODUCTION

Strong state lighting is a quickly developing region of research and applications, because of the unwavering quality and anticipated high productivity of these gadgets. The white Drove sources that are ordinarily utilized for general brightening can likewise be utilized for information transmission, and Noticeable Light Interchanges (VLC) is a quickly developing territory of research. One of the key difficulties is the restricted tweak data transfer capacity of sources, normally a few MHz. Be that as it may, as a room or inclusion space would regularly be lit up by a variety of LEDs there is the potential for parallel information transmission, and utilizing optical MIMO methods is possibly appealing for accomplishing high information rates.

In this paper we explore non-imaging and imaging MIMO approaches: a non-imaging optical MIMO framework does not perform legitimately at all beneficiary positions because of symmetry, however an imaging based framework can work under every single predictable condition. Reproductions show such frameworks can work at a few hundred Mbit/s, and up to Gbit/s by and large.

Present day's IOT unites the devices and accept a central part in various strategies like keen home motorization, insightful urban zones, vehicle leaving, traffic control, splendid ventures, savvy condition, agribusiness fields and patient wellbeing observing framework, etc. One of the methodologies is to screen the wellbeing condition of the patient and screen it to specialists or paramedical staff through the IOT, as it is difficult to screen the patient for 24 hours. So here the patient wellbeing condition or status for example Heartbeat rate, Respiratory rate, Body Temperature, Position of the body, Blood glucose, ECG, etc can be estimated by using the Nonobtrusive sensors. These sensors are related with the Arduino Uno board, it assembles the data for example biomedical information from the sensors and the identified biomedical data can be transmitted to the server. The "Thing speak" named new cloud is used here to put the identified data into the server. From this server the data can be imagined to the authorities and other paramedical staff by Thing speak android application. Along these lines by using this Savvy wellbeing observing framework decreases the effort of experts and paramedical staffs to screen the patient for 24 hours and moreover diminishes the time and cost of support. Visible light correspondence (VLC) has wide unlicensed transfer speed, empowers correspondence in radiofrequency-touchy situations, acknowledges vitality effective information transmission, and can possibly help the limit of remote access organizes through spatial reuse. Then again, Wi-Fi gives more inclusion than VLC and does not experience the ill effects of the probability of blockage because of the observable pathway prerequisite of VLC. So as to take the benefits of both Wifi and VLC, we propose and actualize two heterogeneous frameworks with Web get to. One is the half breed Wifi-VLC framework, using a unidirectional VLC channel as the downlink and holding the Wi-Fi backchannel as the uplink. The uneven arrangement settle the optical uplink difficulties and advantages from the full-duplex correspondence dependent on VLC. To

additionally upgrade the strength and increment throughput, the other framework is displayed, in which we total Wi-Fi and VLC in parallel by utilizing the holding procedure in the Linux working framework. We additionally hypothetically demonstrate the prevalence of the amassed framework as far as normal framework delay. Online test results uncover that the cross breed framework beats the ordinary Wi-Fi for swarmed conditions regarding throughput and Website page stacking time, and furthermore exhibit the further improved execution of the accumulated framework while thinking about the blocking length and the separation between the passageway and the client gadget. This letter explores the execution of submerged optical remote correspondence (UOWC) frameworks utilizing optical preintensification just as different beneficiaries to abuse the upsides of spatial decent variety. Numerical outcomes are additionally given to assess the mistake execution of preintensified single-input various yield UOWC frameworks when ON-OFF keying adjustment is used. Our outcomes uncover that the proposed framework setup can for sure offer critical framework execution upgrades as far as the feasible piece mistake rate.

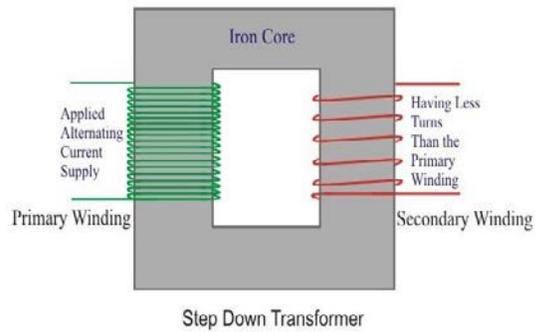
**LITERATURE SURVEY**

MIMO and VLC communication system is used in order to reduce correlation channel matrix . [1] The white LED sources that are typically used for general radiance can be used for data transmission and VLC is used for research area .one of the main aim is to limited modulator bandwidth of sources. [2]In patient monitoring system, respiration rate ,temperature rate can be detected by using IOT [3]. The hybrid WIFI-VLC system to utilize a unidirectional VLC channel as the downlink and reserving the WIFI backchannel as the uplink [4]. The performance of underwater wireless communication(UOWC) system employing optical pre-amplification as well as multiple receivers to exploit the advantages of spatial diversity [5]. As of late, the submerged exercises are expanding, pushing the exploration for novel arrangements. There is a wide assortment of frameworks deputed adrift observing, extending from floats, ships, subsequently referenced AUVs, Remotely Operated Vehicles (ROVs) [6].

**Power Supply:**

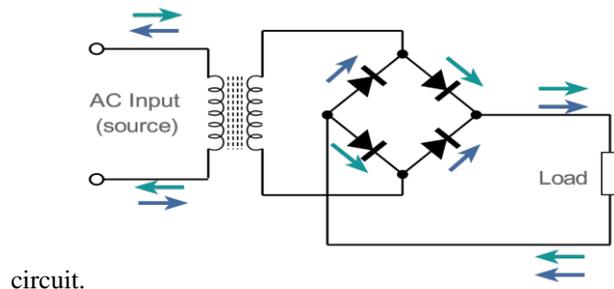
**A. Transformer**

The potential transformer will step down the power supply voltage (230-12V) level. Then the secondary winding of transformer will be connected to the precision rectifier, which is constructed with the help of op-amp. The advantages of mistreating precision rectifier are it will be provide peak voltage output as DC, reset of the circuits can provide solely RMS output.



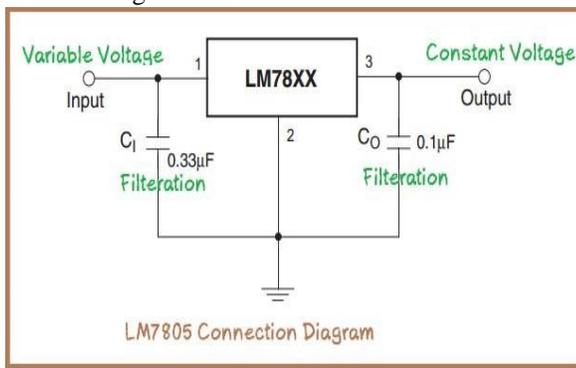
**B. Bridge rectifier**

At the point when four diodes are associated as appeared in figure, the circuit is called as extension rectifier. The contribution to the circuit is connected to the slantingly inverse corners of the system, and the yield is taken from the staying two corners. Give us a chance to expect that the transformer is working legitimately and there is a positive potential, at point An and a negative potential at point B. the positive potential at point A will advance inclination D3 and turn around predisposition D4. The negative potential at point B will advance predisposition D1 and turn around D2. As of now D3 and D1 are forward one-sided and will enable current stream to go through them; D4 and D2 are turn around one-sided and will square current stream. The way for current stream is from point B through D1, up through RL, through D3, through the auxiliary of the transformer back to point B. this way is demonstrated by the strong bolts. Waveforms (1) and (2) can be seen crosswise over D1 and D3. One-half cycle later the extremity over the optional of the transformer turn around, forward biasing D2 and D4 and switch biasing D1 and D3. Current stream will presently be from point A through D4, up through RL, through D2, through the auxiliary of T1, and back to point A. This way is demonstrated by the broken bolts. Waveforms (3) and (4) can be seen crosswise over D2 and D4. The present move through RL is dependably a similar way. In moving through RL this current builds up a voltage comparing to that appeared (5). Since current moves through the heap (RL) amid both half cycles of the connected voltage, this scaffold rectifier is a full-wave rectifier One preferred standpoint of an extension rectifier over a customary full-wave rectifier is that with a given transformer the extension rectifier creates a voltage yield that is about twice that of the traditional full-wave



### C. Voltage regulators

Voltage controllers contain a class of broadly utilized ICs. Controller IC units contain the hardware for reference source, comparator intensifier, control gadget, and over-burden assurance all in a solitary IC. IC units give guideline of either a fixed positive voltage, a fixed negative voltage, or a customizable set voltage. The controllers can be chosen for task with burden flows from many milli amperes to several amperes, relating to control evaluations from milli watts to several watts. A fixed three-terminal voltage controller has an unregulated dc input voltage,  $V_i$ , connected to one info terminal, a directed dc yield voltage,  $V_o$ , from a second terminal, with the third terminal associated with ground. The arrangement 78 controllers give fixed positive directed voltages from 5 to 24 volts. Also, the arrangement 79 controllers give fixed negative directed voltages from 5 to 24 volts.



### D. Microcontroller

Every one of the capacities required on a solitary chip. A microcontroller varies from a microchip, which is a universally useful chip that is utilized to make a multi-work PC or gadget and requires different chips to deal with different assignments. A microcontroller is intended to be increasingly independent and autonomous, and works as a minor, devoted PC. Microcontrollers have turned out to be normal in numerous regions, and can be found in home machines, PC hardware, and instrumentation. They are regularly utilized in cars, and have numerous modern uses also, and have turned into a focal piece of mechanical apply autonomy. Since they are generally used to control a solitary procedure and execute straightforward guidelines, microcontrollers don't require huge preparing power. Created like Compact disc plays, hello there fi gear, computer games, clothes washers, cookers, etc fit into this class. The interchanges advertise, car showcase, and the military offer the remainder of the application zones. Microcontroller have generally been customized utilizing the low level computing constructs. Low level computing construct comprises of short mental helper portrayals of the guidance sets. These mental aides are hard to recollect and the projects produced for one microcontroller can't be utilized for different sorts of

microcontrollers. The most well-known grievance about microcontroller writing computer programs is that the low level computing constructs is to some degree hard to work with, particularly amid the advancement of complex ventures. The answer for this issue is to utilize abnormal state dialects. This makes the programming an a lot less difficult undertaking and the projects are normally progressively lucid, versatile, and less demanding to keep up. There are different types of Essential and C compilers accessible for generally microcontrollers. Fundamental compilers accessible for generally microcontrollers. Essential compilers are more often than not as translators and the code created is generally moderate

### E. Introduction of 8051 Family

"The 8051 family was introduced within early 1980's by Intel. "Since Its introduced, the 8051 has been one of the most popular microcontroller and has been second-sourced by many manufacturers. The 8051 presently has many various versions and a few varieties embody on chip analogue- to-digital converter, a considerably large in size of program and data memories, pulse-width modulation on output, and flash memories that can be erased and programmed and programmed by electrical signals. Microcontrollers have now moved into the 16-bit market. 16-bit micro-controllers are high –performance processors that and applications in real-time and computer intensive fields (e.g. in digital signal processing or real-time control). Some of the 16-bit microcontrollers in embody massive amounts of program and data memories, multi-channel ADC, a large number of I/O port, many ports, high-speed arithmetic and logic operations, and a strong instruction set with signal process capabilities. The simplest microcontroller architecture consists of a microprocessor, memory, and input/output. The microprocessor consists of a central processing unit (CPU) and the control unit (CU). The CPU is the brain of a microprocessor and is where all the arithmetic and logical operations are performed. The control unit controls the internal operations of the microprocessor and sends to other parts of the microprocessor to carry out the required instructions. Memory is an important part of a microcomputer system. Depending upon the application we can classify memories into two groups: program memory and data memory. Program memory stores all the program code. This memory is usually a read-only memory (ROM). Other types of memories, e.g. EPROM and PROM flash memories are used for lowvolume applications and also during program development. Data memory is a read/write memory (RAM).In complex applications where there may be need for large amounts of memory it is possible to interface external memory chips to most microcontrollers. Input/ Output (I/O) ports allow external digital signals to be connected to the microcontroller. I/O ports are usually organized into groups of 8 bits and each group is given a name. For example, the 8051 microcontroller contains

four 8-bit I/O ports named P0, P1, P2, and P3. On some microcontrollers the direction of the I/O port lines are programmable so that different bits of a port can be programmed as inputs or outputs. Some microcontrollers (including the 8051 family) provide bi-directional I/O ports line of such microcontrollers can be used as inputs and outputs. Some microcontrollers provide 'open-drain' outputs where the output transistors are left floating (e.g. port P0 of the 8051 family). External pull-up resistors are normally used with such output port lines

**F. 8051 Family**

The 8051 family is a prominent, industry standard 8-bit single chip smaller scale PC (microcontroller) family, fabricated by different organizations with various capacities. The essential standard gadget, which is the principal individual from the family, is the 8051, which is a 40-stick microcontroller. This fundamental gadget is presently accessible in a few designs. The 80C51 is the low-control CMOS form of the family. The 8751 contains EPROM program memory, utilized primarily amid advancement work. The 89C51 glimmer programmable and erasable memory (PEROM) where the program can be reinvented. The 8052 is an upgraded individual from the family which contains more Smash and furthermore more clock/counters. There are numerous variants of the 40-stick family which contain onchip simple tocomputerized converters, beat width modulators, etc. At the lower end of the 8051 family we have the 20-stick microcontrollers which are code perfect with the 40-stick gadgets. The 20-stick gadgets have been made for less mind boggling applications where the I/O necessities are not high and where less power is required (for example in convenient applications). AT89C1051 and AT89C2051 (produced by Atmel) are such microcontrollers, which are completely The code perfect with the 8051 family and offer diminished power and less usefulness. The 8051 is a 8-bit, low-control, superior microcontroller. There are an extensive number of gadgets in the 8051 family with comparative engineering and every individual from the family is descending perfect with one another. The essential 8051 microcontroller has the accompanying highlights:

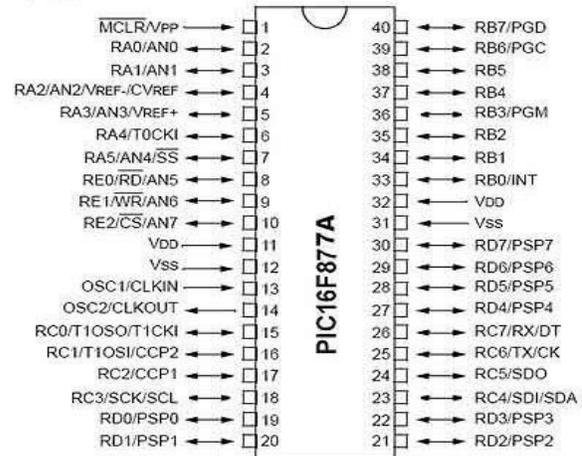
- 4 Kbytes of program memory
- 256\*8 Slam information memory
- 32 programmable I/O lines

**G. PIC16F877**

The PIC16F877A CMOS Streak based 8-bit microcontroller is upward good with the PIC16C5x, PIC12Cxxx and PIC16C7x gadgets. It highlights 200 ns guidance execution, 256 bytes of EEPROM information memory, self programming, an ICD, 2 Comparators, 8 channels of 10-bit Simple to-Computerized (A/D) converter, 2

catch/analyze/PWM capacities, a synchronous sequential port that can be designed as either 3-wire SPI or 2-wire I2C transport, a USART, and a Parallel Slave Port.

**Pin Configuration and Description**



**I. Pin Diagram of PIC16F877A**

The pins RB0-RB7, RC0-RC7, and RD0-RD7 are digital I/O pins. The pins CCP1 and CCP2, which share locations with RC1 and RC2, can be used for a PWM signal (see DC Motor tutorial). The pins AN0-AN7 are for analog I/O (see Photo resistor tutorial). Transmitter and receiver are for debugging I/O (see Output Messages to Computer tutorial). The remaining pins deal with power/ground, the clock signal, and programmer I/O.

**J. TEMPERATURE SENSOR**

The primary slave associated with a temperature sensor LM35. This detects the temperature of a motor and gives the dimension of temperature.

**K. General Depiction**

The LM35 arrangement are accuracy incorporated circuit temperature sensors, whose yield voltage is straightly relative to the Celsius (Centigrade) temperature. The LM35 in this manner has favorable position over direct temperature sensors aligned in Kelvin, as the client isn't required to subtract a huge steady voltage from its yield to get advantageous Centigrade scaling. Figure 4.4 Essential Centigrade Temperature Sensor (+2°C to +150°C) The LM35 does not require any outer adjustment or cutting to give common exactnesses of ±1/4°C at room temperature and ±3/4°C over a full -55 to +150°C temperature run. The LM35's low yield impedence, direct yield, and exact inalienable alignment make interfacing to readout or control hardware particularly simple. It very well may be utilized with single power supplies, or with in addition to and short supplies. As it draws just 60 µA from its supply, it has extremely low self-warming, under 0.1°C in still air. The LM35



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# Quality of Secondary Schools Trained Geography Teachers in Universities and Diploma Colleges in Pedagogy

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## Abstract

There has been a concern about the quality of secondary schools teachers being prepared and produced by University and Teachers Training Colleges especially in pedagogy and use of instructional resources which is naturally and technically a pedagogical issue. The study was guided by Shulman's concept of pedagogical content knowledge. A total sample of the study was ten (10) secondary schools, ten (10) Heads of department, fifty (50) Geography teachers and five hundred (500) Geography students. Schools, Geography teachers and Heads/Chairs of departments were purposively selected while form three (3) and form four (4) classes were selected by simple random method. The researcher used a descriptive cross-sectional survey research design involving both qualitative and quantitative methodologies. Data were collected using questionnaires for Geography Teachers and interview schedules for Heads/Chairs of departments, observation schedules, and resources checklist. The major findings were most of University trained Geography teachers were not competent enough in pedagogy and faced difficulties in utilization of educational technology in teaching/ learning process which included: insufficient knowledge of meaningful instructional activities, fewer lessons in the timetable as recommended by the ministry, inadequacy of teaching/learning resources, examination oriented programme, cheating and inadequate teacher professional development in Geography. It was also noted most of TTCS trained teachers had been effectively oriented on the use of instructional resources but follow-up a mechanism like in-service training was inadequate. Based on research findings, the study recommended that Geography teachers should be in-service in the use of practical approaches and at least have six lessons per week to enable them to cover syllabus on time. It was also recommended that the ministry of education modernize all secondary schools in Kenya by technologizing them to make them tandem with the expectation of modern education. In addition, it was further recommended that most of the Geography departments should have Geography rooms which should be well equipped.

**Keywords:** Competency, Quality, Pedagogy, Instructional Resources

## 1.1 Introduction.

Over years educational accountability has been a prominent topic for discussion and debate in social, educational and political arenas across the world. Studies done in Australia, United State of America, Europe and other parts of the world shows that low degree of achievement in many educational reforms has been a major reason why teachers' instructional beliefs and principles underpinning innovation in teacher education need to be understood and taken seriously, otherwise reforms would remain artificial and cosmetic. Report by Thomas (2001) on quality teaching suggest that most states are not doing an adequate job of preparing teachers for today's classroom.

In Mackey Report 1981, from the time 8.4.4 system of education was introduced in Kenya, Geography was regarded as a compulsory subject in secondary schools; form one to form four up to 1992. Kamunge report 1988, noted that school curriculum was loaded and thus its objectives were never attained and therefore, the commission recommended lessening of school subjects which lead to Geography remaining as core subject only in form one and two (Muricho and Changách Koskey, 2013).

In primary schools it was familiarised in the early 1980s, since then it was taught as a traditional subject until early 2000s when it was integrated into social studies. It is now examined by Kenya National Examination Council (KNEC) as an integrated subject in primary schools and primary teacher training colleges (PTTCS) and as traditional separate subjects in secondary schools and some higher learning institutions (Dan, 2010).

In recent years there has been a concern to study the influence of teachers in curriculum execution and their instructional beliefs. Many educators claim that the beliefs held by school Geography teachers shape their ability to seek and acquire skills, knowledge, and attitude to perform their pedagogical tasks. If educational changes have to be attained there is more to be done rather than mere transfer of instructional resources and media to schools (Roehrig, Kruse and Kern, 2007). New trends in education which include learner-centred methods and autonomous learning, according to Kohn (2000) on his study of Teacher education and their problems worldwide advises that the programmes need to be re-designed and modernized to produce school teachers who recognize the role of a learner in instructions process.

Emerging educational reforms however is one issue that is recognized as important for all education stakeholders in regards to the relationship between effective teaching and students learning. Lee (2013) encouraged teachers to embrace change as they consider the most effective ways to prepare future leaders. He reminded his audience that "better teachers lead to better schools. Better schools lead to better children. Better children lead to better democracy."

Public Secondary schools in Kenya need competent teachers who have the ability to pioneer instructional development through instructional technology to guide and equip students with 21<sup>st</sup>-century skills of globalization (T. Education and Skills, 2010). However, according to Genvieve (2017), the crucial question of discussion on her study was, 'was the present crop of teachers produced by Kenyan universities adequately prepared in pedagogy to meet the development of the skills and needs to the learner they would teach after their training?' This is because in Kenya there is a strong feeling that University and teachers training colleges (TTCS) are not preparing and producing competent professional Geography teachers to serve the technological development for instructions.

Notwithstanding, the performance and ability of the Geography teachers to use learning/ teaching resources largely depend on the type of training she/he received in teacher professional development. There are three main components that quality education largely depends on, namely, relevant and wide use of educational resources, physical facilities and competent teachers (Ko, Sammons and Bakkum, 2014). However, the inter-relationship between the three components is not easily noticeable. To prepare and produce a competent Geography teacher in pedagogy it involves professional development fully versed in the selection and use of instructional resources.

A Geography teacher who is versed in development and administration of educational materials and if a need arises, in absence of such resources he/she will never sit back but go out of his/her way to improvise and put the resources in use. Competent Geography teacher should be in a position to access and use available teaching/ learning resources for instruction through improvisation. For efficient use and safety of instructional resources, physical facilities are required. Provision of competent and educated teachers versed with knowledge, skill, and attitude is the most important thing that the ministry of education in Kenya can give to the secondary schools in the country (Genvieve, 2017).

According to Genvieve (2017) and Kafu (2014) on their studies, ninety percent (90%) of teachers in secondary schools in Kenya are university graduates. Most scholars believe that school teachers prepared in the universities are more creative and innovate basing the argument on the fact that prospective teachers are prepared by the best brains in the land and universities are cradles of sophisticated knowledge than the teachers prepared in Diploma Teacher Training Colleges.

In addition, they argued that most universities their physical facilities are well equipped and have the required instructional resources. Given that the majority of secondary school teachers are University graduates, there was a need to design and conduct research on comparative study on trained teachers in Universities and TTCS teaching in secondary schools in Kenya. Hence there is interest to determine their quality of teaching and specifically their competency in pedagogical related issues for Geography in secondary schools in Mwea East Sub- County, Kirinyaga County, Kenya.

## 1.2 Problem Formulation.

Modern society expects Geography school teachers to be competent in pedagogy and in the utilization of instructional resources for instructions. In the modern world, competent school teachers should be a solution to emerging technologies in modern education. The critical question in this juncture is "Is the present crop of Geography trained teachers in secondary schools well equipped for the difficulties posed by developments in the emerging educational technologies in instructions?" This poses a concern on the competency of schools teachers being prepared and produced in pedagogy by the universities and TTCS across the curriculum and teaching in public secondary schools in Kenya.

It is in the basis of this realization that the present research on comparative study on teachers trained in universities or Diploma Colleges in pedagogy and use of instructional resources for Geography was designed, developed and conducted for secondary schools in Kirinyaga County, Kenya to fill this knowledge gap. Specifically, the study investigated the quality and competency of trained Geography secondary school teachers in pedagogical issues in Mwea East Sub- County.

The study, therefore, focused on the following objectives;

- i. Establish the quality of Geography teachers in pedagogy in the selected secondary schools in Mwea East Sub-County.
- ii. Examine the procedure used by Geography teachers in the utilization of some of the educational technology.

## 1.3 Theoretical Framework.

The study was steered by Shulman Lee, 1987, model of knowledge growth in teaching (Shulman, 2012). Shulman introduced the concept of pedagogical content knowledge known as PCK which raised the issue to what teachers should know and be able to do. He developed an idea of going beyond content or subject matter knowledge to include how to teach particular content.

He also stated the knowledge that makes a discipline easy or difficult to learn. In order for teachers to teach effectively, they need to know the potential problems learners experiences basing on their ages and backgrounds. In the understanding of content related

material PCK involves the use of effective and cognitive domains. Teaching any discipline is a highly complex cognitive activity in which trained teacher must apply knowledge from various domains.

To understand the interaction between the teachers, learners, environment and instructional resources Koehler, Mishra, Kereluik, Shin and Graham (2014) built on Shulman's notion of Technological Pedagogical Content Knowledge (TPCK), which involves an understanding of the complexity of relationships among students, teachers, knowledge, content, and technologies. According to the educational technology comes with its own biases and affordance that makes some technology applicable than others. According to Enqvist (n.d.), this theory is relevant to the study as it deals with issues related to effectiveness and competency of trained teachers in pedagogy and utilization of educational technology.

Therefore, the adopted theory formed the main basis of the study since it focuses on pedagogy and use of instructional resources that were the focus of the conducted study. This theory provided the framework based on previous studies and therefore it assisted the researcher in planning for data collection and analysis concerning difference and/or relationship of trained Geography teachers in Universities or in TTCS in pedagogical issues and classroom practice in secondary schools in Kenya. That is, the selected theory was quite relevant to the present study as it facilitated the in-depth study of the problem.

## **2.1 Quality and Competency of Geography Teachers in Pedagogy.**

According to Kafu (2014), primary schools teacher are well prepared in pedagogy than their counterparts in secondary schools. He examined how to prepare a teacher in education technology and professional development in the utilization of instructional resources at the elementary level which is naturally and technically a pedagogical issue. Primary trained teachers in Primary Teacher Training Colleges (PTTC) in other word are more competent in pedagogy than teachers trained in TTCS and Universities.

Anyiendah (2017) established poor performance in the teaching of English in primary schools in Kenya as a reflection of poor preparation in the pedagogy of these teachers from their respective teacher training institutions. She noted English teachers were not well prepared in pedagogy to be competent in teaching the subject at school level. The findings by Genvieve (2017) echoes her findings in relation to prospective teacher training in pedagogy in Kenyan Universities and that of Kafu (2014) in the development and utilization of instructional resources at elementary education in Kenya.

Teacher education is critical as it set the development agenda of any society. Through the produced teachers, teacher education programme serves as the source of the required competencies for the development agenda of any society (Noe, Hollenbeck, Gerhart and Wright, 2006). The programme focuses on the development and growth of competency school teachers and prospective learners so as to develop their love for education and interest in the teaching profession and learning process respectively. In 1975 the Daily Nation Newspapers had a very simple and clear heading "Teachers have again failed the nation". The message here was about the quality and performance of school teachers either they lacked professional competencies or they did not know how to teach school children to prepare them to pass their examinations. In 1996, the same concern was raised in relation to the quality of Kenyan university graduates, where were claimed to produce "half-baked" products (Genvieve, 2017).

In some of the universities and TTCS, teacher preparation programme is a complex scenario. Some of the individuals involved in teacher training are not "trained and qualified" teachers thus not a specialist in Teacher education and are directly involved in preparing school teachers in professional areas. These create complications in preparing professional teachers in pedagogy and those they serve later in secondary schools. In response to the above observation, Kafu (2013) propose pedagogical competence since teachers are the basis of creativity and innovation in education. Hence preparation and production of ill-prepared teachers in pedagogy may originate from the manner Teacher education programme is designed and organized in Kenyan Universities and TTCS.

Notwithstanding, the study was done by Eshiwani (1992) regarding the poor state of teaching and learning of Mathematics in Machakos district shares the same sentiments of which is attributed by poor preparation of Mathematics teachers in pedagogy.

Studies by Genvieve (2017), Anyiendah (2017), Nyerere (1967), Kafu (2013), Lelei and Weidman (2012) and (Ominde, 1964) all these authorities demonstrate the need for and the importance of pedagogy in advancing development in the society. To them, all these developments are facilitated by teachers who are well placed to play these critical roles of creativity and innovativeness in the society. In his publication on Education for self-reliance Nyerere (1967) emphasized on re-training of teachers in pedagogy to adjust them to new philosophy and practices in education in order to serve the needs of the learners.

All reviewed authorities show that most of these Universities and TTCS teachers are ill-prepared in pedagogy. From the above researches, there is one important fact that preparation of secondary school teachers at Universities and TTCs levels in Kenya is wanting. This is well demonstrated at annual KNEC reports in the specific subjects that show a deplorable performance of the candidates.

## **2.2 Procedure used by Geography Teachers in Utilization of Educational Technology.**

Learning resources are materials that the facilitator and learner use in the teaching/learning process for effective instructional objectives. The term learning resource is used by various scholars interchangeably with educational media, teaching material, educational technology, audio-visual material, and instructional materials. For Geography teacher to accomplish his/her lesson

objectives she/he needs to have a wide range of teaching equipment and materials for learners motivation (Arends and Castle, 1991).

According to Ramsden (2003), learning resource is any source of information that both the teachers and students use for expressive and operative instructions. This resource includes; textbooks, audio-visual, computers, still pictures, televisions, radio, charts and maps, flip charts, field trips among others. The weakness or skills of students in a classroom cannot deter an individual learner from effective learning using a computer thus a computer allows every learner to learn through her/his own pace without being affected by others pace.

It is important to note educational technology saves time in the teaching and learning process. In learner-centered approach (LCA) the teacher is simply a facilitator of instructions thus no longer treated as the only source of information, therefore, he/she can organize students to achieve specific learning objectives by use of a wide range of educational materials (Keller, 1987). Traditional materials such as real objects, chalkboard and hand-outs can also be used to facilitate student attainment on instructional objectives.

In addition, instructional media assist learners to discover themselves and realize their aptitudes. Knowledge, skills, values, and attitude are enriched by the use of teaching materials and thus cultivating the information illiterateness (Sampath, 1981). Critical awareness of the teacher contributes to the effective use of instructional media on what the material can or cannot do. Proper use of educational media in and out of the classroom as an essential part of planned training guarantee attainment of instructional objectives (Earle, 2002). The learner is able to respond to questions, retain knowledge, follow instructions directed by the teacher when a variety of teaching materials are used (Sampath, 1981).

For the purpose of the study, the following resources have been used in training teachers in pedagogy in teachers training colleges and Universities and used in teaching and learning process in secondary schools in Kenya. These include print material such as textbooks, non- projected materials (chalkboard, models), and projected media such as computer and community resources such as field trips. According to Bednarz (1994) spatial distribution of occurrences on the earth's surface and their interrelationship influence social activities thus Geography teachers describes the location of teaching resources in the environment to enable a learner to comprehend the importance of the surroundings. Most scholars despite having different definitions agree that instructional technology assists in effective and efficient teaching and learning process but what matters most is the procedure of utilization.

### **3.1 Research Methodology.**

In this study, the researcher used the descriptive study as it focuses on the description of the observed phenomena which involves both qualitative and quantitative methodology to obtain useful data in evaluating the representative selection of the population. The design was used to establish the factors that influence the competency of a school teacher in pedagogy and prospective learners in Kenyan secondary schools.

The focus was to determine the causes of existing differences or/and relationship in the status of the groups of individuals involved in the teaching process. The researcher adopted two techniques for the study; purposive sampling technique and random sampling technique. In this respect, the study population comprised of twenty four (24) public secondary schools in Mwea East Sub- County. The researcher sampled Geography teachers, students and Heads of the department from the ten (10) selected schools, through random sampling technique ten (10) Heads of department, fifty (50) Geography teachers and five hundred (500) students were sampled.

### **4.1 Finding and Discussion.**

This chapter presents results of the study conducted in public secondary schools in Mwea East Sub-County, Kirinyaga County, Kenya on the comparative study on the competency of trained Geography teachers in Universities or TTCS in pedagogy and use of educational technology. The results are based on the analysis of data collected using a questionnaire for Geography teachers and the interview schedule for Heads of Department as well as observation schedule and resources checklist. These instruments comprised three main parts; personal details, common items applicable to all respondents and the main body of these instruments.

### **4.2 Quality and Competency of Geography Teachers in Pedagogy.**

In a related investigation on their general view on the quality of Teacher Preparation programme, an item was designed focusing on suitability and relevance of the courses offered by schools of education in training institutions.

**Table 4. 1: Relevance of the offered courses in the Universities and Diploma training colleges.**

Respondents	Gender	Education level	Relevancy	Frequency	Percent	Valid Percent	Cumulative Percent	
Geo Teachers	Male	Degree	Relevant	4	16.0	16.0	16.0	
			Not Relevant	14	56.0	56.0	72.0	
			No Opinion	7	28.0	28.0	100.0	
		Total	25	100.0	100.0			
		Diploma	Relevant	4	28.6	28.6	28.6	
			Not Relevant	9	64.3	64.3	92.9	
			No Opinion	1	7.1	7.1	100.0	
	Total		14	100.0	100.0			
	Female	Degree	Not Relevant	4	50.0	50.0	50.0	
			No Opinion	4	50.0	50.0	100.0	
			Total	8	100.0	100.0		
		Diploma	Not Relevant	2	66.7	66.7	66.7	
			No Opinion	1	33.3	33.3	100.0	
			Total	3	100.0	100.0		
HODs			Male	Degree	Valid	Not Relevant	5	100.0
	Relevant	1		50.0	50.0	50.0		
	No Opinion	1		50.0	50.0	100.0		
	Female	Total	2	100.0	100.0			
		Degree	Valid	Not Relevant	2	100.0	100.0	100.0
		Diploma	Valid	Relevant	1	100.0	100.0	100.0

Analysis on table 4.2 shows that a proportion of 4 (16.0) male degree trained teachers and 4 (28.6) male diploma trained teachers thought the offered courses were relevant while 14 (56.0) male and 4 (50.0) female degree trained teachers and 9 (60.00) male and 2 (66.7) female diploma trained teachers thought otherwise. In addition, 7 (28.0) male and 4 (50.0) female degree trained teachers and 1 (7.1) male and 1 (33.3) female diploma trained teachers and/or could not comment on the quality of the courses.

Of great interest, was the Heads of Departments' views were similar to those expressed by Geography school teachers. Only 1 (50.0) male and 1 (100.0) female diploma trained Heads of Department indicated that the offered courses were relevant for teacher preparation. In addition, 5 (100.0) male and 2 (100.0) female degree trained Heads of Department said courses offered were not relevant but only 1 (50.00) male diploma trained Head of Department said was unable to comment on this matter. This creates a dilemma for a modern school teacher preparation who are expected to play a role of assessing and accommodating individuals' academic, intellectual and emotional needs prepared in Kenyan universities as advocated by (Genvieve, 2017).

This observation is worrying if an individual produced by Kenyan universities indicate that the quality of teacher preparation from Kenyan universities is poor. Therefore, it right to claim that Kenyan universities produce "half-baked" graduates.

**Table 4. 2: Quality on professional areas based on sex and category of School Teachers.**

Gender	Education level	Training Status	Frequency	Percent	Valid Percent	Cumulative Percent	
Male	Degree	Valid	Content/ Teaching subjects	22	73.3	73.3	73.3
		Professional/ Pedagogical area	8	26.7	26.7	100.0	
		Total	30	100.0	100.0		
	Diploma	Valid	Content/ Teaching subjects	14	87.5	87.5	87.5
		Professional/ Pedagogical area	2	12.5	12.5	100.0	
		Total	16	100.0	100.0		
Female	Degree	Valid	Content/ Teaching subjects	1	10.0	10.0	10.0
		Professional/ Pedagogical area	9	90.0	90.0	100.0	
		Total	10	100.0	100.0		
	Diploma	Valid	Content/ Teaching subjects	1	25.0	25.0	25.0
		Professional/ Pedagogical area	3	75.0	75.0	100.0	
		Total	4	100.0	100.0		

When the analysis was done on the basis of sex and category on table 4.3, depending on their training, 9 (90.0) female and 8 (26.7) male degree trained teachers and 3 (75.0) female and 2 (12.5) male diploma trained teachers indicated effectiveness in pedagogical/professional area of their training while 22 (73.3) male and 1 (10.0) female degree trained teachers and 14 (87.5) male and 1 (25.0) female diploma trained teachers indicated competency in content/ teaching subjects. This observation is not surprising since female teachers are most likely to take interest in pedagogical courses in training unlike their male counterparts (Magolda, 1997).

Apart from the above investigated general view aspect of teacher preparation programme, the study also attempted to determine the competency and effectiveness of pedagogical process in Mwea East Sub- County secondary schools, the number of Geography lessons being taught regardless the other subject combination by individual teacher, teaching workload and the requirement for individual to prepare for a lesson. An item in teacher questionnaire and Observation schedule was designed, developed and used to investigate the effectiveness and efficiency of teaching pedagogical issues in secondary schools.

#### 4.2 Procedure used by Geography Teachers in Utilization of Educational Technology.

It is an established fact that teaching and learning resources are the forces behind effective instructions and development of quality education in secondary schools in Kenya (Okoth, 2015). This item regarding procedure used in the utilization of instructional resources provides the desired conducive environment for preparing competent learners in a competent education system. Educational resources are the software as well as facilitators of efficiency and effectiveness in the conduct of learners programme not only in secondary schools level but also at any other level of learning in the education system.

This item focused on availability, the procedure of utilization, suitability and status of instructional resources for preparing prospective learners in secondary schools in Mwea East Sub- County in Kirinyaga County, Kenya. Analyses of the data collected on the relevant items yielded the following results. On a global dimension, educational resources are critical in the preparation of anticipated learner of the modern school.

**Table 4.4: Availability and adequacy of educational resources**

Schools		Frequency	Percent	Valid Percent	Cumulative Percent	
Girls	Valid	Strongly agree	3	23.1	23.1	23.1
		Neither agree or disagree	1	7.7	7.7	30.8
		Disagree	7	53.8	53.8	84.6
		Strongly disagree	2	15.4	15.4	100.0
		Total	13	100.0	100.0	
Mixed day	Valid	Strongly agree	4	11.4	11.4	11.4
		Agree	2	5.7	5.7	17.1
		Neither agree or disagree	8	22.9	22.9	40.0
		Disagree	20	57.1	57.1	97.1
		Strongly disagree	1	2.9	2.9	100.0
Day/Boarding	Valid	Total	35	100.0	100.0	
		Strongly agree	2	16.7	16.7	16.7
		Agree	1	8.3	8.3	25.0
		Neither agree or disagree	2	16.7	16.7	41.7
		Disagree	5	41.7	41.7	83.3
		Strongly disagree	2	16.7	16.7	100.0
		Total	12	100.0	100.0	

On availability and procedure of utilization of educational media, the analysis on table 4.4 reveals that, 23.1 of Girls' boarding school teachers, 11.4 of mixed day school teacher and 16.7 mixed day and boarding school teachers- respondents strongly agreed and reported that teaching resources were readily available and adequate for their use in classroom instructions. However, a large proportion of 53.8 Girls school teachers, 57.1 mixed days and 41.7 of mixed day and boarding school respondents disagreed and revealed that the instructional resources in the selected schools were not available and adequate for use.

However, the findings from the observation schedule provided a clear spectrum on the procedure used on available teaching and learning resources for classroom instructions. From the tool, it was established that there were three (3) main instruction resources for use in learners' preparation in Mwea East Sub- County secondary schools, which include: teachers' book material, globe, and topographical maps. This list of resources more or less tallied with those provided in the resources checklist.

There was noticeably absent of Geography laboratory/ resources center, computers and their accessories, records on fieldwork and library. These are essential resources for the development of individual learning practices and reading habit. Consequently, the quality of learners being produced by these secondary schools is not modern enough to perform in this highly technological era. This observation confirms what Kafu (2014) observed on use of ICT for teaching and learning process.

However, a large proportion of respondents as illustrated on the table below either felt that these educational resources are inadequate or unable to use or had no opinion on this item is a worrying situation. This large proportion to ignore is a clear indication that secondary schools in Mwea East Sub- County lacks the essential educational resources for preparing anticipated learners and therefore may be producing learners who are not competent enough thus affecting their KCSE performance.

A general view from Heads of the department is that Geography school teachers in Mwea East Sub- County do not have adequate skills to use educational resources to conduct efficient classroom instructions. This is a clear indication that Geography teachers are crippled in the quest for preparing and producing the desired quality learners in secondary schools in Kenya. According to Kafu (2014), Kenyan secondary schools are not producing competent learners because teachers teaching them are not adequately equipped for the task

**Table 4.5: Procedure of Utilization of educational resources**

Respondents		Frequency	Percent	Valid Percent	Cumulative Percent
Geo Teachers	Valid	Introduction	22	44.0	44.0
		Demonstration	14	28.0	28.0
		Illustration	3	6.0	6.0
		None	11	22.0	22.0
		Total	50	100.0	100.0
HODs	Valid	Introduction	2	20.0	20.0
		Demonstration	1	10.0	10.0
		None	7	70.0	70.0
		Total	10	100.0	100.0

In addition, table 4.5 shows that a large number of (22) teachers only utilized the available teaching and learning resources in the first ten (10) minutes of the lesson introduction, surprisingly 70 percent of HODs did not utilize teaching resource for classroom instructions. The researcher listed the following items as instructional resources in the selected public secondary schools (globe, topographical maps, charts, chalkboards, teachers’ book material, and computers).As observed without incorporating these instructional resources in classroom instruction across the forty (40) minutes, preparation of prospective learners in secondary schools in Kenya is likely to remain wishful thinking and untenable in this goal as Kafu (2014), Genvieve (2017) and Peterson (2000) have observed classroom instructions in the developing world.

It is worth noting that most of the listed items were mainly found in Girls boarding secondary schools with a proportion of 23.1 percent. Followed by 16.7 percent of those who strongly agreed and 8.3 of the respondent who just agreed in Mixed day and boarding schools. Mixed day schools had a lower proportion of 11.4 percent of those who strongly agreed and 5.7 percent of those who just agreed on resources availability. These are institutions which may not be having the capacity to develop some of these resources for classroom instructions. On the other hand, 7.7 percent of respondents in Girls boarding schools, 22.9 percent of respondents in mixed day schools and 16.7 percent of mixed day and boarding schools respondents had no idea about these educational materials. This observation sharply contrasts with that was established in the analysis of the teachers training status. This variation in opinion could be attributed to the experience these two groups of respondents had with educational resources from their universities/ diploma colleges of training. Teachers are the designers and users of these items for instruction; they are trained in them and have had much longer exposure to them than their learners. The absence of teaching material is perhaps the underlying cause of poor utilization. The checklist was designed and developed to provide qualitative data on the state and status of the available instructional resources for preparing prospective learners in pedagogy in Mwea East Sub- County secondary schools. Besides, this tool was meant to confirm the information provided by respondents in the questionnaire and on the observation schedule.

**5.1 Conclusion and Recommendations.**

The study data established the following findings related to the quality of Geography trained teachers in the universities or diploma teachers training colleges and their competency in pedagogical issues; There are various probable challenges facing Geography teachers and in particular, Kenyan Universities trained teachers in education management in general and in particular quality of pedagogical courses. From the above findings, there is little or no facilitation provided to Geography department and in particular to Geography teachers in terms of financial resources, instructional resources, and in-service programmes to facilitate proper preparation of anticipated learners in pedagogy. In addition on the basis of the established findings, the practice structure and duration of administering pedagogy in secondary schools in Mwea East Sub- County are not efficient and appropriate thus compromising the crop of learners produced as "half- baked" individuals. Further, there is inadequate, irrelevant, outdated and inappropriate teaching and learning resources for pedagogy and the status of some of these available instructional resources in Mwea East Sub- County secondary schools is deplorable. The following recommendations were made basing the argument on the study conclusions. All personnel involved in the teacher training programme should be teachers in the profession. They should be qualified teachers especially in pedagogical issues and in particular in Kenyan universities if Kenya has to have competent teachers teaching in secondary schools. Therefore, there is a need to review the existing structures and practices of conducting teacher education. The adopted four lessons in Geography per week should be extended by one or two lessons in a week. This is necessary to enable teachers to cover the Geography syllabus effectively and on time. It was further recommended the Ministry of Education should develop and supply relevant educational resources and in particular for Geography subject for administering efficient classroom instruction and particularly learner-centered teaching practice. This will ensure the preparation of competent learners in secondary school level. Ministry of education should modernize all secondary schools in Kenya by technologizing to make them tandem with the expectations of modern education in general and in particular instructional technology.

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# Clinical Comparative Evaluation of Pain Perception during Infiltration with the CCLAD or Conventional Syringe

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**Abstract- Aim:** The aim of this study was to compare a computer controlled local anesthetic delivery (CCLAD) system with a conventional syringe in terms of the pain of needle insertion and injection during infiltration.

**Material and method:** Sixty patients between the ages of 18 and 45 years requiring local anesthesia for root canal treatment of maxillary posterior teeth were randomly allocated to receive local anesthesia with the CCLAD system (Comfort Control Syringe) or a Conventional syringe (Aspirating Syringe). Lidocaine 2 % with adrenaline (1:80,000) was given as an infiltration. The pain experience during the LA was recorded using a visual analogue score (VAS). Data was analysed using SPSS version 21. VAS scores were summarized as mean/median and standard deviation / interquartile range. As the VAS scale is an ordinal variable, thus inferential statistics were applied using non-parametric test i.e. Wilcoxon test.

**Results:** Mean VAS score used for assessment of pain perception on using Comfort Control Syringe was  $1.50 \pm 0.51$  and for Conventional Syringe group was  $2.37 \pm 0.56$ . The difference between the groups were statistically significant ( $<0.001$ ).

**Conclusion:** Assessment of pain perception during CCLAD system was found to be significantly lower than that found in conventional syringe.

**Index Terms-** CCLAD, Conventional syringe, Pain perception, Visual analogue score

## INTRODUCTION

In dentistry, injection of a local anesthetic is the greatest source of fear and anxiety, especially in children and adolescents, because pain and discomfort are mainly associated with it<sup>1</sup>. In addition, serious anxiety and fear can increase the perception of pain<sup>2,3</sup>. Although local anesthesia aims to eliminate pain during dental procedures, the fear associated with the needle puncture is often considered a reason why the dentist is not visited<sup>1</sup>. Fear and anxiety-related behavior can be a major impediment to dental care and have a negative impact on global health of the patient.<sup>4</sup> Therefore, techniques to reduce pain during injection are urgently needed to prevent patients from avoiding dental

treatment.<sup>5</sup> A useful alternatives in selected cases are the use of general anesthesia, sedation, hypnosis and a host of other behavioral techniques. A study conducted by Hill and Walker<sup>6</sup> evaluated stresses in patients undergoing wisdom teeth extraction and the authors concluded that local anesthesia is the preferred mode of pain control for patients who do not express a strong preference for anesthesia.

There are various ways to relieve pain before dental procedures or the often painful nature of the injection into local anesthesia. Transcutaneous electrical nerve stimulation (TENS),<sup>7</sup> intraoral lidocaine patch and computerized local anesthesia<sup>8</sup> are newly developed methods for pain relief and anxiety in dental patients as alternatives to conventional local anesthesia.

The Comfort Control Syringe (MIDWEST, DENTSPLY) is a computer-controlled anesthetic system with a hand-piece component, enabling the anesthetic solution to be delivered at a constant and slow pressure, potentially below the pain threshold.<sup>9,10</sup>

Pain is commonly measured and described using the visual analog scales (VAS), although this is a useful method for describing the pain experience, the multidimensional nature of this complex stimulus is not evaluated. For this measurement, more sophisticated techniques include the analysis of the sensory, affective and cognitive components of pain, as described in a number of scientific studies.<sup>11-13</sup>

The present study was therefore conducted to evaluate and compare the perception of pain during infiltration with the CCLAD or conventional syringe using visual analog scales. The null hypothesis was that during infiltration with the CCLAD system or conventional syringe there is no difference in the perception of pain.

## MATERIALS AND METHODS:

This study was conducted in the Department of Conservative Dentistry and Endodontics, and institutional ethical clearance was obtained. The patients were explained about the procedure, and informed consent was obtained.

Patients aged between 18 and 45 years in good health undergoing root canal treatment of maxillary and mandibular posterior teeth were included. All the included patients had been clinically diagnosed with irreversible pulpitis. Patient with severe needle

phobia, taking any medication that would alter pain perception, pain on palpation and percussion were excluded.

The patients were randomly divided into two groups of twenty each:

Group I Computer-controlled injection system (Comfort Control Syringe, MIDWEST, DENTSPLY): Local infiltration of lidocaine hydrochloride 2% with adrenaline 1:80,000, marketed in special cartridge, using compatible disposable 30-gauge, 10 mm needles and auto-controlled injection system.

Group II Conventional syringe (Aspirating Syringe, Septodont): Local infiltration of 2% lidocaine hydrochloride with adrenaline 1:80,000, using 30-gauge, 10 mm needle and disposable TS.

The anesthetic solution in all patients was delivered by same operator, to ensure that the results were not influenced by inter-operator variability. Pain perception rating was obtained by using 10 point visual analog scale (VAS) of pain rating. Overall pain was assessed by using a 200 mm horizontal, ungraded visual analog scale onto which patients were asked to place a marking. The left side was marked “no pain” and the right side marked “worst pain imaginable”. A 10 point verbal rating was also used and patients were asked to give a value to their pain experience, zero being “no pain”. Values thus obtained were submitted for statistical analysis.

Data was analysed using SPSS version 21. VAS scores were summarized as mean/median and standard deviation/interquartile range. As the VAS scale is an ordinal variable, thus inferential statistics were applied using non-parametric test i.e. Wilcoxon test. The level of statistical significance was set at 0.05.

**RESULT:**

Table 1 showing mean VAS score and Standard deviation (SD) of Comfort Control Syringe and conventional syringe group.

Mean VAS score used for assessment of pain perception during Comfort Control Syringe application was found to be significantly lower ( $1.50 \pm 0.51$ ) than that found in Conventional Syringe group ( $2.37 \pm 0.56$ ).

**Table 1: Mean VAS score and Standard deviation (SD) of Comfort Control Syringe and conventional syringe group.**

Groups	Mean $\pm$ SD	Median	IOR	P <sup>a</sup> value
Comfort Control Syringe	1.50 $\pm$ 0.51	1.5	1.00	<0.0001, S
Conventional Syringe	2.37 $\pm$ 0.56	2.0	1.00	

S= significant, <sup>a</sup>Wilcoxon test

**DISCUSSION:**

The most common reason for patients not to visit the dentist is dental fear. Dental fear can occur for a variety of reasons, including noise and vibration from tooth cutting devices such as pain during dental treatment and local anesthesia’s irrational fear.

Patients, however, often fear pain caused by anesthetic injections rather than pain caused by dental treatment.<sup>14</sup>

A number of devices have been introduced that can inject local anesthetics into the tissues at a speed set. These “painless anesthetic devices” are collectively referred to as computer-controlled local anesthetic delivery devices (CCLAD). CCLAD also refers collectively to devices that not only slow and maintain injection speed, but also maintain constant speed while taking into account the anatomical characteristics of the injected tissues due to the system’s Infiltration / Nerve block options.<sup>15,16</sup> Currently, the Wand system, Quicksleeper and Comfort Control Syringe are available for this type of device.

In the present study, the null hypothesis was rejected because the perception of pain during infiltration with the Comfort Control Syringe and conventional syringe differed. In this study, a computer- controlled local anesthetic delivery system for infiltration injection before root canal treatment led to a lower mean pain perception level for a group of 30 patients compared to a traditional syringe injected group.<sup>2</sup> This could be because local anesthetic supply systems controlled by the computer deliver local anesthesia at a slowly graduated speed controlled by the equipment. Injection speed is associated with injection discomfort; the faster LA is delivered, the more discomfort is caused. Since computer systems provide the solution slowly, they are expected to provide a comfortable injection process. Some authors say that using the WAND reduced anxiety about dental injection in most patients.<sup>13,17</sup>

Lipp and others<sup>18</sup> suggested that basic information before dental anesthesia could be a useful method to reduce anxiety and improve the confidence of a patient in a dentist or surgeon. Lackey and others concluded that WAND was a viable alternative to traditional local anesthetic administration and reduced fear and anxiety in dental patients with this system.<sup>19</sup> The CCLAD system overcomes the human error when compared to the conventional Local Anesthesia delivery system in terms of controlling the speed of anesthetic delivery in the tissues.

Similar to our study, Dulger and others found a highly significant statistical difference between the VAS values recorded for the two groups with the computer-controlled injected group, with a mean VAS value of 1.08 compared to 2.58 for the traditional syringe injected group.<sup>20</sup> In their comparative clinical study of 50 patients, Hochman and others reported that the WAND was 2 to 3 times less painful than traditional syringe injection and that 48 of 50 patients had a more comfortable WAND injection.<sup>21</sup> They concluded that there was an optimal anesthetic flow rate that minimizes the perception of pain during an injection. In a study carried out by Yenisey to compare pain levels of computer-controlled and conventional anesthesia techniques in the treatment of prosthodontics, it was concluded that the Wand technique reduces pain levels during needle insertion and local anesthesia.<sup>22</sup>

However, there are few studies that show no difference between the computer-assisted injection system and conventional local anesthesia.<sup>23,24</sup> Goodell and others instead found that the use of

a conventional syringe injection technique was superior to the WAND. This study reported reduced pain perception, increased tolerance and reduced dental anxiety after injection when using conventional syringe. It should be noted that this study included predominantly men employed in the military service and that a more randomly selected group could expect different results.<sup>25</sup>

### CONCLUSION

Under limitations of this study it is concluded that the anesthetic solution administered with a CCLAD system reduces pain level significantly when compared to the conventional syringes.

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# Influence of Quality Management on Successful e-Government

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**Abstract-** The total quality management is the part of the business in modern age. Everyone use it and in e-services, it has more importance because most of the services are virtual i.e. performed using the tools of information technology. When want to talk about quality, one must provide that the product of service, which we are making or offering to the consumer or users, should be fit for the purpose, free from errors and mistakes, fit for the use and meets the need of the customer. In addition to the above, the quality in e-business is crucial as it involves the three important dimensions: quality management, quality control and quality assurance. The implementation of Total Quality Management (TQM) in e-services environment includes the empowerment of team, systematic problem solving, data derivivers' decision, statistical process and selection and use of appropriate problem solving tools and techniques.

## I. INTRODUCTION

The organizations with such abilities in e-services are doing things better because they are fast in communication, implementation and decision-making and they are achieveing greater simplicity and flexibility in their processes. In this way, they can get the faster response from their customers and can provide better customer satisfaction, In that way, improvement, growth and development of organisation and their financial and non-financial objectives are acieved effectively and efficiently.

It is expected that better implementation of total quality management will make change at the market and organizations in future. There is a hope that it will help in achieving organizational goals and to help the customers to achieve customer satisfaction and understanding. I will help with management commitment of all employees within organization. Making all involved in organization system work in a quality management and in a systematic way will ultimately result in better customer and supplier relationship.

## II. WHAT IS E-GOVERNMENT IN TODAY`S LIFE

The application of information and communication technology in an e-government environment is a complex, multidimensional issue involving people, technology and processes. As we all know that the core task of government is governance and the job of regulating society and it lacks sufficient technicians to develop and maintain an e-government service system efficiently. In order to facilitate the growth of information technology andomunication usage, most government institutions outsourced their network services and rely on service providers to operate and maintain e-government services system.<sup>1</sup>

In the past through time, before any establishment of e-government system, government services mainly depended on traditional offline service where government staffs and citizens communicate in person. E-government is fully online service, with no need for meeting government staff persons with citizens, with use of Internet technology.This ultimatly has result in reducing management costs, improvement in management efficiency, and also doing a promotion of synergy between different departments, and improvement in services efficiency.<sup>2</sup>

Also, there is an imbalance between the distribution of IT resources and citizens' ability in usage of those. There are often cases of online and offline services coexisting in series in the process of e-government in action. In coexistence case, many businesses can be selected via online and offline in one of two ways, such as citizens to apply for exit permits. Some parts of the business must be finished through online submission, while other parts need to be submeted in person, offline, eg. papers of personal income tax. As a result, those two processes of public business create an experience of citizens' perception of services quality.<sup>3</sup>

There are two types of e-Government users, and they can be: citizens and enterprises. Government services have life cycle theory,<sup>4</sup> and, for citizens, e-Government services can be birth declaration, education registration, social insurance, tax returns and other business; for enterprises, e-Government services mainly

<sup>1</sup> N.H.Arshad, Y.M.Lin, A.Mohamed, S.Affandi, "Inherent Risks in ICT Outsourcing Project," In: A. Aggarwal, R. Yager and I. W. Sandberg (Eds.), Studies in Simulation and Modelling. Canada: WSEAS Press, 2006

<sup>2</sup> Pieteron, W., & Ebbers, W. (2008). The use of service channels by citizens in the Netherlands:Implications for multi-channel management. International Review of Administrative Sciences,74(1)

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<sup>4</sup> Tang, X.P., Wu, Q.L., & Zhang, P.Z. (2007). Study on the needs of e-Government for the public in China. E-Government, 4(9)

include enterprise registration, tax declaration, customs, intrastate declaration and other businesses. Larsen and Rainie<sup>5</sup> highlighted that e-Government services must have access to government information, government forms and services, release of policy information, employment and business opportunities and election information, archival files of tax, registration, signing a contract, paying a fine, and submissions for all kinds of advice to the government. The improvement of e-Government services make all those process become faster, more convenient and more efficient, also increase government transparency and accountability.

### III. A GENERAL VIEW TO E-GOVERNMENT

E-government tends to be the use of information and communication technology in order to improve accessibility and delivery of government services.<sup>6</sup> E-government promises to transform the efficiency, effectiveness, transparency and accountability of informational and transactional exchanges between the government and its citizens. E-government is not merely the computerization of a government system, but a belief in the ability of technology to achieve high levels of improvement in various areas of government.<sup>7</sup> Therefore, e-government is a comprehensive issue involving people, technology, process and system. When an e-government is implemented by outside service providers, all the factors mentioned above should be considered by outsourcing managers.

E-government outsourcing provides many advantages for the states and citizens. The claimed benefit includes reduced cost, efficiency in application maintenance and support, improved application timeliness, and access to extensive online help and qualified support.<sup>8</sup> However, it also provides many challenges. One of the biggest challenges is keeping control over the outsourcing activities and maintaining the performance of public service delivery. Some outsourcers were lack of experience in outsourcing management so that they totally depend on their outsourcing vendors to operate and maintain their e-government system. If the service provider does not follow the contract, the citizen would not receive some information correctly and timely. What is worse, the reputation of government would be ruined.

E-government system is supported by information and communication technology. The primary aim of e-government initiatives is to enable constituents to have full access to governmental activities via electronic means.<sup>9</sup> These accesses come from the application of technology of servers and workstations, peripherals, networking and communication infrastructure, general computer operation and communications

software, information sharing, data management, and so on. E-government outsourcing tends to be technology-centric, with additional services such as consultancy, training, systems integration. After all, outsourcing vendors always focus on technology so that they are often aware of innovations that can give government a competitive advantage.

Information culture can be expressed through the use of electronic document management system and electronic signature, the involvement of government employees in the process of defining requirements for information systems and the testing process. A manifestation of this culture is the shared responsibility for the implementation of information systems, the integration of government stakeholders, building trust in e-government services, encouraging (by government employees) citizens and businesses to electronic forms of contact with the government units, cooperation between government units. New social and cultural competences of government employees are very important to create such an information culture. The smallest impact on the development of e-Government bears social exclusion.

Though many e-government outsourcing resulted from in-house staff lacking enough technical expertise, it ought not to hand the action over to an outsourcing service vendor. In-house staff should know some new development of technology and assess emerging technologies so that government institutions could determine which technology can best be applied to the e-government systems. On the other hand, one of the main objectives of e-government outsourcing is to control cost of operating and maintaining e-government system. This cost includes maintenance cost and support cost, cost of modernizing and upgrades. Without necessary technical knowledge, government institutions would fall into the black hole of hidden cost.

### IV. QUALITY MANAGEMENT

Total Quality Management (TQM) is a managerial approach in which the entire organization is managed so that it excels in all quality dimensions that are important to customers. TQM provides a generic concept for continuous improvement in quality and other performance such as profit and market share. It is a philosophy that stresses a systematic, integrated, and consistent perspective involving everyone and everything. TQM can be considered as a business philosophy centered around seven principles: customer focus, leadership involvement, quality assurance, continuous improvement, employee empowerment, supplier partnerships, and

<sup>5</sup> Larsen, E., & Rainie, L. (2002). The rise of the e-citizen: How people use government agencies' web sites. Washington, DC: Pew internet & American life project.

<sup>6</sup> S.N.Salleh, "The multimedia super corridor and e-government initiatives in Malaysia," Third ITU Waseda University Workshop for Regulators and Policy Makers held in conjunction with the World Summit on E-Government organized by GITI, Waseda University in Tokyo, 2003

<sup>7</sup> D.Dada, "The failure of e-government in developing countries: a literature review," The Electronic Journal on Information Systems in Developing Countries, 2006, Vol.26, No.1, pp.1-10

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<sup>9</sup> W.A.Conklin, "Barriers to adoption of e-government," the 40th Hawaii International Conference on System Sciences, 2007

strategic quality plan.<sup>10</sup> TQM starts with customer's expectation and every person in the organization would place himself in the customer's shoes. Even if an employee might not have direct contact with an external customer, he must also understand how customers really feel about a product or service.

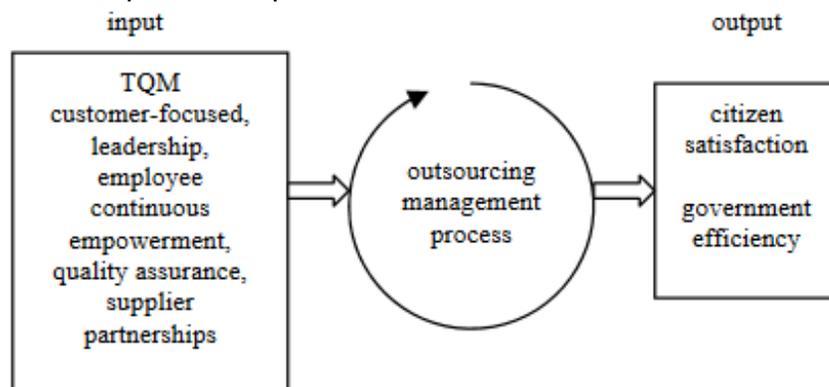
Continuous improvement is one of principles of TQM and it assumes that there will always be room for improvement, no matter how well an organization is doing. The distribution of customer survey responses will always be reset at a new level once you reach a certain point. Organization ought to determine customer's future expectation when they are already satisfied. TQM considers quality as everyone's responsibility from the Board of Direction to the entry-level employees. It proposes employment empowerment which means giving employees the responsibility, authority, training, and tools necessary to manage quality.

In today's highly competitive society, the demand for quality is one of the most critical factors for government institutions to survive in the global context. As a useful method to improve quality performance in private sector, government institutions introduced TQM and has explored and implemented it

with reasonable success. When e-government management team resorts to TQM in order to improve performance of outsourcing, the process of TQM in e-government outsourcing could be illustrated as an input and output process.

A well-developed strategic quality plan should drive the quality effort forward the organization's course by providing the vision and guidance. Quality improvement could not be achieved without significant and sustained efforts over time. One of the characteristics of strategic quality plan is that should be simple so that an organization can focus on only a limited number of quality objectives at once.

In terms of the input and output process, TQM is a process of transformation of a set of inputs including materials, procedures and methods, information and knowledge, people and their skills.<sup>11</sup> The outputs include products and services with higher quality. In general, through the process of TQM, the whole performance of the organization is improved. The essence of it is do everything right first time, and to satisfy customer requirements every time, by involving everyone in the organization.



Picture 1: TQM process in e-government outsourcing<sup>12</sup>

#### V. ORGANIZATIONAL FACTORS RELATED TO E-GOVERNMENT ADOPTION

The most important factors for e-government adoption are related to organizational factors. Great expectations exist from e-government leaderships, that they are to be visionaries, to drive e-government through initiatives, and with little or no problems proceed in adopting e-government. Coordination of public ICT investments and top management support are key factors. In many opinions, electronic communication between government units (G2G model)<sup>13</sup> and adaptation of new management models in government units promote the adoption of e-government. These models are: government processes management, knowledge management, electronic document

management, workflow management. The rule of law is determinant in E-government adoption. Intellectual property, digital signatures, data protection, public procurement, interoperability, electoral law, all of these must be matter of legal regulations.

Adoption of e-government requires:

1. technical and economic accessibilities of ICTs – ICTs access (supply),
2. competences and awareness related to the use of ICTs – ICTs competences, and
3. usage of ICTs by government units, citizens and businesses – ICTs usage (demand).

It is viewed through several studies that there is a gap between supply of ICTs in government units and actual usage of

<sup>10</sup> C.C.Bozarth, R.B.Handfield, "Introduction to operations and supply chain management," Pearson Education Asia Ltd. 2008

<sup>11</sup> M.Colurcio, "TQM: a knowledge enabler," The TQM Journal, 2009, Vol.21, No.3, pp.236-248

<sup>12</sup> Jinmei Huai, Apply TQM to E-Government Outsourcing Management, 2012 International Conference on Applied Physics

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<sup>13</sup> Beynon-Davies P. (2007). Models for e-government. Transforming Government: People, Process and Policy, 1(1), 7-28.

ICTs. ICTs access means that there is a constant need of investments in ICT infrastructure in government units. In particular purchase of hardware, infrastructure networks construction. Also there must be implemented either standard or created new dedicated back-office and front-office information systems. ICTs investments in themselves do not mean success in adopting e-government. Improvement of efficiency must involve a variety of organizational, social and cultural changes that will lead to, transparency, and accountability in government units by reducing transaction times and removing redundant layers of bureaucracy. Lack of relevant changes, such as re-engineering of government processes and documents workflows or adaptation of the law, usually means that the implementation of ICTs does not bring the expected benefits. Low quality and lack of integration of information systems and their lack of adaptation to the needs of users can be even a cause of failure to use ICTs. In particular, this relates to the e-government services for citizens and businesses. Thus, in addition to ICTs supply, the adopting e-government is also determined by ICTs demand. Competences of government managers and employees are very important for these two stages. Their knowledge and skills are needed to take appropriate investment decisions, implement ICTs and successfully use ICTs.

TQM process in e-government outsourcing requires people and technology as basic inputs, so that applied information and communication technology can guarantee public service delivered correctly and timely. TQM process consists of cycles. Managers are to view performance of e-government outsourcing system in dynamic way. Reactions from the citizen are triggers for the managers to inspect activity of outsourcing vendor and modify, if it is necessary, delivery procedure for public services. The public service delivery is obligation for each participant and every bit of technology, involved in processes related to TQM.

E-government outsourcing comprises heterogeneous elements and multiple stages. Decision-making, business transactions and communication can take place through outsourcing process. Bring electronic production network and electronic public service into effect is a project need more resources. Teamwork and communication play an important role in outsourcing management. Since e-government outsourcing is cooperation between government institution and outsourcing vendor, getting communications right is important to outsourcing action process.

Through TQM, all levels of people are encouraged to become more closely related and to participate in outsourcing's objectives. Responsibility is on everyone, to deliver quality services in order or task to meet the citizen's requirements. Everyone should understand responsibility of serving their own customers, who are expecting to receive product of their, quality work. but Different tasks for individual participants, government officials, and outsourcing vendors, but at the end they have common objectives. Thus, their own work, well provided and with clear knowledge of their requirements, can only help to satisfy the citizen.

## VI. CONCLUSION

Good communication avoids misunderstandings and reduces the costs of quality by avoiding mistakes. One of TQM successful factors is creating and maintaining smooth channels of

communication. Under the circumstance of TQM, effective communication of two-way process could be established and managers could select the appropriate methods for various situations. Both employees from government and outsourcing vendor should learn to express their idea correctly and must be sensitive to other's suggestions.

Recognition of success factors in good practice for e-government, carry significance for reliable and effective e-government adoption. Overcoming challenges is the most important. Therefore it is important to realize that there is no just one, single and simple, solution to fit every situation. In Europe countries, with different political, economic, social and governance contexts, is required to have different approaches. Proposed model must be easy to adjust quickly to new conditions. If e-government implementation is to be successful one, recommendation for government agencies is that they need to encourage people to engage in government online services by increasing accountability of the services, strengthening the system trust, and advertising services, because that can increase people's participation in e-government.

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# Kangaroo mother care as compared to standard care for the management of preterm low birth weight babies.

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**Abstract-** Preterm low birth weight (LBW) babies are unable to control their body temperature and are at greater risk of illness. Conventional neonatal care of LBW babies is expensive and needs both trained personnel and permanent logistic support like the incubator, warmer etc. Kangaroo Mother Care (KMC) is a special way of caring for low birth weight babies has three main components- (a) thermal care through continuous skin to skin contact (b) support for exclusive breastfeeding (c) early recognition and response to complication. This study was conducted to assess the effectiveness of KMC as compared to conventional care. This randomized controlled trial was conducted in the Enam Medical College & Hospital, Dhaka from October 2017 to September 2018. Fifty neonates selected as per inclusion and exclusion criteria. Twenty-five of them were randomly allocated to KMC (Group-I) and 25 of them to Standard Method Care (Group-II). This study was done by  $\chi^2$ , t-test etc. with SPSS version 20.0. During hospital stay hypothermia (Group-I 4% vs. Group-II 24%) and hyperthermia (Group-I 8% vs. Group-II 32%) were significantly low in KMC group. 64% of neonates were group-II and 36% were group-I developed late-onset neonatal sepsis (LONS) during the study period and the difference was statistically significant ( $p=0.04$ ). Neonates with KMC care required statistically shorter duration to start direct breastfeeding than standard care group (Group-I  $9.6 \pm 2.16$  days vs. Group-II  $20.12 \pm 3.82$  days;  $p=0.04$ ). Total cost during hospital stay was significantly less in the KMC group (Group-I  $9508 \pm 4142$  takas vs. Group-II  $35064 \pm 13352$  takas;  $p=0.01$ ). At 40 weeks corrected gestational age, KMC infants showed significantly higher daily weight gain than standard care group (Group-I  $27.08 \pm 3.02$  gms vs. Group-II  $16.00 \pm 2.76$  gms;  $p=0.002$ ). In this study, KMC an effective method and provides effective thermal control, helps to achieve full enteral feeding, and birth weight achieving in LBW neonates.

**Index Terms-** KMC, Low birth weight, Hypothermia, Conventional care.

## I. INTRODUCTION

Low birth weight (LBW), defined as weight at birth about  $< 2500$  gm irrespective of gestational age, has an opposing effect on child survival and growth, and may even be a vital risk factor for adult diseases (Outcomes et al.). Preterm LBW is a major problem worldwide. Ten countries account for 60% of worlds preterm birth, among them Bangladesh rank 7 (Blencowe et al.). Approximately 40% of Newborn deaths children under five years of age in developing countries occur in three major causes being birth asphyxia, infections, and complications due to prematurity and low birth weight (Blencowe et al.). It is also notable that, in Bangladesh deaths in the neonatal period account for 60% of all under-five deaths. Developing country like Bangladesh to achieve Millennium Development Goal (MDG-4) must address and reduce the excessively high neonatal mortality rate. Birth weight is a significant determinant of newborn survival (Survey). Worldwide each year at least 15 million babies are born too soon each year before 37 completed weeks of pregnancy that is one out of every 10 babies (Blencowe et al.). LBW infants are about 20 times more probable to die, compared with weightier babies. One-third of LBW babies die in the first 12 hours after delivery. One of the main causes that premature LBW babies are at greater risk of illness and death is that they lack the ability to control their body temperature-i.e., they get cold or hypothermic very quickly. A cold newborn stops feeding and is more susceptible to infection (Lawn et al.). Preterm LBW infants are predisposed to heat loss because they have a high ratio of surface area to body weight, little subcutaneous fat, and reduced glycogen and brown 'fat' stores. In addition, their hypotonic ("frog") posture limits their ability to curl up to reduce the skin area exposed to the cold environment. Conventionally these babies are managed under radiant warmer or incubator which is expensive and needs both trained personnel and permanent logistic support. The baby under warmer has increased the risk of temperature instability, increase the chance of nosocomial infection and increase the insensible loss of water (Thompson). Kangaroo Mother Care (KMC) is a special way of caring for low birth weight babies. In the early 1970s, interested by problems stand up from the lack of incubators and also the impact of mother and newborn partition, Colombian pediatrician Edgar

Rey developed a technically simple method later named Kangaroo mother care (Alashetty). KMC has three main mechanisms including thermal care through unremitting skin to skin contact by being tied with a cloth to the front usually of the mother; provision for exclusive breastfeeding; early recognition and response to complication (Charpak et al.). The reported advantages of KMC for neonates are well-maintained skin temperature, reduced incidence of apnea and bradycardia, stable transcutaneous oxygen level (Chia et al.). KMC has been shown to be efficacious in reducing the physiological and behavioral responses to pain in preterm infants 28 to 36 week's gestation (Johnston et al.). KMC is one of the non-pharmacological measures recommended by the Canadian Paediatric Society and the American Academy of Pediatrics for reducing pain associated with bedside procedures in NICU (American Academy of Pediatrics Committee on Fetus and Newborn et al.). A complex process of care named either conventional or modern neonatal care includes interventions already proven to lower the burden of both neonatal morbidities and mortality. Conventional neonatal care of LBW babies is expensive and needs both trained personnel and Permanent logistic support. This complexity is critical during the stabilization period until the infant has adapted to autonomous extrauterine life. The problem of healthiness systems forced by the care of preterm infants in high-income countries is substantial and well documented. Indeed it is estimated that the cost of care for a single LBW infant in the USA is US\$51600. This challenge still largely remains invisible in low-income countries but is actually of greater magnitude as LBW rates are higher and the resources available fewer, characterized by understaffed hospitals with ill-equipped or non-existent neonatal care units which ultimately result in higher neonatal mortality rate (Ruiz-Peláez et al.). This study was conducted to assess the thermal control, cost during hospital stay and effectiveness of KMC as compared to conventional care.

## II. METHODOLOGY

This randomized controlled trial study was conducted in low birth weight babies admitted in Enam Medical College & Hospital, Dhaka, Bangladesh from October 2017 to September 2018. Inclusion criteria were neonate with birth weight 1250 to 1800 gm, gestational age >30weeks to <37 weeks and the Hemodynamically stable after birth. A detailed history was taken from the mother/caregiver and from an obstetric record and then entered in the structured questionnaire. Gestational age was determined by best obstetric estimates and new Ballard score. Exclusion criteria were a major life-threatening congenital malformation, severe perinatal asphyxia, babies require a ventilator or ionotropic support, the mother is critically ill or unable to comply with the follow-up schedule, parental refusal for KMC intervention. Eligible subjects were selected as per inclusion and exclusion criteria. The subjects were divided into two groups; Kangaroo Mother Care (Group-I) and Standard Method Care (Group-II). Randomization was achieved by lottery technique and allocation was concealed by sealed envelope technique. Some variables are thermal control, neonatal morbidities: sepsis, hypothermia, and apnea, duration of hospital stay, breastfeeding, and time to achieve full enteral feeding, growth and hospital stay and cost. After enrollment, according to the inclusion and exclusion criteria, the subject was divided into two groups; Kangaroo Mother Care (Group-I) and Standard Method Care (GroupII). Randomization was achieved by simple randomization and allocation was concealed by sealed envelope technique. For the entire eligible neonate, an informed written consent obtained after constructing an informed consent form in easily understandable language and let the caregiver duly informed. In the KMC group mothers were explained detail about KMC adoption in the presence of their family. KMC was initiated as soon as the baby was stable. If the mother is not available initially any of the family members can start KMC. The mother provided skin to skin contact in upright position dressed in a cap, socks, and diaper and supported in the bottom with a sling/binder. Adequate privacy was ensured. Comfortable chairs and beds were provided to the mothers practicing KMC in the nursery. Skin-to-skin contact was given for a minimum of 1 hour at a time and at least for 12 hrs./ day, duration was gradually increased to as long as comfortable to the mother and baby. When the baby is not in KMC, the baby was placed in the cot with adequately clothed and covered. A "KMC" chart was given to the mother to keep a record of the duration of kangaroo care provided. If the mother is unable to fill up the chart, it was done by a close family member. Neonate in the SMC group was managed under a radiant warmer. In both the groups, mothers were allowed to handle their babies at any hour of the day breastfeed the babies by nasogastric tube, cup-spoon or directly. Babies in both the groups were provided feeding, vitamin and minerals supplementation as per protocol. During hospital stay, both the groups were monitored for daily weight gain by electrotonic weighing scale, episodes of hypothermia, apnea, nosocomial sepsis, hyperbilirubinemia, necrotizing enterocolitis, physiological parameters (heart rate, respiratory rate, axillary temperature, and oxygen saturation) were measured by a single observer and duration of stay at hospital was recorded. Gastrointestinal symptoms such as vomiting, abdominal distension, the character of nasogastric aspirate, characteristics of feces and its color were monitored. After assessment by laboratory tests, clinical follow-up and response to treatment, gastrointestinal symptoms categorized as LONS or feeding intolerance. If any of the study neonates in either group, developed features suggestive of sepsis, the following investigations were sent: Blood sample was collected and sent for culture and sensitivity, complete blood count (CBC), CRP, peripheral blood film (PBF) and other supportive investigations as demanded by clinical condition. All existing clinical management's protocols, clinical practices were uninterrupted. The decisions for patient's management were given by the consultant of the NICU. Duration of antibiotic was as per the existing protocol of the unit. The Weight of the baby at admission and thereafter daily and plotted in the weight chart to see the weight gain pattern of two groups and time to achieve birth weight regain. Age at the start of feeding was recorded. Time to reach full enteral feeding was calculated by the difference between the age at the start of feed and the age of effective breastfeeding or getting

150ml/kg/day of the requirement of feed by nasogastric tube or dropper. Adequacy of breast milk was assessed by effective suckling of the baby, feeding at least 8 times in day and night, adequate urine output (6 times per day), the baby is getting weight (10-15 gm/kg/day) and mother’s satisfaction and confidence. Length of hospital stay was calculated at the time of discharge. Cost during hospital stay was calculated by bill payment sheet, investigation cost, and medication cost. Data were recorded by standard Questionnaire and checklist. The study protocol was submitted for review by the Institutional Review Board. Informed written consent was taken from each of the parents before taking any interviews. The consent form has clearly described the purpose and methods of the study, confidentiality in this study, their rights to participate voluntarily and to refuse at any point in time without consequences. Data were compiled and analyzed by the chi-square ( $X^2$ ) test, unpaired student’s ‘t’ test probability (p) value of less than 0.05 with the help of SPSS version 20.0.

Calculation of sample size:

Sample size will be determined using the following formula:

$$n = \frac{P_1(1-P_1)+P_2(1-P_2) \times (Z_\alpha + Z_\beta)^2}{(P_1 - P_2)^2}$$

$$= \frac{0.85(1-0.85)+0.42(1-0.42) \times (1.96 + 1.28)^2}{(0.85 - 0.42)^2}$$

$$= 21 \text{ in each group}$$

$P_1$ = 0.85 proportion of patients developing outcome in the control group

$P_2$ =0.42 proportion of patients developing outcome in the intervention group (George et al.).

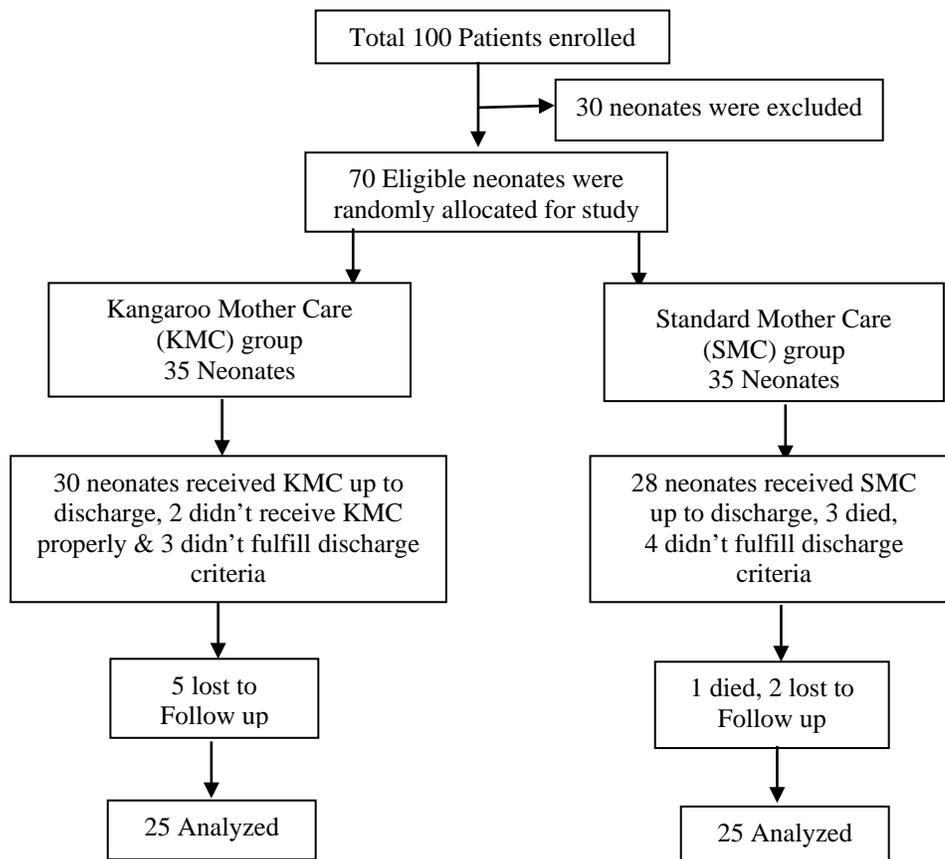
$Z_\alpha$ =Z- value at a definite level of significance.1.96 at 5% level of significance.

$Z_\beta$ =Z-value at a definite power.1.28 at 90% power.

As the effect size is unpredictable in our population we will increase the sample size to 50.

Intervention group - 25 patients & Control group-25 patient.

**Flowchart of selection of case and control**



### III. RESULTS

This randomized controlled trial was conducted in fifty neonates selected as per inclusion and exclusion criteria. Twenty-five of them were randomly allocated to Kangaroo Mother Care (Group-I) and 25 of them to Standard Method Care (Group-II). There were no differences in birth weight, gestational age, number of male/female neonates, places of delivery and mode of delivery among the two groups. During hospital stay hypothermia (Group-I 4% vs. Group-II 24%) and hyperthermia (Group-I 8% vs. Group-II 32%) were significantly low in the KMC group. 64% of neonates of the standard care group and 36% of KMC group developed late-onset neonatal sepsis ( LONS) during the study period and the difference was statistically significant (p=0.04). Neonates with KMC care required statistically shorter duration to start direct breastfeeding than standard care group (Group I 9.6± 2.16 days vs. Group II 20.12 ± 3.82 days; p=0.04). Total cost during hospital stay was significantly less in the KMC group (Group I 9508± 4142 takas vs. Group II 35064± 13352 takas; p=0.01). At 40 weeks corrected gestational age, KMC infants showed significantly higher daily weight gain than standard care group (Group I 27.08± 3.02 gms vs. Group II 16.00± 2.76 gms; p=0.002) (Tables 1-5).

Table-1: Thermal control in two groups.

Variables	Group-I (n-25) n (%)	Group-II (n-25) n (%)	p-value
Hypothermia	1(4%)	6(24%)	0.04
Hyperthermia	2(8%)	8(32%)	0.03

Table-2: Occurrence of sepsis in two groups.

Variables	Group-I (n-25) n (%)	Group-II (n-25) n (%)	p-value
Late onset sepsis	09(36%)	16(64%)	0.04
No sepsis	16(64%)	9(36%)	

Statistical analysis was done by the Pearson Chi-Square test.  
 n = Total number of subjects

Table-3: Effect on breastfeeding in two groups.

Variables	Group-I (n-25)	Group-II (n-25)	p-value
Time of starting breastfeeding (days) (mean± SD)	9.6±2.16	20.12±3.82	0.04
Adequacy of breast milk production n (%)	22(88%)	16(64%)	0.04
Exclusive breastfeeding rate up to follow up n (%)	25(100%)	23(92%)	0.14

Statistical analysis was done by unpaired 't' test and Pearson Chi-Square test.

Table-4: Distribution of the study patients according to cost.

Study group	Cost (Taka) mean± SD	p-value
Group-I	9,508 ± 4,142	0.01
Group-II	35,064 ± 13,352	

Statistical analysis was done by unpaired 't' test.

Table-5: Effect of growth in two groups at 40 weeks corrected gestational age.

Variables	Group-I (n=25) mean± SD	Group-II (n=25) mean± SD	p-value
Weight gain (gm/day)	27.08±3.02	16.00±2.76	0.002
Head circumference gain (cm/wk.)	0.86±0.09	0.81±0.09	0.07
Length gain (cm/wk.)	0.99±0.16	0.92±0.10	0.08

Statistical analysis was done by unpaired 't' test.

#### IV. DISCUSSION

Low birth weight (LBW) has an adverse effect on child survival and development. Preterm LBW neonates are predisposed to heat loss. Conventionally these babies are managed under radiant warmer or incubator which is expensive and needs both trained personnel and permanent logistic support. The baby under warmer has increased the risk of temperature instability, increase the chance of nosocomial infection and increase the insensible loss of water. KMC is a special way of caring for the preterm or low birth weight infants where the baby is kept in skin-to-skin contact with the mother and breastfed exclusively. The reported advantages of KMC for the infant are well maintained of skin temperature, reduce the incidence of apnea and bradycardia, stable transcutaneous oxygen level, long quiet sleep periods, shorter hospital stay and therefore have the potential for considerable cost savings. It is observed that KMC decrease the incidence of nosocomial infection, reduce severe morbidity, and avoid hospital readmission and helps in increasing weight gain in comparison to the conventional care group. KMC has also been found to be related to higher breastfeeding rate improved maternal confidence and bonded better to their infant (Conde-Agudelo et al.) to evaluate the efficacy of KMC as compared to standard care for the management of preterm low birth weight babies this randomized controlled trial was conducted in Enam Medical College & Hospital, Dhaka, Bangladesh, from October 2017 to September 2018.

This interventional study included 50 preterm low birth weight neonates based on inclusion and exclusion criteria. Twenty-five of them were assigned to the KMC group (Group-I) and 25 in the standard care group (Group-II). During the hospital stay, higher incidence of hypothermia (4% vs. 24%) occurred in the KMC group and Standard care group respectively, which was statistically significant (Table-1). This finding was comparable to another study (Suman et al.). Hypothermia was found significantly lower in the KMC group (6% vs.37%, p<0.001). Episodes of hypothermia were significantly reduced in the KMC group and higher rectal temperature was recorded (Ali et al.);(Outcomes et al.);(Ludington-Hoe et al.).(Ibe et al.) also found the same results in their studies. In another RCT states that hypothermia was significantly less common (13.5 vs. 31.5 episodes/100 infants) in KMC infants (Cattaneo et al.). The incidence of hyperthermia was also found higher and statistically significant in the standard care group in this study (32% vs. 8%). Similarly higher incidence of hyperthermia was also found in another study (Suman et al.). A large proportion (64%) of neonates in the standard care group developed sepsis during the study period (Table-2). In the KMC group, the rate of sepsis was 36% (9 out of 25). The difference in the rate of sepsis in the two groups was statistically significant (p<0.05). In another prospective RCT on 114 preterm LBW neonates, statistically significant sepsis was found in the conventional care group that

was 23.2% vs. 6.9%  $p=0.014$  (Ali et al.). Significantly low incidence of sepsis was also reported by another study (Suman et al.). Among 206 LBW babies, a significantly lower incidence of sepsis was found in the KMC group 3.9% vs. 14.8%  $p=0.008$ . Cochrane review concluded that KMC reduces the incidence of nosocomial infections (Conde-Agudelo et al.) in a prospective observational study also found a low incidence of sepsis (4.7%). This study showed that neonates who got KMC required a statistically significant shorter time to start breastfeeding directly than the standard care group (Table-3). Another study also showed the same type of results (Suman et al.). An Adequate amount of breast milk production was significantly higher in the KMC group mother in this study. Adequacy of breast milk was assessed by daily urine output and weight gain of the baby. KMC is associated with a longer duration of breastfeeding, higher volumes of milk expressed, higher exclusive breastfeeding rates and the higher percentage of breastfeeding at the time that pre-term infants are discharged from hospital (Renfrew et al.);(Hake-Brooks and Anderson). We always try to ensure breast milk for the baby from mother or donor milk, formula feeding is not recommended in our institution. For this reason, though the exclusive breastfeeding rate was higher in the KMC group in this study (100% vs. 92%) but was not statistically significant. A randomized trial carried out with KMC among babies less than 1500 gram which found higher breastfeeding rates (55% vs.28%) at 6 weeks in the KMC group (Whitelaw et al.). The number of mothers exclusively breastfed their babies at 6-week follow-up was double (12/14 vs. 6/14) in the KMC group than in the control group (George et al.) Another comparative study also found a higher rate of exclusive breastfeeding in the KMC group (Suman et al.). KMC was found to decrease the probability of not exclusively breastfeeding (relative risk 0.41, 95% confidence interval 0.25 to 0.68) at discharge (Conde-Agudelo et al.). Exclusive breastfeeding was found to be more prevalent in the KMC group as compared to the control group (Ali et al.). Proportions of exclusively breastfed neonates was higher at 40 weeks (KMC: 94.4%, control: 72%,  $p=0.002$ ). This study showed that neonates who got KMC required statistically significant less amount of money for treatment purpose than standard care group (Table-4). Total cost during hospital stay was significantly less in the KMC group. (Group I  $9508 \pm 4142$  takas vs. Group II  $35064 \pm 13352$  takas;  $p=0.01$ ). Less morbidity like sepsis and shorter duration of hospital stay may likely decrease the amount of cost in the KMC group. In this study at 40 weeks corrected gestational age, KMC neonates showed significantly higher daily weight gain than standard care group (Table-5) (Group I  $27.08 \pm 3.02$  gms vs. Group II  $16.00 \pm 2.76$  gms;  $p=0.002$ ), head circumference gain (cm/wk.)  $0.86 \pm 0.09$  and  $0.81 \pm 0.09$  and length gain (cm/wk.) was  $0.99 \pm 0.16$  and  $0.92 \pm 0.10$  in KMC group and standard care group respectively and both differences were not significant statistically. Similarly, in another study, it was found that KMC babies accomplished considerably better development. It exposed that KMC babies had better average weight improvement per day (KMC: 23.99 gm vs. CMC: 15.58 gm,  $p<0.0001$ ). The weekly increases in head circumference (KMC: 0.75 cm vs. CMC: 0.49 cm,  $p=0.02$ ) and length (KMC: 0.75 cm vs. CMC: 0.49 cm,  $p=0.02$ ) were higher in the KMC group (Suman et al.). An RCT from India has shown higher increments in weight, length and head circumference in kangaroo infants in the neonatal period (George et al.);(Ali et al.) showed that KMC infants gain larger daily weight, while they were cared in the hospital (control:  $10.4 \pm 4.8$  grams, KMC  $19.3 \pm 3.8$  grams,  $p<0.001$ ). In a meta-analysis by Neonatal Review Group of the Cochrane Collaboration randomized trials comparing KMC and conventional neonatal care in LBW showed KMC neonates had gained more weight per day by discharge than controls (weighted mean difference 3.6 g/day, 95% confidence interval 0.8 to 6.4) and had a larger head circumference at 6 months' corrected age than controls (George et al.).

## V. CONCLUSION

From this interventional study, it can be concluded that Kangaroo Mother Care maintain effective thermal control, decrease the incidence of sepsis, reduces feed intolerance, helps to achieve full enteral feeding and birth weight earlier in preterm low birth weight neonates. KMC also found to reduce hospital stay, treatment cost and enhances growth during the postnatal period. With proper implementation, KMC may become a safe and effective method in the management of preterm low birth weight babies.

## CONFLICT OF INTEREST

None

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# Reducing the Cost of Home Lighting in Remote or Rural Community in Developing Nations

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**Abstract:** Home lighting is required to provide illumination when the environment is dark. Incandescent bulb has been a common device used to provide illumination, but needs to be powered by an alternating current (AC). This paper compares the benefit of using direct current (DC) devices to provide illumination than AC devices and hence reduces the cost of home lightning. A model was developed based on basic home lighting need in a developing community in Nigeria Ilaro. The study shows that using DC devices like LED light will reduce the cost, lower power requirement and also present a greater life span for the lightning devices and this can also by extension be used to reduce cost of lightning in urban settings.

**Keywords:** Alternating current (AC), Direct Current (DC), Lighting devices Light emitting Diode (LED).

## Introduction

Home lighting system is the illumination of the home using a source of light such as incandescent bulb or other source of lightning [1]. Typical, in rural area setting or remote location availability to electricity source is inadequate or not accessible [11]. The use of renewable source then suffix as the best alternative in this settings [12]. Sometimes when electricity supply is available its tariff is too expensive to make it accessible [13]. A lightning bulb operate by the heating of a filament to produce light been enclosed in a transparent glass, each of the bulb requires electricity to be energized. [2], The higher the wattage the higher the illumination and heat generated by the bulb and also higher power requirement [3]. A Light source is required at home or office to provide Illumination to a building as required in the day or night. This type of bulb uses alternating current (a.c) for its form of power. [4], as energy is neither created nor destroy some of this energy will be converted to light while other will be converted to heat. Currently, Light Emitting Diode (LED) is used in array to provide illumination, the array of LED is powered using direct current (d.c) [5]. As shown in Plate 1. [6]. The LED light generates lesser heat and provide better illumination, [7]. Due to the fact that the energy conversion is more efficient. [8]. A battery can be used as a power source, which in turn, can be charged using a solar panel and by extension can be used in the rural area setting. To this end in this paper a model was develop using the combination of a solar panel, charge controller and an accumulator (Battery)., To provide illumination for a typical Home requirement [9]., as shown in Table 1 and 2.



Plate 1: d.c 5W bulb

**Table 1:** typical Home Load Analysis d.c Load

S/N	ITEMS	Power	QUANTITY
1	Light Bulb	5W	18
2	12V d.c Fan	5W	2
3	12v project with TV option	7W	1
4.	Phone charging port		1
Total		107 Watt	

**Table 2:** A.c Load Equivalent

S/N	ITEMS	Power	QUANTITY
1	Light Bulb	15w	18
2	Ceiling Fan	80W	2
3	50 inches Flat screen TV	100W	1
4.	Phone charger	7w	1
Total		202 Watt	

The total wattage for the basic home load on d.c is 107W and 202W for a.c load equivalent as shown in Table 2

## DESIGN AND METHODOLOGY

A model was developed as shown in Figure 1

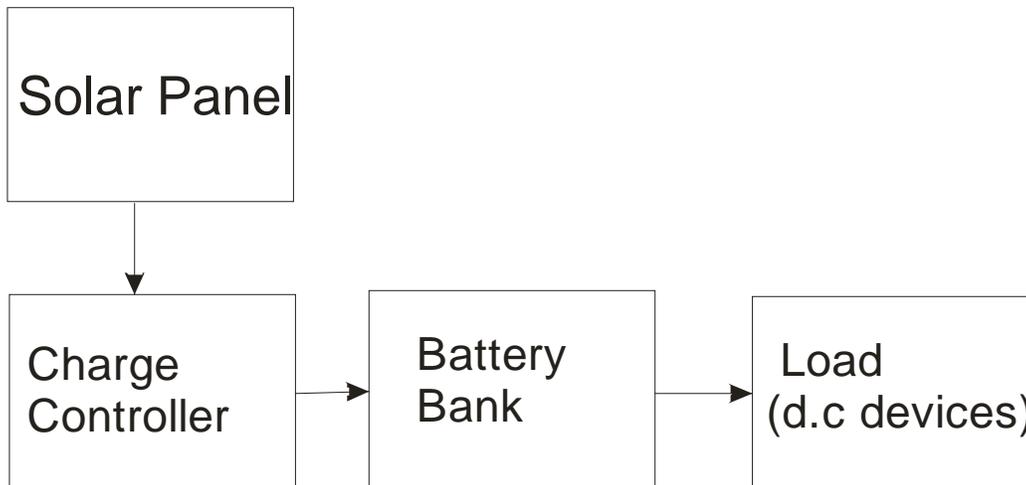


Figure 1: D.C Power system

### 1. Solar Panel:

The solar panel provide d.c power by converting the light ray from the sun to d.c power which in turn is used to charge a battery bank [10].

### 2. Charge controller:

This device compares the voltage on the battery under charge and prevent over charging of the battery.

### 3. Battery Bank

This is an accumulator or set of battery used to store charges during the day when sunlight is available.

### 4. Load:

This is all the load or d.c devices connected to the d.c source.

**Table 3: Parameter of Variables**

S/N	ITEMS	DESCRIPTION	QUANTITY
1	Solar Panel	24V,200W	1
2	Charge Controller	12/24V 30A	1
3	Battery Bank	12V,200AH	2

Table 3 shows the parameter used in this model to provide illumination to the load described in Table 1. In conjunction with this a distribution box was used to isolate the system from the a.c equivalent circuit and to provide protection in case of short circuit fault or any other fault.

## RESULT AND ANALYSIS

Items in table 1 above are the load powered by the electrical output generated by the system. The system can provide continuous power to the unit for 24hrs continuously, for the sake of analysis only the cost for the night duration when there is no sunlight that is 15Hrs will be used. The cost of power to items in table 1 can be evaluated by PHCN rating or the utility company rate. The equivalent load will be considered a.c load and also the d.c equivalent which will focus on the lighting point, according to Table 1., 18unit of 5w d.c bulb is been used to provide illumination for the 15hrs night duration from 6pm to 9am., and considering the cost if a.c equivalent powered bulb is been used to provide illumination over same period, using supply from the utility company or PHCN.

18 unit of 5W bulb will be equal to 90W per hour, hence

Watt consumed by 18 unit of d.c bulb

$$18 \times 5 = 90W$$

Per an hour

For 15 hours;

$$90W \times 15\text{hrs} = 1350\text{Watt-hour}$$

In Kilowatt-Hour

$$1350/1000 = 1.3\text{KWh}$$

For a month the total cost of lighting will be

$$1.3\text{KWh} \times 30 = 40.5\text{KWh per month}$$

**Table 3:** Energy charge by utility company (PHCN) per month for domestic lighting Load.

Unit consumed (KWH) = 40.5 per month

Tariff rate (as at June. 2018 by Electricity company) =N=24.97

Hence, energy charge will be (Unit consumed x Tariff rate)

$$=N=1,011.285$$

Using the 15hrs duration, Table 3., shows 40.5 units would be used throughout the month by the same lighting load. From the result obtained it can be inferred that system will cost =N=1,011.285 if the utility tariff is used to provide light for domestic use at home or office.

Considering the a.c equivalent of 18 unit of incandescent light bulb or low energy bulb for this calculation.

Let consider a 15W low energy bulb, hence

18unit of 15W bulb will be equal to 270W per hour, hence

Watt consumed by 18 unit of low energy bulb

$$18 \times 15 = 270W \text{ Per an hour}$$

$270W \times 15hrs = 4050 \text{ Watt-hour}$

In Kilowatt-Hour;

$4050/1000= 4.05KWh$

For a month the total cost of lighting will be

$4.05KWh \times 30 =121.5KWh \text{ per month}$

**Table 4:** Energy charge by PHCN per month for domestic a.c equivalent lighting Load.

Unit consumed (KWH) = 121.5 per month
Tariff rate (as at June. 2018 by PHCN) =N=24.97
Hence, energy charge will be (Unit consumed x Tariff rate)
=N=3,033.855

Using the 15hrs duration, Table 4., shows 121.5 units would be used throughout the month by the same lighting load, with a cost of =N=3,033.855

From the result obtained it can be inferred that the d.c system has reduced the cost of energy charged paid to PHCN. That is =N=1,011.285 is saved by using the d.c model to provide light for domestic use at home or office, when compared with the a.c equivalent that will cause at minimum wattage of 15W =N=3,033.855

Consider Figure 2, which shows the amount saved by using d.c load in providing lighting for the duration of 15Hrs.

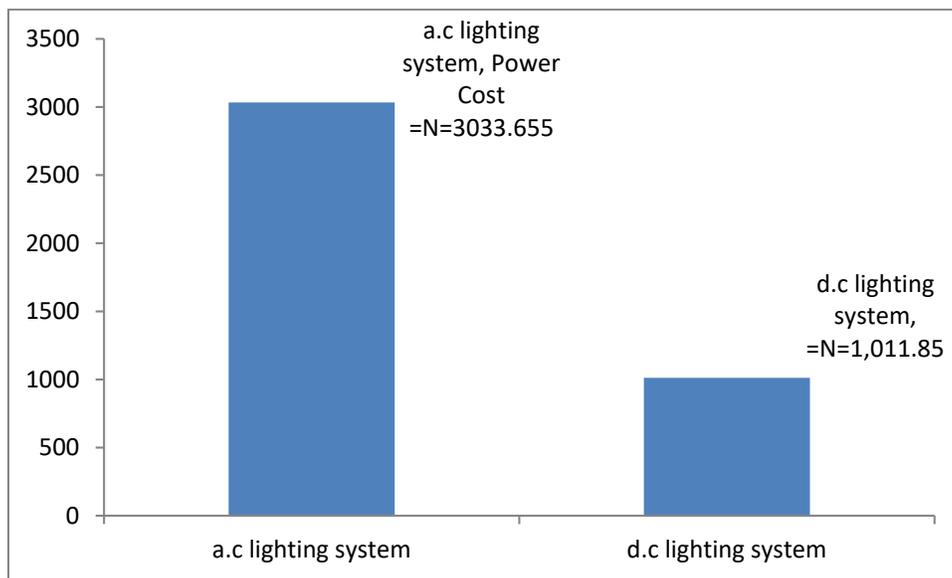


Figure 2: a.c lighting versus d.c lighting cost

From figure 3 we can also infer that 75% savings is achieved when d.c lighting system is used.

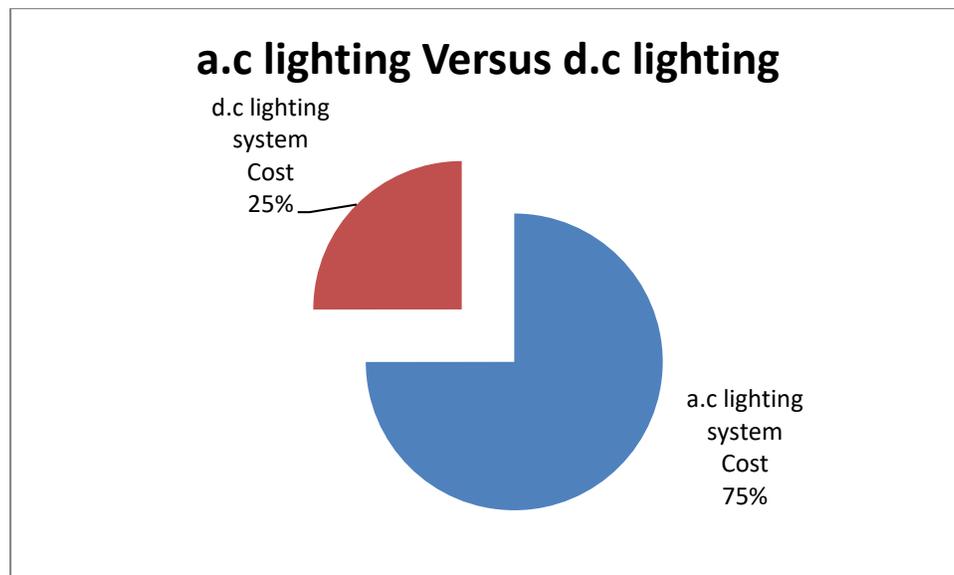


Figure 3: percentage saved by d.c lighting load 75%

## Conclusion

The result shows that using DC devices like LED light as used in this study and also adopting the model developed, will reduce the cost, give better illumination, lower power requirement and also present a greater life span for the device.

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# Formulation and Development Floating Tablet of Anti Depressant (Venlafaxine Hydrochloride).

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**Abstract-** The main object in this research study is development, formulation and evaluation of Venlafaxine hydrochloride anti-depressant gastro retentive tablets that is release 24 h time of period in control manner.

Floating drug delivery system use in treatment of depression is the main object on floating drug delivery system mechanism, needs and application and the main focus on used in treatment in depression mental state, floating drug delivery system is extreme valuable process and capability to prolong and control the gastric emptying time which domicile in the stomach for long time and floating system is more significance in enhancement of bioavailability and minimize the drug wastages, depression is most serious mental state today many people is know that depression not disease but it is serious mental disease which is cause anxiety etc. And floating drug delivery system is very useful on those drug which have lower bioavailability and in this disease. And in this mental state patients not want to take medicine two to three times because they not feel good and normal and floating system is most useful for Patients compliance so floating drug delivery system is very applicable in anti-depressant drug for example Venlafaxine hydrochloride.

In this formulation used different type of the apply in this preparation which is HPMC, Carnauba wax, Sodium bi carbonate, cetyl alcohol, Talc, Olive oil as well as drug formulate and give satisfactory and optimal release and stay buoyant on the medium surface the conclusion is obtain success in this formulation and increase in bioavailability as well gastric residence time.

**Index Terms-** Gastro retentive system, Floating drug delivery system, Depression

## I. INTRODUCTION

Oral drug delivery system is aid to arrive to resistance to change of position therapeutic plasma drug concentration in to the preparation. These drug dosage forms disclose good patient compliance and assumption drug release profiles. Moreover these were not constructed to counter the difficulties attached with physiological position of the human body that are gastric emptying which more important effectual the bioavailability and in turn the curative capacity to produce a desired effectual of the drug dosage forms. Thus gastro retentive dosage forms such as hydrodynamic balanced systems, modify density system, GIT release the drug in absorption zone and extended the gastric residence duration by antagonistic gastric emptying method. The groups can controller

release of the drug in absorption zone before eviction of the dosage form from the human body thence make proper the bioavailability of the drug.

Gastric emptying of dosage forms is an utmost various method and capability to extended and control emptying time is vital plus for dosage forms, which domicile in the stomach for a large time than conventional dosage forms, while the dosage form is lower absorption/non absorbing phase. These kinds of problems defeat by the floating drug delivery system. It is the gastro retentive drug delivery system.

## II. GASTRO-RETENTIVE SYSTEM

Gastro retentive system can stay in the gastric site for many hours and thence importantly extended the gastric retention made better bioavailability minimize drug wastage and make better, solubility of drugs that are less soluble in high pH environment. Gastric retention generate newer curative possibilities and substantial profits from patients.

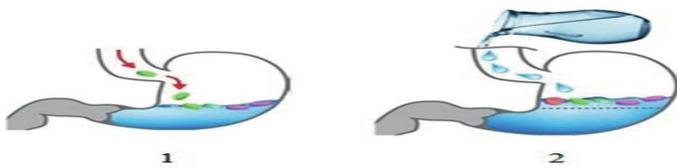
Gastro-retentive system are those dosage form which is able for retain itself in the stomach of gastric content to maximizing the produce absorption drug from medium of acidic in control manner. Gastro retentive system are favourable drug which is improving their.

- Bioavailability
- Therapeutic effective
- Possible reduction
- Reduces drug wastage
- Rise solubility for drug that are less soluble in high pH

## III. FLOATING DRUG DELIVERY SYSTEM-

Floating drug delivery system are less density which buoyancy is capable amount for float over the gastric content. It stay buoyant in stomach without affective gastric empty retention time. Conclusion maximize the gastric retention time for better control of fluctuation in plasma drug concentration.

Devis is primarily introduce the floating system that floating drug delivery system to use the difficulty of swelling of dosage form and presented the modern gastro retentive drug delivery system to the pharmaceutical or pharmacy industry. Today the more of effectual control drug release dosage form.



#### IV. FLOATING DRUG DELIVERY SYSTEM

The main purpose of floating drug delivery system is arrive assuming and maximize in bioavailability. Today pharmaceutical scientist are mostly participate in development of floating drug delivery system. The dosage form has vantage of once dose for cure and should be deliver the active drug material directly at specific site. Floating system is beneficial as drug with narrow absorption window, which is importance for local action to other dosage form of tablets which are absorbed in the stomach. Floating drug delivery system will maximize the bioavailability of the drug from by floating dosage form in the stomach for large duration and produce for extended time and these several kinds of system are significant for narrow absorption. Useful the special category of the dosage form. Gastric emptying is most fast in fasting stage, bulky in the presence of food to slow emptying and give important liquid for efficient buoyancy.

#### V. TYPE OF THE FLOATING DRUG DELIVERY SYSTEM-

There are two types of the floating drug delivery system-

##### A)-EFFERVESCENT TYPE OF FLOATING DRUG DELIVERY SYSTEM-

##### B)-NON EFFERVESCENT TYPE OF FLOATING DRUG DELIVERY SYSTEM-

**EFFERVESCENT TYPE-** Effervescent type of the floating drug delivery system is also known as the gas generating system which is formulated by the aid of the swelling type polymer such as methyl cellulose, chitosan and several type of effervescent compound like sodium bicarbonate, tartaric acid and citric acid. The relative magnitudes of two quantities of citric acid and sodium bi carbonate is optimal stoichiometric for gas generating in the floating is slightly convexity of the drug delivery system can be neglected by inert gas CO<sub>2</sub> by effervescent chemical reaction between organic acid citric acid and carbonate.

**MECHANISM OF ACTION-** Effervescent system are formulated with aid of the swelling polymers and several types of the effervescent type compounds are apply in formulation when they come in attach with acidic gastric content then they freedom CO<sub>2</sub> and gas ensnare in swollen hydro colloids which furnish buoyancy to the dosage form.

**NON EFFERVESCENT TYPE-** Non effervescent system is made by gel forming largely swell cellulosic hydrocolloids HPMC hydroxyl propyl methyl cellulose, polysaccharides, matrix polymer in large (20%-75%) to tablet capsule, it is non effervescent swelling system. In this technology dosage form is

attaches mixing of drug with gel that is swell close interaction with after administration of oral and keep a comparative unity of shape and bulk density of lower than 1.

**MECHANISM OF ACTION-** After swallowing bang up investment via absorption of a liquid by a solid or gel of gastric fluid to the point which is preclude their outlet from the stomach non effervescent type system is also known as plug type system. First forming a gel at the surface of the dosage form is mechanism of swelling of polymer or bio adhesion to mucosal bed in gastro intestinal tract hydrate by first formed a gel on the surface of drug dosage, conclusion construction of a gel power to determine the diffusion of solvent-in and drug out of the dosage form. Having base on the mechanism on the swelling of polymer or bio-adhesion the mucosal bed in gastro intestinal tract. Resultant diffusion rate of solvent in drug out from dosage form controlled by the gel emphasis.

#### DEPRESSION

Depression is also known as the Major depressive disorder. The most common and serious medical illness that is negative effectual on feelings, the mode your and how your act, But its treatment is available, depression cause by the emotional state of the feelings of dreary and also lost of interested activities of the joy and happiness. Depression is mainly assortment of emotional and physical difficulties and minimize in ability to process of work at the home and another working place. Feeling down in depression situation- change in brain chemistry cause the depression position. Most scientist or researchers says about depression which is depression is caused by these several factors which is-Hormonal Factors Medical Factors

Depression is the situation of unhappy and sorrow. Today the mostly people suffering from depression because of our modus vivendi is so horrendous. While person are in depression, person provender at every point sad for few days, weeks or months or only some days. Some people think depression is common like normal state and not a real health status but this not correct thought, Depression is real disease with original sign and symptoms. It is not kind of weakness, but treatment is possible and most of person is cure or recover the disease of the depression. Depression is trivialities status but it is commonly is present in today life. W.H.O World health organization is display the several suffering person how they overcome the depression. And also present the report how many people suffering by this disease 1 in 5 women and 1 in men at same point life duration of time 21% of women and 12% of men are suffering from the depression.

#### SIGN & SYMPTOMS OF DEPRESSION-

- A) Involvement in joy and pleasure is minimize or almost lost.
- B) Feeling guiltiness also occur in depression condition cause the weight loss or weight gain in appetite.
- C) Problem generate in making decision of thinking or in disease condition.
- D) Angriiness is over much in depressive mood.
- E) Loss of interest in friend family party or get together activities in depression.
- F) Biochemistry- Changes of chemical reaction in brain chemistry may be cause of sign and symptom in disease of depression.

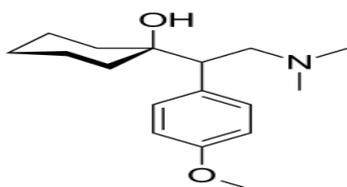
- G) Genetics-Depression in hereditary from families 70% of chance cause by the generation.

#### Venlafaxine. Hydrochloride

- Effexor is the trade name of Venlafaxine HCL of Anti-depressant. It is the antidepressant category of SNRI that is serotonin noradrenaline reuptake inhibitor.
- SNRI is the maximum the concentration of the neurotransmitter serotonin and noradrenaline in the brain of the human body.
- It is primarily acquired by Wyeth in 1993 that is the momentary present in market by the Pfizer.
- It is applied for the therapy of the major depressive Disorder (MDD) that is stature, commonly Anxiety
- Disorder (GAD), Panic disorder and social phobia

### VI. DRUG PROFILE

#### 3.1 DRUG DATA - VENLAFAXINE HCL



#### MOLECULAR STRUCTURE OF THE VENLAFAXINE HYDROCHLORIDE

Venlafaxine HCL is a serotonin and norepinephrine reuptake inhibitors.

1. Molecular formula:  $CH_{27}N_2O_2HCl$
2. Molecular weight: 313.87
3. Action and use-Inhibition of 5HT and noradrenaline reuptake; antidepressant.
4. Chemical name: (RS)-1-[2dimethylamino-1-(4-methoxyphenyl)-ethyl]cyclohexanol.
5. Category: Anti-depressant.
6. Preparation
  - i. Prolonged release venlafaxine capsules.
  - ii. Prolonged release Venlafaxine Tablets.
  - iii. Venlafaxine Tablets.

#### 3.1. Physico-chemical properties:

- i. Description: white crystalline powder.
- ii. Standards: Venlafaxine HCL contains not less than 98.5 per cent and not greater than of 101.5 percent, measured on the not still wet ground.

Solubility: Venlafaxine HCL is regarded to be soluble in aqueous solutions with pH between 2 and 5. It is sparingly to somewhat soluble in aqueous solution with pH 7.

#### EXCEPIRNT USED IN FORMULATIONS-

- HPMC
- Cetyl Alcohol
- Talc
- Sodium bi carbonate
- Carnauba wax
- Olive oil

### VII. METHODOLOGY

#### PRE FORMULATION STUDIES

Pre-formulation studies are taken up in order to appraise the physical and chemical properties of the drug alone and in the joined form with the receiver.

These researches are significant to predict the physical and chemical properties and stability of the drug and additives.

#### ORGANOLEPTIC PROPERTIES:

##### 1. Color

Take a small amount of sample and trim it on the white paper and analyze it seem.

#### PHYSICAL PROPERTIES:

##### 1 .Angle of repose

The flow characteristics are determined by angle of repose. Unappropriated flow of powder is due to frictional force amount by angle of repose. Angle of repose is defined as the big angle possible between the surface of a pile of the powder and the horizontal plan.

**Table No. 1 Flow properties and corresponding Angle of repose**

Flow property	Angle of Repose (Degree)
Excellent	25-30
Good	31-35
Fair-aid not needed	36-40
Passable – may hang up	41-45
Poor –must agitate , vibrate	46-55
Very poor	54-65
Very, very poor	>66

The excellence characteristics of a tablet that prepare it a popular and satisfactory dosage form are denseness, physical stability, fast formation ability, chemical stability and efficacy. In commonly above characteristics of tablet by the quality of the granulation from which it is prepared. Mostly preparation and process liable regard in the granulation step can effectual the characteristics of the granulation generate. Thence many methods to determine certain granulation characteristics have been generated to monitor granulation suitability for tablet preparation. The chief characteristics required to be proctored in granulation are flow properties and sponginess.

#### 2. Determination of bulk density and tapped density:

A correctly weighed of the powder (W) was had caution poured into the graduated cylinder and the volume (v<sub>0</sub>) was measured. Then the graduated cylinder was closed with lid, set into the density measurement setup (bulk density setup) the density setup was set for 500 taps after that, the volume (v<sub>f</sub>) was determine and continued operation till the two back to back reading were equilibrium.

The bulk density and taped density was measured by applying the following formulas.

$$\text{Bulk Density} = W/V_0$$

$$\text{Tapped Density} = W/V_f$$

Where, V<sub>0</sub>= Initial volume,

V<sub>f</sub> = final volume

### 3. Compressibility index

The compressibility Index and Hauser ratio are determine if the property of a powder to be compressed. Extent they determine the relative significance of inter especial connection. In a free following powder, such connection are commonly lower important, and the bulk and tapped density will be intimate in value. For bad flowing materials, there are often larger inter corpuscle connection, and a larger difference between the bulk tapped density will be obtained. These difference are designated in the compressibility index and the Hausner's ratio.

The compressibility index and hausner's ratio are determined by measuring the values for bulk density (P<sub>bulk</sub>) and tapped density (P<sub>tapped</sub>) = P<sub>tapped</sub> - P<sub>bulk</sub>/P<sub>tapped</sub> X100

Hausner ratio = P<sub>tapped</sub> /P<sub>bulk</sub>

Chart are following

**Table No. 2 Scale of flow ability**

Compressibility index (%)	flow character	Hausner Ratio
< 10	Excellent	1.10-1.11
11-15	Good	1.19-1.25
21-25	Passable	1.26-1.34
26-31	Poor	1.35-1.45
32-37	Very poor	1.46-1.59
>38	Very, very poor	>1.60

### 4 .Melting point:

It is the used for to test the purity of the sample

#### Procedure:

Take a little amount of sample into the fusion tube. Locate in the tube in the melting point setup contain castor oil maximize the temperature of castor oil bit by bit and write the temperature begin to melt and when all the powder is full done its melts.

### 5. Solubility:

Take a little amount of sample and mix the solvent until the sample mostly dissolves. It is determined for the presence of any undissolved particles.

### 6. Drug-excipient compatibility studies:

Drug-excipient compatibility studies are significant to known the connection between drug and excipient and in between excipients of the preparation, which could later effectual the

stability of the preparation and may in obstacle with the pharmacological action of the drug.

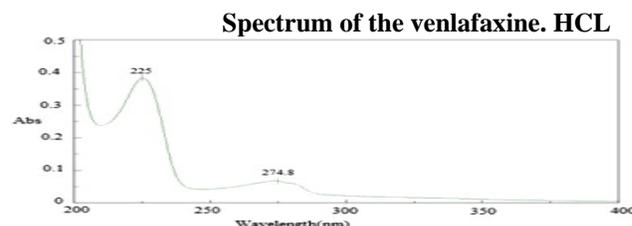
The physical determination of the preparation is complete while alone and in mixing with the excipients. If there is any change in the physical looks seems that there is connection.

But few substance do not show any physical changes when mixed in a preparation, for such FT-IR (Fourier Transform-infrared) studies are conducted.

### Procedure by FT-IR studies:

The FT-IR studies are conducted for Venlafaxine HCL and mixture of Venlafaxine excipients by formulation in potassium bromide discs. The peaks are gained and compare with the standard by bigger imposing these spectra and determined and for any difference in shape and size of spectrum. If there is any importance alteration represents between drug and excipients.

**Preparation of the standard curve-** Determination of the maximum absorbance



### Preparation of 0.1 M Hydrochloric acid:

Correctly determined 8.5 ml of hydrochloric acid and requirement water to make up to 1000 ml.

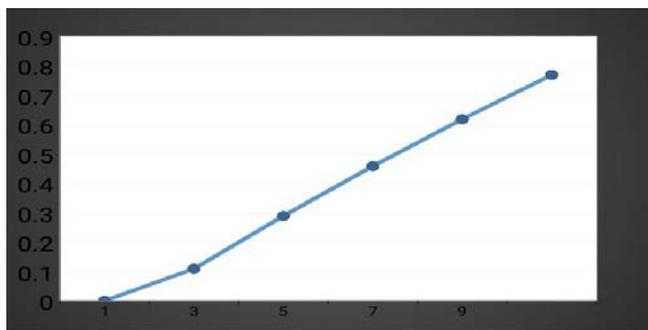
### Preparation of stock solution:

Pipette out 10 ml of the above solution and it to a 100 ml volumetric flasks. Then make up the volume to 100 ml with 0.1 M HCL. Then made the standard stock solution withdraw 2ml, 4ml, 6ml, 8ml, and 10ml into five 100 ml different volumetric flasks. Then up the volume to 100 ml with 0.1M HCL to get 2, 4, 6, 8, 10/ml concentration.

### CALIBRATION CURVE OF THE VENLAFAXINE HCL:

Concentration in ug /ml	Absorbance in nm
1	0.109
3	0.289
5	0.458
7	0.618
9	0.769

$$y = 0.088x, r^2 = 0.991$$



**Calibration curve of venlafaxine HCL in 0.1 N HCL**

**CALIBRATION CURVE OF VENLAFAXINE HCL:**

The absorbance of the made stock solution was determined at 224 nm in an UV spectrophotometer. Plot a graph between concentration (in ug/ml) vs absorbance (in nm) on X-axis and Y-axis respective.

Ingredients	f <sub>1</sub>	f <sub>2</sub>	f <sub>3</sub>	f <sub>4</sub>	f <sub>5</sub>	f <sub>6</sub>	f <sub>7</sub>	f <sub>8</sub>	f <sub>9</sub>	f <sub>10</sub>	f <sub>11</sub>	f <sub>12</sub>
Venlafaxine. Hcl	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5
olive oil	80	-	-	120	-	-	160	-	-	200	-	-
Carnauba wax	-	80	-	-	120	-	-	160	-	-	200	-
Cetyl alcohol	-	-	80	-	-	120	-	-	160	-	-	200
H P M C	142	142	142	102	10	102	62	62	62	22	22	22
NaHCO <sub>3</sub>	50	50	50	50	50	50	50	50	50	50	50	50
Talc	3	3	3	3	3	3	3	3	3	3	3	3

**FORMULATION**

**Steps Involved in Formulation**

- Formulate of venlafaxine. Hcl effervescent day thermoplastics granulation
- Effervescent floating tablets. Each and every containing 37.5mg
- Venlafaxine. Hcl were formulated by melt granulation (Hot melt technique). The constituent ingredient of various formulation is presented.
- All the component except was were melted in porcelain dish on hot plate and dosage form was mixed to it.
- Then to this composition another saved component except talc were mixed to it.
- The conclusion mixture was allowed to Solidify at room temperature and then passed by sieved 16 to from granules .the granules were lubricated by mixing talc extra bit by bit.
- The lubricated granules were than compressed into a tablet by applying standard flat – face punches on single punch tableting machine, each and every Tablet containing 37.5mg of venlafaxine. hcl and total tablet weight 312 mg at invariant.

**Hot melt Extrusion (Technology)**

Hot melt technology is a mostly used in Plastic industry and current time has been presented to be an executable method to formulate many type of dosage forms and drug delivery system. Hot melt technology procedure are recently used in pharmaceutical industry for the manufacture of a many of dosage forms and preparation. HME offers many significance on the old and traditional pharmaceutical methodology or technique the absence of solvents, some processing level, thence low consuming

easy and continuous process, large grade of mechanization recognized by regulative authority the capability to method badly compactable material into tablet form and the potentially of the preparation of solid dispersion and better bioavailability.

**Principle-**

The main object of principle behind HME technology regard adding and melting an active API active pharmaceutical ingredient, pharmaceutical degree polymer and other excipient in a melt extrusion and then forcing it done dies with one or more rotating screw to come into possession the coveted product.

**Application-**

- Hot melt extrusion can be graduated for the formulation of granules and pellets.
- Hot melt extrusion also applied in formulation of sustained release wax granules.
- Hot melt extrusion showed greater power and better component uniformity.
- Effervescent granules also made by HME show governable rate of effervescence.
- HME has most of uses in formulation of solid dosage forms that is tablet and capsules.

**EVALUATION-**

**. Pre-compression parameters**

**1. Angele of repose:**

Take a little amount of powder (5 gm) in a cone shaped funnel fix it in a holder at a suitable height say 6 cm above the surface. Locate a graph sheet below it. The sample was passed slowly by the funnel. The height of the powder tip was developed. Then determine the perimeter of the heap by construct with the pencil on the graph sheet. The radius of the heap was determined, the angle of repose is measured by application the following formulation. This is repeated five times for correct conclusion.

## 2. Bulk density and Tapped density:

Weight a little amount of the powder (w) was poured into the graduated cylinder and the volume (v0) was determined. Then, graduated cylinder was closed with lid, set into the density measured setup (Bulk density apparatus) set for 500 taps and change that, the volume (vf) was determined and continued ways till the two back to back readings were equal.

The bulk density and tapped density were measured applying the following preparation.

$$\text{Bulk Density} = W/V_0$$

$$\text{Tapped Density} = W/V_f$$

Where,  $V_0$  = Initial volume,

$V_f$  = final volume

The conclusion were tabulated.

## 3. Compressibility index and Hauser ratio:

The compressibility index and Hauser ratio are calculated by determining the values for bulk density ( $P_{\text{bulk}}$ ) and tapped density ( $P_{\text{tapped}}$ ) as follows:

$$\text{Compressibility -index} = \frac{P_{\text{tapped}} - P_{\text{bulk}}}{P_{\text{tapped}}} \times 100$$

$$\text{Hauser ratio} = \frac{P_{\text{tapped}}}{P_{\text{bulk}}}$$

The conclusion were tabulated in table

## EVALUATION OF FORMULATED TABLES OF VENLAFAXINE HCL

All the prepared sustained release tablets were evaluated for following official and unofficial parameters.

### Weight Variation

Twenty tablets were at random choose from each and individually weighted. The average weight and standard deviation of twenty tablets was measured. The batch passes the test for weight variation test if not more than two of the individual tablets weight deviate from the average weight by more the percentage present in a none aberrant by more than two in one the percentage presented.

### Observation:

The average weight and standard deviation of the tablets of each batch were given.

Weight variations-

### Derivative - Tablet weight-average weight x 100 / total tablet weight

**Table No: 6 Weight variation Specification**

Average weight of tablets(X mg)	Percentage deviation
130 or less	±10
130to 324	±7.5
More than 324	±5

### 1. Dimensions

Control of physical damnation of the tablets is requirement for consumer credence and to maintain tablet to tablet uniformity. The dimensional description were calculated applying digital

Vernier calipers. The thickness of tablets is more associate of the tablet hardness can be applied as initial control factors. Six tablets were especially choose from each batch and their thickness was calculated by using Digital Vernier caliper.

### 2. Hardness

It is calculated to become best compactness during shipping, coating, and packaging and to get better shape and design. Hardness was calculated by applying hardness tester. (Pfizer hardness tester) for each batch six tablets were tested. The force required to brittle the tablets is noted by the units is kg/cm.

### Observation:

The determination hardness of tablets of each batch was range from 6-16kg/cm.

### 3. Friability

Twenty tablets were weighed and take in the Roche friablator and setup was rotated at 25 rpm for every 4 minutes. After behavior the tablets were weighed again. The percentage friability was determined applying the formula,

$$\%F = \{1 - (wt/w)\} \times 100$$

where, %F=friability in percentage

w=initial weight of tablets after revolution

### Observation-

All the formulated batches were found in accepted limit of 0.1-0.6 as specified in IP.

### 4. Buoyancy lag Time

It is measured in order to appraise the time taken by the drug to flat 3on the top of the dissolution medium, after it is located in the medium. These parameters can be calculated as a part of the dissolution test.

The results were tabulated in table.

### 5-Floating Time

Test for buoyancy is commonly processed in SGF-Simulated Gastric Fluid attached at 37C. The time of duration for which the dosage from currently floats on the dissolution media is termed as floating time.

### 6-Dissolution study:

#### Preparation of buffer:

Determine 8.5 ml of HCL in a 1000 ml volumetric flask and make up the volume to 1000 ml applying distilled H2O.

#### Requirements:

Medium 0.1N HCL

Volume: 900 ml

Apparatus: USP II (paddle)

RPM: 50

Time: upto 12 hrs

Temperature: 37 c  $\pm$  0.5oc

max: 224 nm

Process the test in six tablets one tablets in each dissolution vessel containing 900 ml of 0.1 Hcl maintained at 37 c  $\pm$  0.5 c.at specific time of duration removed wanted quantity of sample and replace same quantity of 0.1N Hcl (maintain sink condition), Then obtained was taken and calculator produce.

$$\% \text{ purity} = \frac{\text{absorbance} \times 900 \times \text{dilution}}{\text{Slope} \times 1000 \times \text{label claim}} \times 100$$

Slope \* 1000 \* label claim

### 7-Assay:

Break 20 tablets and weight equal to 20 mg Venlafaxine HCL and dissolved on 0.1N HCL and make up volume to 100 ml.

By the separated 10 ml and diluted to 100 ml with 0.1 N HCL. Measure the absorbance at 232 nm in UV spectrophotometer.

1. **Kinetics of drug release**
2. The in -vitro dissolution profile of all batches were attached to Zero order,

First order, Higuchi model and Koresmeyer- Papers model to found the kinetic modeling of drug release. Connection coefficient (r2) values were determined for liner curves conclusion by the fixation analysis of the above plot.

- **Zero-order kinetic model** - Cumulative % drug released Vs time.
- **First-order kinetic model** – log cumulative % drug remaining Vs time.
- **Higuchi model** – Cumulative % drug released Vs square root of time.
- **Nordmeyer-Pappas model** – log cumulative % drug released Vs log time.

**Zero – order kinetics**

Zero order release would be predicted by the following equation:

$$A_t = A_o - K_o t$$

- A<sub>t</sub> - Drug release at time 't'
- A<sub>o</sub> - Initial drug concentration
- K<sub>o</sub> - Zero-order rate constant (hr<sup>-1</sup>)

While the data plotted as cumulative % drug release Vs time and the plot is liner, then the data obtain zero-order equal to K<sub>o</sub>

Fist order kinetics:

First order release can be predicated by the following equation:

$$\log C = \log C_o - K_t / 2.303$$

- C- Amount of drug remained at time (t)
- C<sub>o</sub> -Initial drug concentration
- k- First order rate concentration (hrs-1)

When graph is plotted as log cumulative % remaining Vs time yields a straight line, and then the produce obeys first kinetics. The constant 'K' answering by multiplying 2.303 with the slope values.

**Higuchi's Model:**

Drug produce from the matrix devices by diffusion has been determined by Following Higuchi's diffusion equation:

- Q - Amount of drug release at time (t)
- D - Diffusion coefficient of the drug in the matrix
- A - Total amount of drug in unit volume of matrix
- CS - The solubility of drug in the matrix
- ε - Porosity of the matrix
- t - Tortuosity
- t - Time at which amount of drug released

When the data is poltted as Cumulative % drug released Vs square root of time yields a straight line, indicating that release diffusion mechanisms. The slope is equal to 'K'.

**Korsmeyer – Peppas model:**

To study the mechanism of drug produce from the microspheres, the in vitro release data were plotted to the well-known exponential equation (Korsmeyer – Pappas model). That is frequently applied to briefly the drug release natured from polymeric systems.

$$M_t/M_a = Kt^n$$

M<sub>t</sub>/M<sub>a</sub> – The faction of drug produced of drug at time (t)  
K-Constant inculcating structural and geometrical characteristics of the drug /polymer system

N-Diffusion exponent to the mechanism of drug produce while the data plotted as log % drug released Vs log time yields a straight line with a slope equal to 'n' and the 'K' can be obtained from y-intercept.

Mechanism of drug release as per Korsmeyer- Peppas equation/peppas model

S.No.	n value	Drug release
1	0 – 0.1	Fickian release
2	0.5 -1.0	Non-Fickian release
3	>1.0	Class II transport

**RESULT AND DESCUSSION**

**Pre formulation Studies:**

**1 Organoleptic Properties**

The tests were performed as per the4 procedure. The results tabulated below.

Test	Specifications/limits	Observations
Colour	White to off-white powder	White to off-white crystalline solid
Odour	Odour less	Odour less

The result complies as per specifications.

**Physical properties:**

**Angle of repose:**

It was determined as per procedure. The result were tabulated below.

**Table. no. 13. Flow properties**

Materials	Angle of repose
Venlafaxine HCl	38.70

The results show that the drug having fair to passable.

**Bulk density and tapped density:**

It was determined as per procedure. The results were tabulated below.

**Table no. 14. Bulk density and tapped density**

Material	Bulk density (gm/ml)	Tapped density (gm/ml)
Venlafaxine HCl	0.48	0.59

**Powder compressibility:** It was determined as per procedure. The results were tabulated below.

**Table no. 15. Powder compressibility**

Materials	Compressibility index	Hausner's ratio
Venlafaxine HCl	6.84	1.06

**Melting point:**

It was determined as per procedure. The results were tabulated below.

**Table no. 16. Melting point**

Material	Melting point range	Result
Venlafaxine HCl	215.217 <sup>o</sup> c	215 <sup>o</sup> c

The result indicates that the Venlafaxine HCl drug was pure one.

**Porosity-19%**

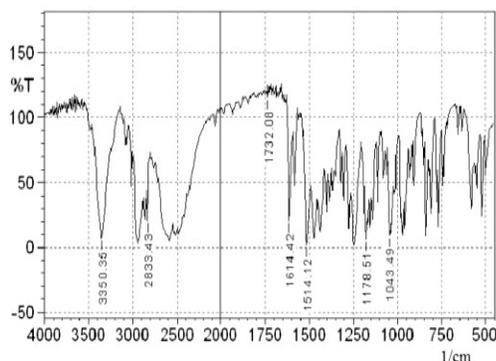
**SOLUTION PROPERTIES**

**Solubility**

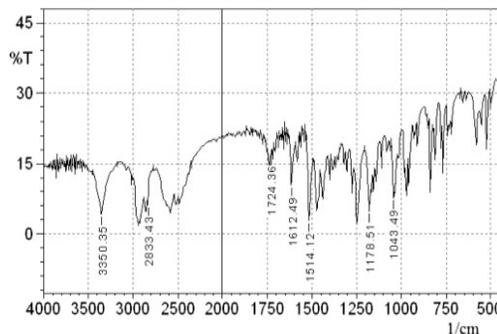
Material	Test	Specification	Observation
Venlafaxine	Solubility	Soluble in water and insoluble inorganic solvent	Complies

**Drug-Excipient interaction and identifications**

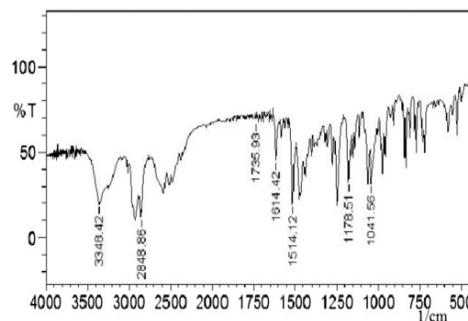
The wavelength of maximum absorbance was obtained at 225.75nm. The calibration curve was found to be linear in the range and straight line equation was obtained having the regression coefficient value of FTIR Spectrum of Venlafaxine HCl showed a characteristic stretching band of o-H at 3350.35 cm<sup>-1</sup>, aromatic C=H stretching at 1614.42 cm<sup>-1</sup>, C-O stretching at 1514.12 cm<sup>-1</sup> and C-N stretching at 1178.51 cm<sup>-1</sup>, C-OC stretching at 1043.49 cm<sup>-1</sup>, C=O stretching at 1732.08 cm<sup>-1</sup> wave number. These characteristics stretching bands were slightly varied after pre-formulation study, revealing no chemical interaction.



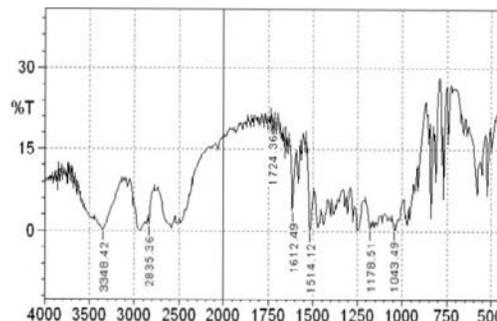
**FTIR of the pure drug**



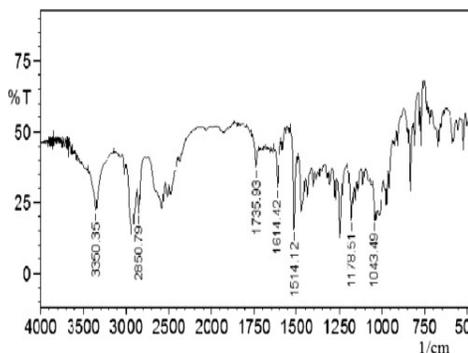
**FTIR of the combination of venlafaxine HCL and carnauba wax**



**FTIR of combination of venlafaxine HCL and Cetyl alcohol**



**FTIR of combination of venlafaxine HCL and olive oil**



**FTIR of physical mixture of optimized formulation (F8)**

**Formulation Development-**

The concentration of all the three selected hydrophobic retardate (carnauba wax, olive oil and cetylalcohol) was decided on trial basis and error basis. Sodium bicarbonate was incorporated as a gas-generating agent. The trial batches were

conducted to finalize the concentration of sodium bicarbonate. Talc was used as glidant to improve the flow of the granules FTIR study showed that all of retardants/excipients used were compatible with Venlafaxine.

- The use of hydrophilic carrier along with a hydrophilic carrier effectively controls the initial rapid release of a highly water soluble drug such as Venlafaxine. HCl hot melt granulation method (Thermoplastic granulation) is especially more effective in achieving this than the direct compression method.
- Methocel KISM is a good polymer for floating drug delivery system as it is matrix forming and low density polymer. Hydrophilic meltable material impart sufficient integrity to the tablets. Lipids/waxes are considered as an alternative to polymers design of sustained drug delivery system due to their advantages

Such as the low melt viscosity (thus avoiding the need of Organic Solvent for Solubilization), absence of toxic impurities of drug and also formation of channels with the matrix in the case of a water soluble drug like Venlafaxine HCl. HPMC tablet upon contact with the dissolution medium swell due to the disruption of hydrogen binding among the polymeric chain and from the thick layer of gel eroded over the period of times these parameters are responsible for controlling drug release rate from HPMC tablets.

- **Physical characteristics**-F<sub>1</sub>-F<sub>12</sub> formulation were evaluated for micromeritics showed the pre-compressed blend has a good flow property. Matrix tablet evaluated for physical parameters such as hardness, thickness, weight variation, friability, drug content and swelling index.

### EVALUATION PARAMETERS

Formulation code	Angle of Repose	Bulk density (g/ml)	Tapped density (g/ml)
F <sub>1</sub>	28.24 ± 0.13	0.408 ± 0.13	0.434 ± 0.11
F <sub>2</sub>	27.08 ± 0.02	0.404 ± 0.17	0.439 ± 0.08
F <sub>3</sub>	30.11 ± 0.08	0.416 ± 0.05	0.449 ± 0.13
F <sub>4</sub>	28.25 ± 0.11	0.408 ± 0.01	0.44 ± 0.03
F <sub>5</sub>	28.78 ± 0.14	0.422 ± 0.12	0.464 ± 0.09
F <sub>6</sub>	29.54 ± 0.06	0.404 ± 0.04	0.449 ± 0.16
F <sub>7</sub>	27.82 ± 0.05	0.415 ± 0.06	0.444 ± 0.11
F <sub>8</sub>	27.12 ± 0.18	0.435 ± 0.12	0.478 ± 0.09
F <sub>9</sub>	30.78 ± 0.06	0.421 ± 0.05	0.484 ± 0.07
F <sub>10</sub>	28.45 ± 0.12	0.408 ± 0.05	0.439 ± 0.05
F <sub>11</sub>	29.65 ± 0.05	0.416 ± 0.14	0.454 ± 0.08
F <sub>12</sub>	31.24 ± 0.11	0.4123 ± 0.02	0.492 ± 0.12

Formulation code	Compressibility Index (%)	Huascar's Ration	Hardness (Kg/cm <sup>3</sup> + SD)
F <sub>1</sub>	5.99 ± 0.04	1.06 ± 0.13	3.10 ± 0.10
F <sub>2</sub>	7.97 ± 0.17	1.08 ± 0.08	5.06 ± 0.15
F <sub>3</sub>	7.34 ± 0.09	1.07 ± 0.02	2.11 ± 0.12
F <sub>4</sub>	8.10 ± 0.08	1.08 ± 0.15	3.46 ± 0.05
F <sub>5</sub>	9.05 ± 0.11	1.09 ± 0.06	7.23 ± 0.05
F <sub>6</sub>	10.02 ± 0.06	1.11 ± 0.12	2.36 ± 0.11
F <sub>7</sub>	6.53 ± 0.15	1.06 ± 0.04	4.38 ± 0.02
F <sub>8</sub>	8.99 ± 0.02	1.09 ± 0.11	8.53 ± 0.07
F <sub>9</sub>	13.01 ± 0.14	1.14 ± 0.03	2.63 ± 0.05
F <sub>10</sub>	7.06 ± 0.07	1.07 ± 0.08	3.11 ± 0.07
F <sub>11</sub>	8.37 ± 0.18	1.09 ± 0.05	7.13 ± 0.11
F <sub>12</sub>	16.19 ± 0.07	1.19 ± 0.12	2.0 ± 0.10

Formulation code	Thickness (mm ± SD)	Wt. Variation (mg ± SD)	Friability (% w/w)
F <sub>1</sub>	3.24 ± 0.055	314.65 ± 2.37	0.58 ± 0.06
F <sub>2</sub>	3.33 ± 0.026	314.16 ± 2.06	0.64 ± 10.11
F <sub>3</sub>	3.43 ± 0.011	315.55 ± 2.52	0.48 ± 0.02
F <sub>4</sub>	3.24 ± .011	315.30 ± 2.26	0.78 ± 0.05
F <sub>5</sub>	3.43 ± 0.020	316.00 ± 2.62	0.54 ± 0.02
F <sub>6</sub>	3.16 ± 0.015	315.30 ± 2.26	0.67 ± 0.12
F <sub>7</sub>	3.55 ± 0.005	316.20 ± 1.89	0.54 ± 0.07

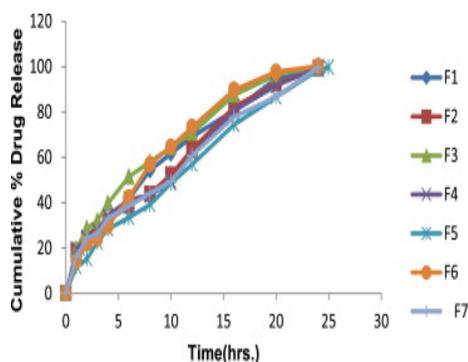
F <sub>8</sub>	3.36 ± 0.015	315.33 ± 2.36	0.45 ± 0.11
F <sub>9</sub>	3.24 ± 0.015	314.05 ± 1.25	0.64 ± 0.05
F <sub>10</sub>	3.27 ± 0.05	315.1 ± 2.33	0.72 ± 0.07
F <sub>11</sub>	3.58 ± 0.010	313.9 ± 1.66	0.59 ± 0.13
F <sub>12</sub>	3.26 ± 0.20	314.4 ± 2.06	0.68 ± 0.02

Formulation code	Drug content (% ± 0.14)	FLT (Sec ± SD)	FD (h)	SI (% ± SD)
F <sub>1</sub>	99.2 ± 0.14	28 ± 2.2	<24	91.36 ± 6.34
F <sub>2</sub>	98.6 ± 0.12	24 ± 2.8	<24	88.8 ± 0.28
F <sub>3</sub>	100.5 ± 0.09	26 ± 3.1	<24	90.4 ± 0.38
F <sub>4</sub>	98.6 ± 0.05	32 ± 2.4	<24	80.8 ± 0.4
F <sub>5</sub>	99.8 ± 0.12	28 ± 2.5	<24	83.04 ± 0.26
F <sub>6</sub>	98.5 ± 0.02	38 ± 3.2	<24	81.44 ± 0.33
F <sub>7</sub>	97.8 ± 0.05	62 ± 2.7	<24	44.16 ± 0.33
F <sub>8</sub>	101.2 ± 0.15	55 ± 2.5	<24	53.92 ± 0.38
F <sub>9</sub>	99.4 ± 0.08	69 ± 2.8	<24	47.52 ± 0.42
F <sub>10</sub>	97.3 ± 0.15	98 ± 3.2	<24	31.8 ± 0.25
F <sub>11</sub>	102.1 ± 0.08	72 ± 3.4	<24	30.56 ± 0.42
F <sub>12</sub>	99.3 ± 0.12	104 ± 3.1	<24	34.4 ± 0.28

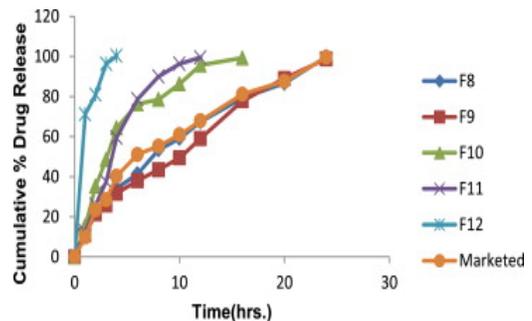
**Evaluation of buoyancy of the tablets-**

In vitro buoyancy variations for all the formation sodium bicarbonate used effervescent base which generates carbon dioxide gas in the presence of hydrochloric acid present in medicine. The gas generated is trapped and protected with in gel formed by HPMC), thus decrease the density of the tablets. As falls density of tablet below 1 (density of water), tablet become buoyant. NaHCO<sub>3</sub> song produced tablets with lag time less than a minute in formulations F<sub>1</sub>-F<sub>6</sub> and F<sub>8</sub> more than one but less than 2 minute in formulation F<sub>1</sub> and F<sub>1</sub>-F<sub>12</sub>. It was found that the tablets of formulations F<sub>1</sub>, F<sub>2</sub>, F<sub>4</sub>, F<sub>5</sub> and F<sub>1</sub>-F<sub>9</sub> floated for duration more than 24 hours and tablets of formulation F<sub>3</sub>, F<sub>6</sub> and F<sub>10</sub>-F<sub>12</sub> floated in the buffer solutions for less than 24 hours. The formulation containing carnauba was showed superiority in floating duration as well as maintained the integrity of formulation due to more hardness to others.

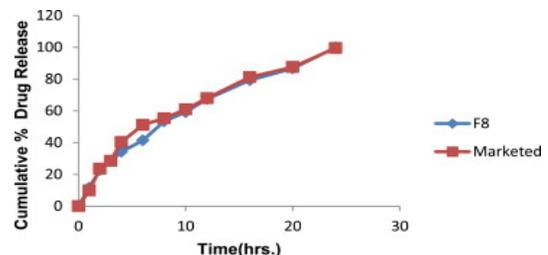
**In-Vitro drug release-**



**In vitro drug release profiles of formulation F1 to F7**



**In vitro drug release profile of the formulations F8 to F12 and marketed**



**In vitro drug release profile of optimized and marketed formulation**

In-vitro studies performed in 0.1 N HCl (1.2 pH) and result depicted. Formulation F<sub>7</sub>, F<sub>8</sub> and F<sub>9</sub> showed release for 24 hours upto 99.62, 99.9 and 98.75% respectively. Marketed tablets showed 99.54% release in 24 hours. Formulation F<sub>1</sub>, F<sub>2</sub>, F<sub>3</sub>, F<sub>4</sub> and F<sub>6</sub> showed release less than 24 h, F<sub>1</sub> F<sub>2</sub>, and F<sub>3</sub> each had hydrophilic retardant in concentration 80 mg which is less sustained effect while formulation F<sub>5</sub> showed more than 24 h as an incipient because even of concentration was 120 mg (lesser). The Sustained effect was more due to combination of hydrophilic polymer and hydrophilic retardants (carnauba was) showed good effect in less concentration. Hydrophilic polymer was used as sustaining agent, gas (carbon-di-oxide) entrapping agent and also as filter entrapping and also as filter.

Formulation F10, F1 and F12 failed to show sustained effect may be due to less concentration of hydrophilic polymer and thus unable to form good matrix. All the three retardants in concentration of 160mg. In formulation F7, F8 and F9 showed desired release for 24 h but after comparing with marketed formulation (ventab-XL) (37.5mg). It was similar to it and hence formulations F8 was considered as optimized formulation. The similarity and dissimilarity factor comparison is showed on the

table similarity and dissimilarity factor. Independent t-test also proved that F8 was the best formulation as the maximum time points of F8 and  $F > 0.05$  (.e. retaining the Null's hypothesis) compared to other formulation proving that is most similar to marketed product. The amount of hydrophilic retardant was found to be inversely proportional to rate of release. Cetyl alcohol showed good results. Olive oil showed better and carnauba was showed best result.

Formulation	F1 Value	F2 Value
F <sub>1</sub>	9	62
F <sub>2</sub>	14	56
F <sub>3</sub>	8	64
F <sub>4</sub>	15	54
F <sub>5</sub>	20	47
F <sub>6</sub>	13	57
F <sub>7</sub>	14	54
F <sub>8</sub>	6	68
F <sub>9</sub>	14	54
F <sub>10</sub>	39	34
F <sub>11</sub>	37	31
F <sub>12</sub>	62	21

Table show similarity and dissimilarity factor comparison is showed the F8 regarding as the optimized formulation

Time points	t-statistic	df	Two-tailed probability (p)
1	4.53	10	10 00011
2	2.03	10	10 0.0693

3	0.46	10	10 0.6551
4	16.84	10	10 0.0000
6	16.92	10	10 0.0000
8	5.47	10	10 0.0003
10	3.62	10	10 0.0046
12	5.707	10	10 0.1187
16	5.559	10	10 0.0002
20	1.755	10	10 0.1098
24	1.112	10	10 0.2923

**Independent t-test Values for comparison between F8 and marketed product.**

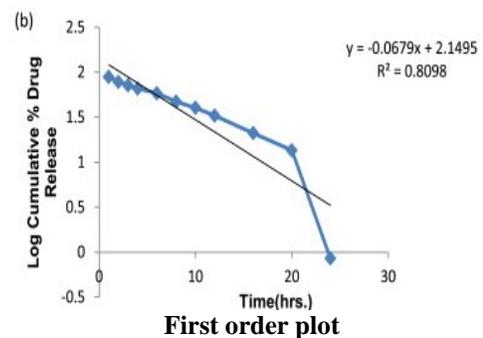
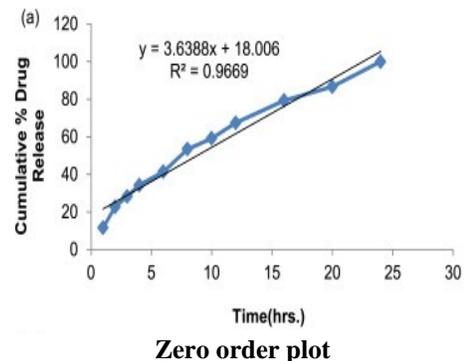
Hardness also played an important role in release. Formulations F<sub>8</sub> had the higher hardness value and hence showed good sustained property. Formulation made with cetyl alcohol i.e. F<sub>3</sub>, F<sub>6</sub>, F<sub>9</sub> and F<sub>12</sub> had least hardness and thus had less sustained effect compared to other formulations. But as an exception F<sub>9</sub> showed release upto 24 hours thus it can be concluded that cetyl alcohol also shows good release in the concentration 160 mg. Hardens obtained with the tablets of carnauba was higher where as with olive oil it was moderate and cetyl alcohol tablets showed least hardness.

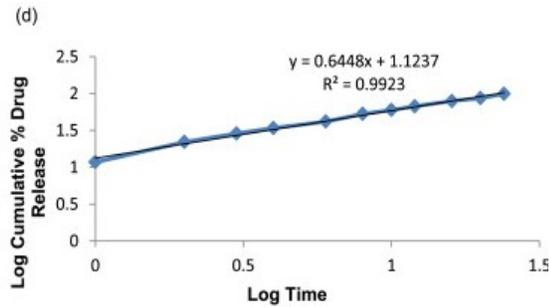
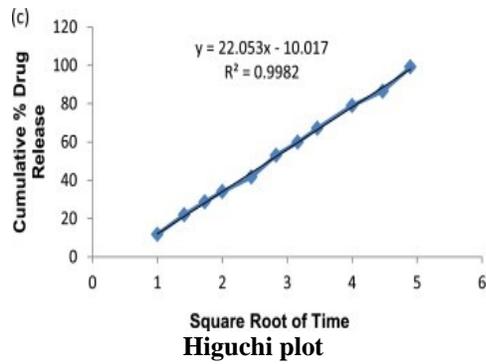
**Stability Studies-** According to ICH guidelines, three months stability studies conducted at controlled temperature 40°C ± 2°C and humidity 75 ± 5% RH .

Showned negligible	Changes	In results
Parameters	After 30 days	After 60 days
Physical appearance	No Change	No Change
Weight variation (mg ± SD)	315.33 ± 2.26	315.28 ± 2.1
Thickness (mm ± SD)	3.36 ± 0.015	3.38 ± 0.021
Hardness (Kg (Cm <sup>2</sup> ± SD)	8.53 ± 0.07	8.53 ± 0.11
Friability (% ± SD)	0.45 ± 0.11	0.45 ± 0.08
Drug content (%)	101.2 ± 0.15	101.12 ± 0.32
Buayancy lagtime (Sec ± SD)	55 ± 2.5	56 ± 2.9
Duration of floating (h)	>24	>24

**Kinetic analysis of release data-**

Kinetic evaluation of the optimized formulation of optimized formulation





### Korsmeyer- Peppas plot

To understand the rate and mechanisms of drug release from optimized tablet formations, dissolution data was fitted into different release Kinetic model. The model that best fitted the release data was selected based on the correlation coefficient value (r<sub>z</sub>) obtained from various Kinetic model. In vitro drug release profile from all these formulations could be best expressed by Korsmeyer Peppas Equation and Higuchi Equations as plot showed highest linearity with R<sup>2</sup> value 0.9164-0.9961 and 0.9805-0.9982 respectively. In Korsmeyer-Peppas Equation, linear plot was for optimized formulation with high correlation coefficient (r<sub>2</sub>) value 0.9923 and Higuchi value 8.9982. Also, Korsmeyer-Peppas Equation's 'n' values for all formulations except F12 were above 0.5. It was concluded that the optimized formulation followed mixed mechanism of diffusion and erosion, so called anomalous/Non-Fickian diffusion mechanism for drug release.

Formulation	Zero Order	First Order	Higuchi	Korsmeyer Peppas		Release mechanism
	R2	R2	R2	R2	N	Non Fickian
F <sub>1</sub>	0.9827	0.8366	0.9922	0.9902	0.614	Non-Fickian
F <sub>2</sub>	0.9923	0.8344	0.97	0.973	0.5624	Non-Fickian
F <sub>3</sub>	0.9748	0.9272	0.9968	0.9961	0.5395	Non-Fickian
F <sub>4</sub>	0.991	0.7314	0.9595	0.966	0.544	Non-Fickian
F <sub>5</sub>	0.9925	0.7918	0.9805	0.992	0.6961	Non-Fickian
F <sub>6</sub>	0.9671	0.9025	0.9851	0.992	0.6685	Non-Fickian
F <sub>7</sub>	0.9924	0.7335	0.9736	0.9778	0.5651	Non-Fickian
F <sub>8</sub>	0.9669	0.8098	0.9982	0.9809	0.5651	Non-Fickian
F <sub>9</sub>	0.9878	0.8434	0.9822	0.9923	0.6448	Non-Fickian
F <sub>10</sub>	0.8293	0.9215	0.9352	0.9848	0.6711	Non-Fickian
F <sub>11</sub>	0.9031	0.9474	0.9652	0.9164	0.63	Non-Fickian
F <sub>12</sub>	0.9573	0.8908	0.9659	0.9638	0.849	Non-Fickian

### VIII. CONCLUSION

The effervescent-based floating drug delivery system was the promising system. The use of hydrophilic retardant and hydrophilic polymer in combination had its own advantages of maintaining integrity and buoyancy of tablets and also initial burst effect was minimized. It could be concluded that for proper floating duration and in-vitro release the hydrophilic retardant and hydrophilic polymer must be used in polymer must be used in polymer must be used in proper ration, formulation F8 Showed release similar to marketed tablet and was considered optimized formulation. F8 followed zero order, Higuchi and Korsmeyer-Peppas release Kinetics-Peppas release Kinetics. The aim of preparation of Gastro retentive tablets of Venlafaxine HCl was achieved

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# Formulation and Development of Antifungal Nail Lacquer Containing Miconazole Nitrate Use in Treatment of Onychomycosis

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**Abstract-** In this research paper the main aim is formulation and development of Anti-fungal nail lacquer which is used in treatment of onychomycosis. Anti-fungal nail lacquer which is used in treatment of Onychomycosis skin fungal disorder was focus on the disease causes and treatment by nail lacquer, onychomycosis causes by the pathogens include dermatophytes, candida, and non-dermatophytes. Improvement clinical efficacy and also proper the patients compliance. Nail Lacquer preparation by simple mixing non-volatile, gloss, smoothness to flow, drug diffusion studies drug content estimation, Nail lacquer is used on fingernails, toenails of the human beings. Which is protect the nail but, nail plate but most of significant in maximize the beauty, gloss, impart colour. Nail lacquer is mostly applicable for those drug which have poor bioavailability in oral formulation this techniques is used in maximize the topical bioavailability of drug across the nail.

In this formulation used different type of the use in this preparation which is 2 hydroxy propyl beta cyclodextrin, ethyl cellulose, nitrocellulose, propylene glycol as well as drug formulate and obtain optimal release conclusion is success in this formulation.

**Index Terms-** Fungal infections, Nail Lacquer, Onychomycosis

## I. INTRODUCTION

All over the last time period the treatment of illness has been carried out by administrating drugs to human body by many routes namely oral, parental, topical inhalation etc. The suitably treatment is accurate and demands by medical condition. As a matter of fact, the thought of solution of the patients disease with least harm done to the patient's health is said to be the main achieve of any therapy. However, a good treatment technique is needful by the knowledge of pharmacokinetics and pharmacodynamics of the stable drug.

Nails of human being do not have role of decorative as well as protective, but can also be considered as a substitute pathway for drug delivery in a special manner in nail disease such as onychomycosis or psoriasis. These nail diseases are to great degree of spread in the population,

In the pharmaceutical industry developing effective method for nail drug delivery system is important. Conformity and

decrease danger side effects of a drug cause from temporary overdose. Other advantageous is convenience, particularly noteworthy in patches that necessitate only once weekly use. Such a simple dosing regimen can helpful in patient attachment to drug therapy. Scheming an0d development of TDSS is multidisciplinary activity that comprehend cardinal feasibility studies starting from the choice molecule of the drug to the presentation of sufficient drug flux in an in vivo and in vitro model followed by friction of a drug delivery system that fitting all the rigorous demand that are specific to the molecule of the drug

**FUNGAL INFECTION-** The fungus is crude organism and the fungi can live all over in the air, in the soil, on the plant and in the Fungal infection the classed by capable of causing harm fungi are very common determine, and it not so serious if they are diagnosed fast and right treated. All the same while fungal infections are solicitude, one of treated again injection can easy fall out, as fungi can be create problem to skill. The fungal are frequently present in the totality of surrounding conditions.

## NAIL DISEASE-

The nail plate may seem not in normal as a conclusion of congenital defect, disease of dermis with attachment of the nail bed, systematic disease, minimize of blood supply, local trauma, infection of the nail folds, Infectious nail plate.

- **GREEN NAIL SYNDROME-**Pseudomonas is category of fungus which is cause the infection

## B-PARONYCHIA-

**1-ACUTE PARONYCHIA-** Bacterial infections e.g. group. A streptococci .that is cause the swelling violent pain.

-**CHRONIC PARONYCHIA-** Mainly fall out in patients whose hands are an invariably in water with recurrent lower trauma prejudicial the cuticle so that throne can farther harm the nail fold. Generally get infected particularly with pseudomonas develops a green or black discoloration.

**C-NAIL PSORIASIS-** Scurfy dermis the nail plate gets cavities dry and frequent tumble and also appears red, orange and brown with red dots.

**D-YELLOW NAIL SYNDROME-** A not widely known position qualify via yellow nail with lack of cuticle, develop slowly and it minimize or separated.

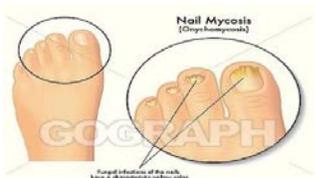
**E-ONYCHOMYCOSIS-** It is chronic for third of integumentary fungal infection and one half of all nail disease.

**PARAKERATOSIS-** Presenting hyperkeratosis.

**ONYCHOMYCOSIS-**

People with infection are frequent feel shame about nail not in figure, because it can one time limits the quality of moving freely, it may indirectly minimize peripheral circulation because of that decline position that are several stasis and foot ulcers Fungal infections of the nails can also dispersed to another site of the body to another human.

**ONYCHOMYCOSIS**



**CLASSIFICATION OF ONYCHOMYCOSIS-**

**A- DISTAL SBUNGAL ONYCHOMYCOSIS-** The more general form may growth in the toenails, fingernails or both, infection is normally caused by trichophyton rubrum which attach in nail bed and the bottom of the nail plate, starting at migrating proximally done inherent nail matrix.

**B- WHITE SUPERFACIAL ONYCHOMYCOSIS-** Once 10% of cases which is caused by several fungus that direct attach the superficial layers of the nail plate and develop well represented opaque white island on the plate the nail is rough, soft and friable. This several of disorder can be treated with topical antifungal drug alone.

**C- PROXIMAL SUB UNGAL ONYCHOMYCOSIS-** It is fall out while infecting organism commonly attach the nail through proximal nail fold, penetrate the newer develop nail plate and then migrate distally.

**D- CANDIDA ONYCHOMYCOSIS-**It can category into three part-

1-Infection starting as infection structure encompassing the nail known felon.

2-Chronic for lower than 1% of disorder this position is seen in immune via media patients and attach direct of the nail plates.

3-While nail plate has removed from nail bed.

**TREATMENT OF ONYCHOMYCOSIS-**

Several modalities can be used for the treatment of disease topical therapy, systemic therapy, combination therapy, nail removal and nail lacquer.

**NAIL LACQUER-**

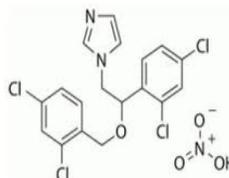
Nail polish or nail varnish is used for people fingernail or toenail to decorate and/or protection the nail plate. Conventional nail lacquer have been applied as cosmetics since a large duration for beautification and protection of nails. Topical nail preparation like lacquer, enamel and varnish are integral part of today's beautification curative. It is help for defence to the nail plate, but most significantly it maximize their glowing, imparting colour.

Formulation of active objects, large tissue concentration for capacity for the treatment of nail fungal disease.

The medicated drug are colourless and non-glossy to be applied for male patients, and more significant the drug are produce from the film so it can penetrate in to the nail the drug consisting polymer film may be considered as a matrix type controlled release the drug are closely spread with polymer and predicted the spread drug in polymer film before it is produce.

**DRUG PROFILE**

**Miconazole Nitrate**



**Structure of Miconazole nitrate**

**Table No.2 Properties of Miconazole nitrate**

<b>Proprietary name</b>	Desenex, Monistat, Zeasorb-AF
<b>IUPAC Name</b>	(RS)-1-2(2,4-Dichlorobenzyloxy)-2-(2,4 dichlorophenyl)ethyl-1H-imidazole
<b>Molecular formula</b>	C <sub>18</sub> H <sub>14</sub> Cl <sub>4</sub> N <sub>2</sub> O
<b>Molecular weight</b>	416.127g/mol
<b>CAS No</b>	22961 – 47 – 8
<b>Melting Point</b>	159-163 0C

**Description:** white crystalline and slightly smell

**Solubility of Miconazole:** Soluble in Ethanol, Acetone

**Mechanism of action** Miconazole interaction with 14-a dimethyl as, a cytochrome P—450 enzyme necessitate to alteration, lanostero to ergo sterol. As ergo sterol is a significance substance of the fugal cell membrane, conquer of its synthesis conclusion in largely cellular permeability for accountable leakage of cellular substance. Miconazole may also conquer endogenous respiration, interaction with membrane phospholopods, conquer the transformation of yeasts to mycelial forms, curb purine taking, and impair triglyceride and/or phospholide biosynthesis.

**Pharmacokinetic** The consumption of the oral drug delivery of the Miconazole (Nitrate) is come into possession to be 20% Volume of distribution is obtained to be 20l/kg and plasma protein binding is 92%and plasma half – life is 24.1 hr

**Dose** The adult dose is 2% topically dose is 250mg and pediatric dose 0.330-0.500 mg/g

**Category-** : Anti – fungal

**EXCIPIENT USED IN ANTI FUNGAL NAIL LACQUER-**

- Nitrocellulose
- Propylene Glycol
- Ethyl Cellulose
- 2- Hydroxy propyl-B- Cyclodextrin

## PREFORMULATIONS STUDIES

### 1 Recognition of Drug

#### A) Study of solubility

Saturated solubility of Miconazole nitrate was made by applying 10 ml of distilled water/ethanol/acetone in 25 ml volumetric flasks in thrice. Precaution was taken so that the drug dosage form stay in medium in spare. Then by using mechanical shaker, the flasks were shaken for 48 hours. The test sampling was done on 24<sup>th</sup> & 48<sup>th</sup> hour. The test sample is withdraw (1 ml after filtration) was soluble with suited medium and analyzed by using UV spectrophotometer at 223 nm.

#### B) Determination of the melting point

Melting point of drug determined by excellent measurement by fetching a few amount of drug in a capillary tube certain at once last and was attached in Thiel's melting point setup and temperature range at that the drug melted was presented. Mean of one of thrice readings was written.

#### C) $\lambda$ max determination

100 mg of pure Miconazole nitrate was interpreted in a volumetric flask and soluble in a small few amount of phosphate buffer pH of 7.4 and volume made up to 100ml. 1ml of the trying firstly of dilution was taken and some diluted to 100ml. The trying test firstly solution scanned for excellent absorbance in double beam UV-Visible spectrophotometer in between the range of 400-200 nm against phosphate buffer pH 7.4 as the clean. Thrice reading were taken and mean was determined.

## ANALYTICAL METHODS

### A) Phosphate buffer solution preparation

#### 0.2M Sodium hydroxide solution preparation

8gm of the sodium hydroxide was soluble in needful quantity of distilled H<sub>2</sub>O in a 1000ml volumetric medium and volume made up to 1000ml with distilled H<sub>2</sub>O.

#### 0.2M potassium dihydrogen phosphate solution preparation –

27.218gm of potassium dihydrogen orthophosphate was soluble in needful quantity of distilled H<sub>2</sub>O in a 1000ml volumetric medium and volume was made up to 1000ml with distilled H<sub>2</sub>O.

### The pH of phosphate buffer solution preparation

50ml of potassium dihydrogen phosphate solution was taken in a 200ml volumetric flask and 39.1ml of 0.2M sodium hydroxide solution was mixed and made up to 200ml with distilled H<sub>2</sub>O.

### B) Standard stock solution & Calibration curve of Miconazole nitrate preparation

Miconazole nitrate 100mg pure drug was right weighed and transfer into a 100ml volumetric flask of medium. And the volume was made up to 100ml with PBS of pH 7.4, to come into ownership standard stock solution of 100mcg/ml concentration. According above solution of 2ml, 4ml, 6ml, 8ml, 10ml, was pipetted out into other 100ml volumetric flask and made up to 100ml with PSB of pH 7.4 come into ownership a concentration range of 20 $\mu$ g/ml, 40 $\mu$ g/ml, 80 $\mu$ g/ml, and 100 $\mu$ g/ml solution. The analyzed of solution at 223nm by using UV-Visible spectrophotometer. The concentration versus absorbance was plotted on the graph. Drug constitute assessment and diffusion presented were aim on this calibration curve.

## Drug-polymer compatibility determine

Pure drug FT-IR spectral analysis and polymer were portaged out singly and as composition. The compatibility between Miconazole nitrate, nitrocellulose, 2-HP- $\beta$ -CD, propylene glycol and made development were carried out in the ratio 1:1. The test were located FT-IR window after mixing and triturating with potassium bromide.

**Table-Drug-Polymer compatibility study**

Composition	Ratio	250 C +2 /60° CRH	40° C +2 /75° C RH
Miconazole nitrate	100mg	6 Months	1 Month
Nitrocellulose	100mg	6 Months	1 Month
HP- $\beta$ -CD	100mg	6 Months	1 Month
Propylene glycol	100mg	6 Months	1 Month
Miconazole + nitrocellulose	1:1	6 Months	1 Month
Miconazole + HP- $\beta$ -CD	1:1	6 Months	1 Month
Final Formulation	NA	6 Months	1 Month

## FORMULATIONS STUDIES

### Preparation of nail lacquer of Miconazole nitrate

#### A) Making of Nitrocellulose

Approximate 5gms of cellulose base (cotton) is mixed to 50ml concentrated sulfuric acid and 25ml 70% nitric acid mixture and chilled to 5-10 °C to give cellulose nitrate. Then cotton was separated and washed in chilled water and with NaHCO<sub>3</sub> Solution separated all acid remain. It was then low at dried at room temperature.

#### B) Optimization of Nitrocellulose film former

**Table-Optimization of nitrocellulose film former**

Formulation Code	Nitrocellulose (% w/v)	Plasticizers (% w/v)		Ethanol (ml)
		PG	Glycerin	
NF1	3	10	....	10
NF2	5	10	....	10
NF3	7	10	....	10
NF4	9	10	....	10
NF5	3	....	10	10
NF6	5	....	10	10
NF7	7	....	10	10
NF8	9	....	10	10

4 different concentrations of nitrocellulose, 2%, 4%, 6% & 8%, were made applying 2 different plasticizers, Propylene glycol and glycerin at 10% concentration as per **Table No. 2**. The optimal concentration for film formation was characterized by great determination by rating the thickness, tensile power, folding stress and H<sub>2</sub>O opposition.

## Evaluation

### a) Film thickness

The thickness of the flick was determined by applying screw gauge with a minimum count of 0.01 mm at many points of the films. The thickness was

**b) Folding Endurance**

Folding endurance of the films was measured by repeat foldaway a little strip of the film (approximately 2x2 cm) at the same site till it brittle. The numerous of times film could be crimped at the same site, without brittle gives the factor of folding endurance.

**b)-Water resistance**

This is determine of the resistance to the aqueous permeability of the layer. This was by applying a continuous layer on a plane and plunging it in water. This weight before and after submergence was written and maximize in weight was calculated. Larger the maximize in weight lesser the water resistance.

**FORMULATIONS STUDIES**

**Preparation of nail lacquer of Miconazole nitrate**

**A) Preparation of Nitrocellulose**

Around 5gms of cellulose base (cotton) is mixed to 50ml concentrated sulfuric acid and 25ml 70% nitric acid mixture and chilled to 5-10 °C to give cellulose nitrate. Then cotton was separated and washed in chilled H<sub>2</sub>O and with NaHCO<sub>3</sub> Solution to separate all acid remain. It was then easily slow dried at room temperature.

t=thickness of sample in cm.

**Development of nail lacquer-**

The Formulation was done according to formula shown .The Miconazole nitrate and Nitrocellulose was solublize in Ethyl alcohol in the important substance used a magnetic stirrer at an various speed. To clear the solution important substance of 2-HP-β-CD, Salicylic acid, and propylene glycol were mixed and volume to 100ml. The prepared nail lacquer was trans change to a narrow plastic screw capped glass bottle.

**FORMULATION TABLE**

Ingredients (%)	F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11
Miconazole nitrate	3	2	3	3	3	3	3	3	3	3	3	3
Nitrocellulose	7	7	7	7	7	7	7	7	7	7	7	7
Salicylic		6	11	16	21	16	16	16	16	16	16	16
2-H-β-CD	...	...	...	...	...	5	7.9	11	11	11	11	11
Ethyl cellulose	...	...	...	...	...	...	...	...	0.26	0.51	0.79	1.09
Propylene Glycol	11	11	11	11	11	11	11	11	11	11	11	11

Ethanol q.s	100	100	100	100	100	100	100	100	100	100	100	100
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**EVALUATION OF NAIL LACQUER**

**A) Nonvolatile content**

10ml of preparation was take in a petri dish and firstly weighed were taken. This dish was put in the oven at 105°C for 1hr, the petri dish was removed, cooled and weighed. This separated in weights was taken. Mean of one of three cycle readings was reported.

**B) Drying time-**A layer of formulation was used on a petri dish with the using by the brush.. The time for make a dry-to-hard layer was noted use by stop watch.

**C) Smoothness to flow**

The preparation was dip from a heighted of 1.5 inches into a glass plate and dispersed on a glass plate and made to wave vertically and see obtaining for smoothness of layer.

**D) Gloss**

Development of nail lacquer was used on the nail and gloss needful and done with marketed cosmetic nail lacquer.

**FORMULATIONS STUDIES**

**1 Development of nail lacquer of Miconazole nitrate**

**E) Viscosity** using the brook field viscometer.

**F) Adhesion**

There are neither to amount of evaluation tools resultant to use the medicinal nail lacquer at this time of duration. The instruments is used of chemical balance applied in the general laboratory as showed. One pan of the balance was transfer with two stainless steel plates. In between the plates a film of 4 cm<sup>2</sup> was made and adhered. The poise of the balance was adjusted by mixing a weight to the right pan of balance. The force needful to pull away the plates determined and compared with a commercial cosmetic nail lacquer test sample.

$$\begin{aligned} \text{Force of Adhesion} &= \text{Mass} \times \\ \text{Acceleration due to gravity} &= \text{Kilogram.} \\ \text{meter/second}^2 &= \text{Neutons.} \\ \text{meter/second}^2 &= \text{Force of} \\ \text{Adhesion (N)} &= \text{Force of} \\ (\text{m}^2) &= \text{Surface area} \end{aligned}$$

**G) Drug content appraisal-**

Nail lacquer equivalent to 200mg was soluble in 50 ml phosphate buffer solution of pH 7.4. Then the solution was supersonic for 15 mints. Resultant solution was filtered, made up to 100 ml with phaphate buffer solution of pH 7.4. From the above solution carried at 10ml and made up to 100ml with PBS of pH 7.4. Then the diluted solution was assessment spectrophotometrically at wavelength of 223 nm and determined the drug constiuents.

**H) Diffusion studies across artificial membrane**

Diffusion studies were tested by Franz cell applying artificial membrane (cellophane) of 0.8µm. The membrane was loaded for 24hrs in solvent system and the solvent fill the receptor compartment.

Nail lacquer equivalent to 200mg was used evenly on the surface of the membrane.

The made membrane was assembled on the cell carefully to avoid entrapment of air bubbles in the membrane. The all weldment was maintained at 37°C, and the speed of stirrings was kept constant for 20hrs. The 5ml aliquot of drug sample was taken at time intervals of **2hr, 4hr, 8hr, 10hr, 12hr, 16hr, and 20hrs** and was replaced by the fresh solvent. Samples were analyzed by double-beam UV spectrophotometer as per method mentioned in drug content appraisal. Each experiment was recurrent thrice.

**I) In vitro permeation studies**

Hooves from freshly slaughter cattle, free of adhering tending to attach and cartilaginous tissue, were loaded in distilled water for 24hrs. Membranes of approximate 1mm thickness were cut form the distal part of hooves. In vitro permeation studies were tested by using from Franz diffusion cell, the hoof membrane was situated by paying attention on the surface of the nail membrane. The targeted receptor compartment was filled with solvent phosphate buffer solution of pH 7.4, and the all weldment was maintained at 37°C with constant mixing for 48hrs. The 5ml factor of number of drug sample was taken after a time intervals of **2, 4, 6, 8, 10, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48hrs.** transferred by the fresh solvent. The drug analysis was done by using double-beam UV spectrophotometer at 223nm.

**J) Determination of antimicrobial activity**

*Candida albicans* were wages for testing antifungal act by the cup-plate method. The culture was take up on sobouraud’s agar slants. 20ml of melted sabouraud’s agar medium was confirm 72hrs. Old 0.2 ml suspension of *Candida albicans* in the Petri dish and allowed to standard by conformity undisturbed for 15 mints. The cups (10mm diameter) were slugged in the Petri dish and filled with 0.05 ml of a solution of the sample. The plates were taken for diffusion at 40°C for 1hr, and followed by incubation at 30°C for 48 hrs. After done the incubation time the zone of suppression in millimeter were determined. On with test solution in every petri dish one cup was filled up with solvent, which play as control. The zone of suppression was noted and compared with control.

**K) Stability study**

Stability studies of nail lacquers were according ICH guidelines. Test samples were at temperature of 25±2 °C/60 ±5% RH for 6 months and 40 ±2°C/75 ± 5% RH for 1 month. Then the samples were analyzed for non-volatile content, drying time, gloss, smooth of flow, drug content and diffusion across artificial membrane.

II. RESULT AND DISCUSSIONS

Results for Analytical Study

1 Scanning of drug

Pure Miconazole nitrate sample was scanned using phosphate buffer solution (PBS) of pH 7.4 between 200nm to 400nm using UV visible spectrophotometer. The tallest peak of Miconazole nitrate was obtained at 223nm (Figure 12) and thus the  $\lambda_{max}$  of Miconazole nitrate was at 223nm and was used some spectrophotometric evaluations during the investigation.

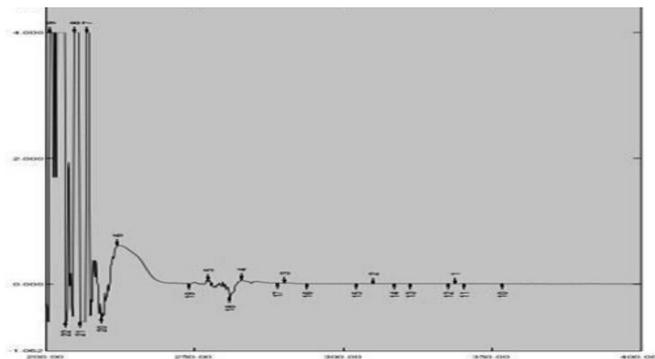
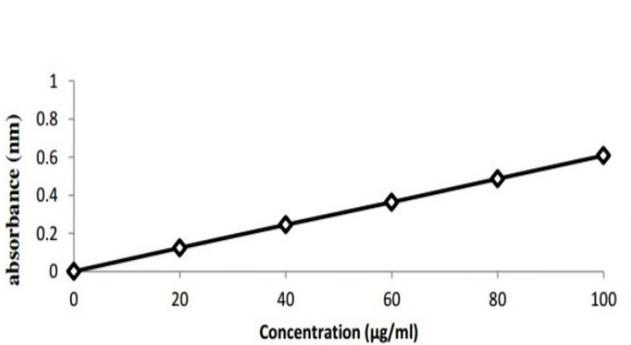


Figure 12: UV spectrum of Miconazole nitrate in phosphate buffer solution of pH 7.4

Standard curve for Miconazole nitrate in phosphate buffer of pH 7.4

Standard solutions of Miconazole nitrate in various concentrations (Table No. 13) were made applying PBS pH 7.4 and their absorption was determined at 223nm. Drug concentration Vs. absorbance was plotted in Figure 13.

Concentration(ug/ml)	Absorbance at 223nm
00	00
20	0.125
40	0.246
60	0.366
80	0.488
100	0.608



Calibration curve of Miconazole nitrate in phosphate buffer solution pH 7.4

2 PREFORMULATIONS STUDIES

1 Solubility studies of Miconazole nitrate

The result of solubility studies of pure Miconazole nitrate are given below:

Table No. 14: Solubility studies of Miconazole nitrate

Solvents	Solubility (mg/ml)
Ethanol	0.78
Water	0.03
Acetone	0.36

From the data, solubility profile of Miconazole nitrate was insoluble in water, soluble in ethanol and acetone.

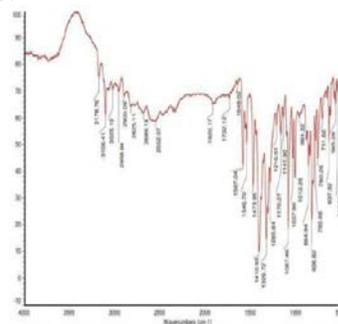
3. Melting point determination

The melting point was found to be  $161^{\circ}\text{C} \pm 0.577$  and as per the IP 2007 melting point of Miconazole nitrate was within the range of  $159\text{-}160^{\circ}\text{C}$ .

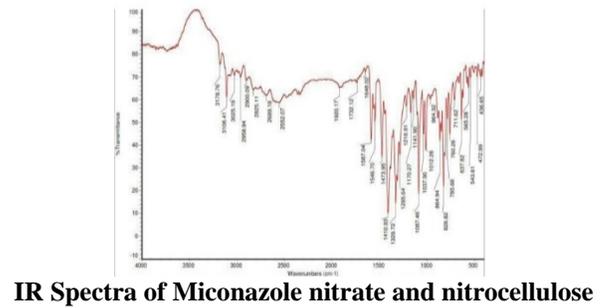
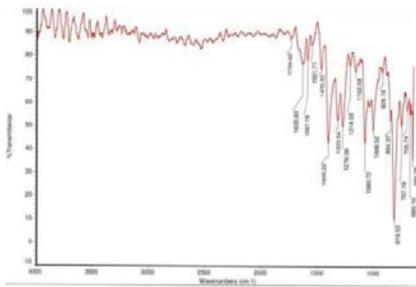
4 Drug excipient compatibility study

All the reference IR peaks of the pure drug Miconazole nitrate were also present in the spectra of mixture of drug-polymer and drug-permeation enhancer-excipients as mentioned in the above Table No. 10.

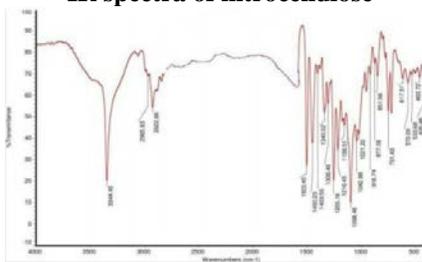
So FTIR study showed that there is no interaction between drug and permeation enhancer. So the drug and permeation enhancer are compatible. The IR spectrums were given in the Figure 14 to 20.



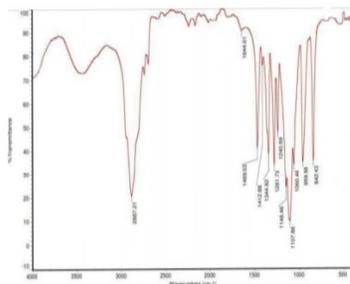
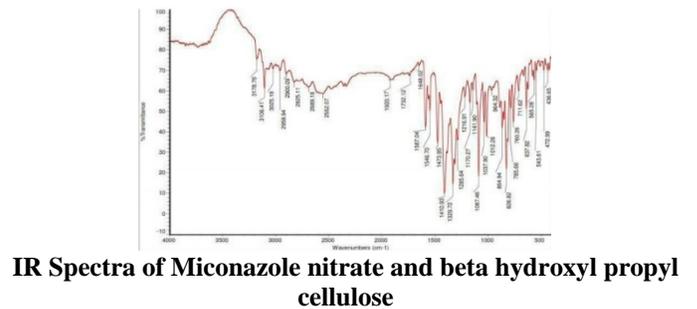
IR spectra of miconazole nitrate



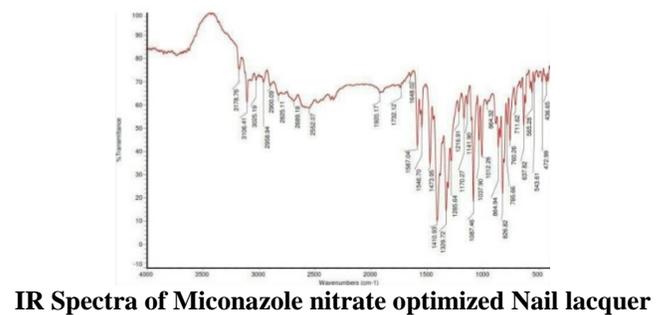
IR spectra of nitrocellulose



IR spectra of ethyl cellulose



IR Spectra of the beta hydroxyl propyl cellulose



IR Spectra of Miconazole nitrate optimized Nail lacquer

TABLE NO. 15L FTIR COMPATIBILITY STUDY INTERPRETATION

FTIR spectra of pure Miconazole nitrate		Miconazole nitrate Optimized Nail Lacquer Formulation (F11)	
Wave number (cm <sup>-1</sup> )	Functional group	Functional group	Wave number (cm <sup>-1</sup> )
3281.6	Imidazole C-N stretch	Imidazole C-N stretch	3178.79
3254.79	Aromatic CH stretch	Aromatic CH stretch	3106.43
2972.94	Aliphatic CH <sub>2</sub> stretch	Aliphatic CH <sub>2</sub> stretch	2958.96
2885.65	Aliphatic CH stretch	Aliphatic CH stretch	2900.10
1448.74	-CH <sub>2</sub> - bending	-CH <sub>2</sub> -bending	1773.97
1416.05	C-H bending (aliphatic)	C-H bending (aliphatic)	1410.95
1329.04	C-N stretch	C-N stretch	1329.74
1083.85	C-C stretch	C-C stretch	1087.48
		C=C aromatic	1587.06
		C=C aromatic	1546.75
		C-H bending (aromatic)	711.66

After spectral comparison it was confirmed that no compatibility reaction took place between drug and additives, as all main properties IR peaks of Miconazole nitrate are present in the physical mixture with individual additives and also in the final

optimized formulation, F11. All the additive peaks were obtained to be entirely indicating nice compatibility.

#### 6.4 Formulation development of Nail Lacquer

The aim of the present study was to furnish a preparation for conquer fungal developed on toe nails or finger nails so that the looks of the nails are valuable. Preparation consists a film former nitrocellulose, permeation enhancer such as 2-H-β-CD, keratolytic agent like salicylic acid and an antifungal agent (Miconazole nitrate) and ethanol as solvent. Preparation is made by simple mixing method.

**5 Optimization of nitrocellulose film former**

Various concentration of film forming polymers were applied for film formation and then applied for optimization of film. Various concentrations were tried between 2-8%. From the conclusion, it was obtained that by maximizing the concentration polymer up to 6%, thickness and strength of film was coveted. While maximizing concentration more than 6%, sticky films were generated. Thus, 6% concentration of polymer was needful for some obtained of plasticizer. Plasticizer tried were Glycerin and Propylene glycol in 10% concentration each. Glycerin showed more sticky film which was unable to detach from surface. Thus, 6% nitrocellulose and 10% propylene glycol, due to its excellent film forming nature was choose for some optimization research.

**A) Thickness (µm)**

Unvarying thickness bespeak the unvarying of the preparation because of that suitability of the executed procedure.

Thickness of all the films determined by applying a micrometer screw gauge. Obtained result presented that thickness of all preparation varied from 55 to 59 µm.

The determined values were shown in the **Table No. 16**. Data for film thickness was duplicate within the coveted range of thickness identified through review of literatures for films.

**B) Folding endurance**

Folding endurance bespeak the flexibility of the polymer film. In order to evaluate the flexibility, the made films were subjected to folding endurance research. The numerous of bend a film can sustain without interruption will dictate its folding endurance. The computed measured determined were above 125 in all of the generated layers and are noted in **Table No. 16** and it was in the range of 126-178 for all the generated films. Regardless of polymer concentration applied, all the films presented nice folding endurance, bring out that the made films were having the capability to produce hold up the mechanical pressure along with nice flexibility. The folding endurance is a significant evaluation, which assure the flexibility of the generated films. Larger the folding endurance values better will be the flexibility of the films. 6% film (NF3) presented good folding endurance, because of that ensuring good flexibility.

**Table No. 16: Optimization of nitrocellulose film former**

Nitrocellulose Concentration (%w/v)	1	2	3	4
Thickness (µm)	59 ± 0.02	60 ± 0.02	56 ± 0.04	59 ± 0.03
Folding endurance	156	127	179	178
Tensile strength (Kg/cm <sup>2</sup> )	2.57 ± 0.01	2.59 ± 0.01	2.61 ± 0.04	2.56 ± 0.02

**B) Water Resistance**

This is the determined of the opposition towards water permeability of the layer. This was done by applying uninterrupted layer on a surface and plunge it in water. The weight before and after immersion was

noted and maximize in weight was determined. Large maximize in weight low the water opposition. Here Nitrocellulose Film of 6% (NF3) has relatively, low weight and has the better water resistance. The data were shown in **Table No. 17**.

**Table No. 17: Water (W) resistance of nail lacquers**

Formulation code	W <sub>1</sub> (g)	W <sub>2</sub> (g)
NF1	6.86	6.92

NF2	6.84	6.93
NF3	6.89	6.90
NF4	6.93	7.15
NF5	6.82	6.92
NF6	6.85	6.92
NF7	6.90	6.95
NF8	6.92	7.05

Having a base on above studies it was distinct that, NF3 formulation has the excellence properties needful for a nail lacquer and thence 6% w/v of nitrocellulose and 10% w/v of Propylene glycol was determined to be the optimum concentrations.

### 6 Evaluation of nail lacquer

All preparations presented coveted layer make, smoothness of flow was nice. Coveted quantity of nonvolatile substance (31-41%) was observed with complete evaporation of volatile matter leaving a thin layer; Conclusion were plotted in **Table No. 18**. Drying time was obtained within 52-127 sec. Demur for F2, where it presented 127 sec, all formulation showed fast drying rate. That is less than 60 seconds. The numerous amount were shown in **Table No. 19**.

#### A) Nonvolatile content

The non-volatile content of all formulation has been shown in the **Table No. 18**, given below

**Table No. 18: Nonvolatile content of nail lacquers.**

Formulation code	Non-volatile content (%)	Formulation code	Non-volatile content (%)
F0	34 ± 0.38	F6	38 ± 0.81
F1	34 ± 0.38	F7	37 ± 0.70
F2	42 ± 0.81	F8	33 ± 0.40
F3	40 ± 0.40	F9	36 ± 0.41
F4	38 ± 0.81	F10	34 ± 1.22
F5	38 ± 0.71	F11	38 ± 0.81

#### B) Drying time

**Table No. 19: Drying time of nail lacquers**

Formulation code	Drying time (sec)	Formulation code	Drying time (sec)
F0	51	F6	57
F1	53	F7	60
F2	129	F8	57
F3	53	F9	60

F4	59	F10	59
F5	60	F11	58

#### C) Smoothness of flow and Gloss:

Both these parameters was obtained to be acceptable as can be received. The nail lacquer dipped onto the glass plate was obtained to dispersed and resultant in unvarying smooth layer. The gloss of the applied lacquer was worthy of comparison with marketed cosmetic test sample achieving the cosmetic credence.

#### D) Viscosity

The viscosity of the test sample ranged from 100 to 220 centipoise it was obtained that between 140 to 160 centipoise the product was clean and glossy. Furthermore this viscosity range furnished nice attachment and flow property. Viscosity outside this range generate translucence and minimize gloss which will not be cosmetically satisfactory.

**Table No. 20: Viscosity of nail lacquers**

Formulation code	Viscosity	Formulation code	Viscosity
F1	100	F7	200
F2	111	F8	140
F3	122	F9	142
F4	133	F10	146
F5	184	F11	146
F6	198		

#### E) Adhesive strength

The adhesive strength of the implied batch was shown to be worthy of comparison with marketed sample and thence can be arrived to exhibit equal adhesive strength on applied nail surface.

**Table No. 21: Adhesive strength of nail lacquers**

Formulation Code	Force of Adhesion (N)	Adhesive strength (N/m <sup>2</sup> )
F11	0.6	12.6
MARKET	0.7	16

<b>SAMPLES</b>		
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**F) Percentage drug content determination**

Percentage drug ingredients for all the lacquers were obtained to be satisfy and in between 86.25-99.01% which is shown in **Table No. 22**. Largest % of drug constituents was obtained to be 99.01% (F11) and the smallest % of drug content was 86.25% (F3). Drug content more than 90% in the Preparation shows the large no. of quantity of drug present in the Preparation, Confirming that the methods of preparation and the constituents choose are not poignant the stability of drug. Large drug constituents also show to confirm that, a nice curative result can be arrived.

**Table No. 22: Percentage drug content**

Formulation Code	Drug content (%)	Formulation code	Drug content (%)
F0	90.01	F6	89.38
F1	91.52	F7	90.13
F2	93.76	F8	98.02
F3	86.27	F9	98.24
F4	94.30	F10	97.56
F5	95.82	F11	99.03

**G) Diffusion studies across artificial membrane**

Diffusion research of all the preparations were obtained by artificial membrane (cellophane membrane -0.8µm) for 48 hrs. The diffusion studies were made on all formulations as per shown in **Table No. 12**.

The top formulated batch F0 did not dwell of any permeation enhancers and in vitro diffusion revealed that only 27.10% drug released till 48 hrs. Thus trials were planned to incorporate a permeation enhancer. Salicylic acid at

concentrations of 5% (F1), 10% (F2), 15% (F3) and 20% (F4) was tested out. The diffusion studies shown that only 64.18%, 65.10%, 68.34% and 69.10% respectively was obtained in 18 hours. It was clean that salicylic acid has valuable the drug permeation due to its keratocytic activity. But it was also determined that the drug permeation was not yet done and some maximize in salicylic acid concentration is not arrived to valuable permeation. Thence it was declared to choose 15% w/v of salicylic acid as the optimum concentration.

To further improve drug diffusion it was decided to include 2-H-β-CD in concentration of 5% (F5), 7.5% (F6) and 10% (F7) into formulations. The drug release and diffusion across membrane was found to improve in presence of 2-HP-β-CD. At concentration of 5%, 82.40% diffusion in 28<sup>th</sup> hour was observed. In case of F6, 89.0% diffusion as observed at 28<sup>th</sup> hours. It was also observed that as concentration of 2-HP-β-CD increased drug diffusion also improved drastically as clear from almost complete drug diffusion of 98.40% release in 20<sup>th</sup> hour with 7.5% concentration.

Though, inclusion of 2-H-β-CD has improved drug diffusion to 98.40%, it was observed that the release was found to be complete within 20 hours. Therefore to sustain the drug release over an extended period it was decided to include a rate controlling polymer ethyl cellulose at concentration of 0.25% (F8), 0.5% (F9) and 0.75% (F10) and 1.0% (F11) into formulation. The result showed an extended and completed release of 96.80% at 28<sup>th</sup> hr. in F8 and 93.0% till 36<sup>th</sup> hour in F9. In F10, a drug diffusion of 97.20% was observed at 40<sup>th</sup> hr. And finally when the concentration of ethyl cellulose was increased to 1% in F11, a drug diffusion of 98.12 percent which sustained over a period of 48 hours was achieved.

The formulation F11 was selected as the optimized nail lacquer formulation based on drug diffusion studies.

**Table No. 23: Comparative study and optimization of salicylic acid concentration**

Time (hr)	PERCENTAGE DRUG RELEASE (µg/ml)			
	F1	F2	F3	F4
0	0	0	0	0
2	9.83	11.23	13.37	15.27
4	10.21	12.07	14.99	16.89
6	13.29	14.37	16.37	17.26
8	16.43	17.89	18.87	20.15
10	26.59	28.97	32.06	30.38

12	32.46	36.35	40.23	36.17
16	43.12	42.32	48.39	42.97
20	48.24	49.99	51.83	50.12
24	49.66	50.83	52.62	54.35
28	52.56	54.90	56.84	58.40
32	56.27	58.77	59.35	60.23
36	58.97	59.99	61.29	63.47
40	60.19	62.19	63.95	66.25
44	62.53	63.27	65.97	68.86
48	64.19	65.15	68.36	69.12

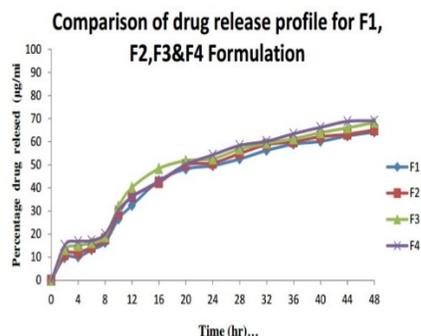


Figure 22: Comparative Dissolution profile of F1 v/s F2 v/s F3 v/s F4

Table No. 24: Comparative study and optimization of 2-HP-β-CD concentration

Time (hr)	PERCENTAGE DRUGT RELEASE		
	F5	F6	F7
0	0	0	0
2	26.26	32.13	39.32
4	32.24	43.56	49.86
6	38.52	52.83	59.66

8	46.53	61.66	67.73
10	48.23	69.36	76.46
12	56.29	76.26	85.06
16	65.16	80.03	92.16
20	76.46	83.36	98.42
24	79.96	88.97	96.26
28	82.42	89.08	94.25
32	80.26	86.35	93.17
36	79.46	84.17	91.84
40	77.33	82.18	90.09
44	76.66	80.88	89.18
48	74.74	78.26	88.98

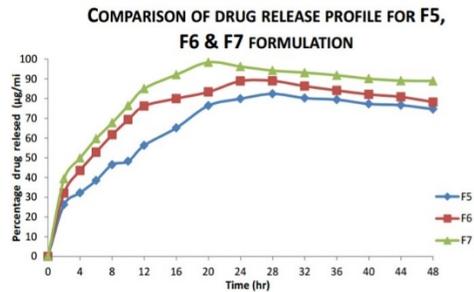


Figure 23: Comparative Dissolution profile of F5 v/s F6 v/s F7

Table No. 25: Comparative study and optimization of Ethyl cellulose concentration

Time (hr)	PERCENTAGE DRUG RELEASE (µg/ml)			
	F8	F9	F10	F11
0	0	0	0	0
2	29.66	26.53	19.46	12.83
4	34.13	31.96	30.46	27.13
6	45.57	40.44	36.92	28.32
8	51.17	44.92	48.85	32.73
10	62.36	53.23	50.75	46.26
12	69.76	60.14	56.80	50.22
16	75.94	68.67	60.25	58.67
20	88.46	72.33	65.72	60.22

24	93.24	83.46	72.68	68.13
28	96.82	89.77	80.52	70.23
32	95.06	95.85	85.73	78.86
36	94.58	93.79	90.63	84.16
40	93.15	90.73	97.57	88.86
44	90.77	89.88	94.23	90.26
48	89.03	88.74	91.32	98.13

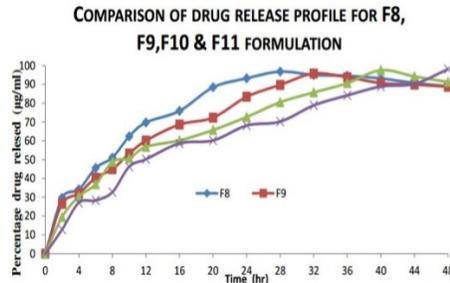


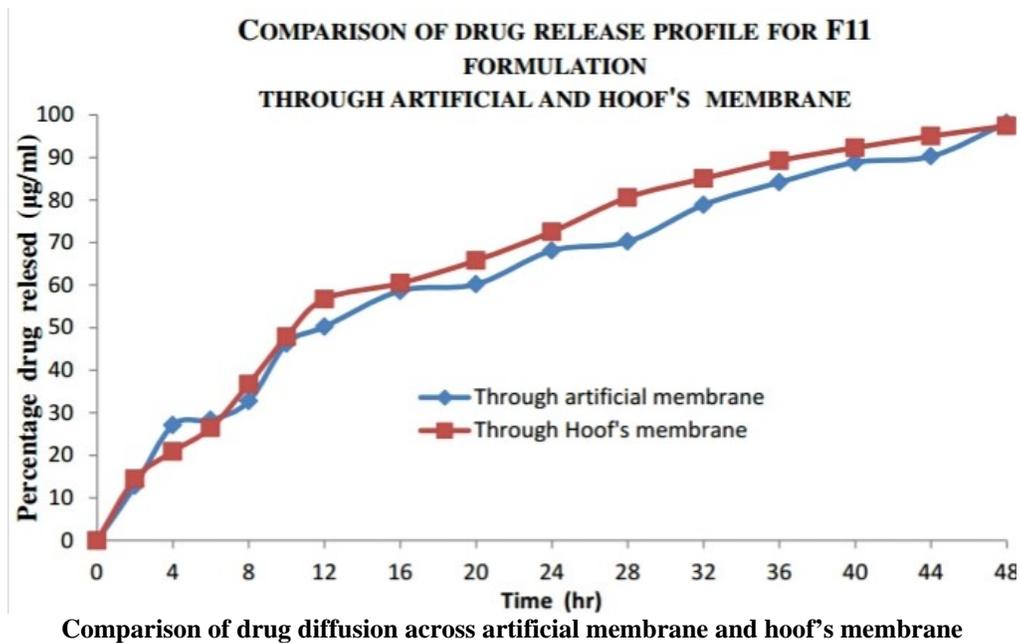
Figure 24: Comparative Dissolution Profile of F8 v/s F9 v/s F10 v/s F11

**H) In vitro ungual permeation studies**

To excite and constituting an imitation diffusion research with that of *in vivo* conditions, i.e. across nail plate, a diffusion study across hooves resultant from freshly slaughtered cattle was done. There was no importance difference and drug release data obtained across artificial hoof's membrane. This research achieve sureness which is nice *in vitro in vivo* correlation can be demur.

Table No. 26: Comparison of drug diffusion across artificial membrane and hoof's membrane

Time	PERCENTAGE DRUG RELEASE (µg/ml)	
	Drug diffused through artificial membrane	% drug diffused through hoof's membrane
0	0	0
2	12.83	14.51
4	27.13	20.91
6	28.32	26.46
8	32.73	36.76
10	46.26	47.91
12	50.22	56.73
16	58.66	60.44
20	60.21	65.83
24	68.12	72.56
28	70.23	80.61
32	78.86	85.06
36	84.16	89.26
40	88.86	92.32
44	90.26	95.05
48	98.13	97.46



**I) ANTI-MICROBIAL STUDY**

The zone of inhibition for the many preparation was investigated, and it was obtained range from 17-22mm, which is allow to compare with that standard with 21mm. The show that all the formulations were sensitive to the microorganisms *Candida albicans*. Conclusion are shown in **Table No. 26**.

**Table No. 27: Zone of inhibition of Miconazole nitrate Nail lacquers**

Formulation Code	Zone of Inhibition (mm)	Formulation code	Zone of Inhibition (mm)
F1	23	F7	19
F2	19	F8	25
F3	22	F9	18
F4	23	F10	24
F5	18	F11	23
F6	17	Standard	22

**J) Stability studies**

Stability studies were applied to obtain the shelf life and storage condition of a product. In this determination F11 were subjected to speed up stability studies for as per day of 1 month. Stability studies were performed in according to ICH guidelines with importance adjustments.

The studies were obtained to ascertain the changes in physical properties such as Non-volatile content, Drying time, % drug content, drug diffusion at three different conditions f higher temperature (40±2°C) for 1 month. The conclusion are shown in **Table No. 28, 29**.

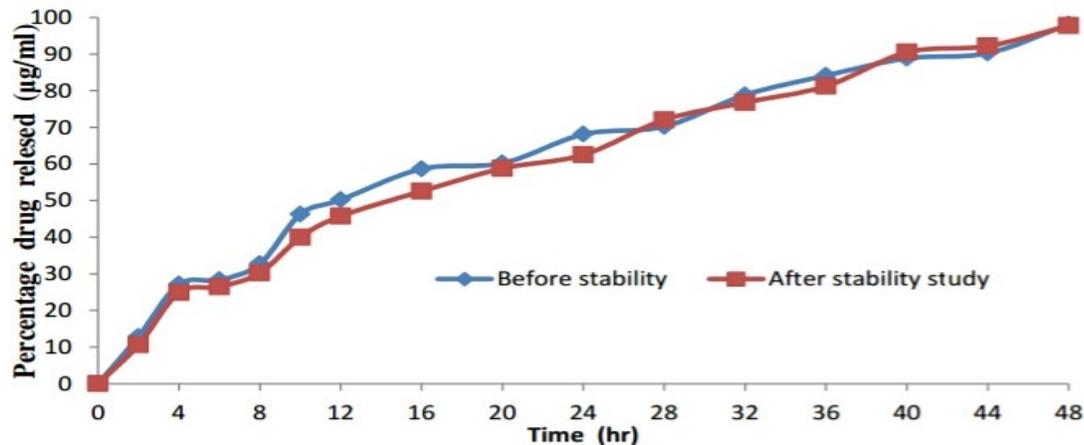
**Table No. 28: Stability studies data of F11**

Parameter	Initial	After
Non content	36±0.82	35±0.36
Dryintin (sec)	57	59
Drug content	99.04	98.52

**Table No. 29: Invitro Diffusion profile of F11 upon stability studies**

Time	PERCENTAGE DRUG RELEASE ( $\mu\text{g/ml}$ )	
	Before stability	After stability
0	0	0
2	12.83	10.61
4	27.13	24.91
6	28.32	26.44
8	32.73	30.26
10	46.26	39.96
12	50.22	45.76
16	58.66	52.56
20	60.21	58.82
24	68.12	62.51
28	70.23	72.06
32	78.86	76.82
36	84.16	81.27
40	88.86	90.54
44	90.26	92.21
48	98.12	97.75

**COMPARISON OF DRUG RELEASE PROFILE FOR F11 FORMULATION BEFORE AND AFTER STABILITY**



**In vitro diffusion profile of F11 upon stability studies**

The evaluation of formulation after stability study presented there was no important change with respect Non-volatile content, Drying time % drug content and drug diffusion with respect to result obtained before stability charging. Thence it was received that the formulation were obtained to acceptable stability compliance needful as per ICH guidelines.

**III. CONCLUSION**

- ❖ The main of the today studies was to formulate and evaluate the Miconazole nitrate nail lacquer as an unguial drug delivery system for the treatment of onychomycosis.
- ❖ Miconazole nitrate selected as a drug, the preparation were prepared with Salicylic acid. And by the FTIR research, resultant that the drug and the additives applied

in the Preparation. Proved the formulations are sensitive to the required volatile contents by the microbial study.

- ❖ The Preparation are sensitive to the microorganism *Candida albicans*. Confirmed by the microbial study.
- ❖ The preparation were survived at 40<sup>0</sup>c for 1 month .confirmed by stability study.
- ❖ By In vitro permeation study is proved in vitro in vivo correlation can be acceptable.
- ❖ Conclusion is achieved by the *in vitro* studies shown that formulation F11 given a complete drug release which sustained over 48 hours. The F11 formulation had salicylic acid at concentration of 15% w/v as keratolytic agent and 10% w/v of (2-Hydroxypropyl)- $\beta$ -cyclodextrinas permeation enhancer. Shown result that the combination of permeation enhancer and keratolytic

agent resulted in an improved permeation rate and also a complete and sustained drug release.

- ❖ The formulation of F11 was chosen as the nail lacquer formulation based on optimization as well as drug diffusion studies.
- ❖ There was no more interchangeable in the values after stability test confirmed by the stability study. It was obtained that the preparations were achieved to confirmed stability compliance necessary as per ICH guidelines.

By the above research, it can be obtained that medicated lacquers shown to be a nice base as a drug delivery system for the unequal drug delivery of an antifungal in the treatment of onychomycosis, which is applying in the treating of the nail infections, the medicated nail lacquers can be also applied for glowing and glamorous of nails with easily and time consuming useful for applying which improves patient compliance.

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# Application of Positive Discrimination to the Invisible Loan Funding Option in the Planning of Tertiary Education in Imo State, Nigeria

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## **Abstract**

The study acknowledged the strategic role of tertiary education in the development of high level manpower that are critical to the economy, but are grossly impeded by financial constraints. The study therefore investigated the application of positive discrimination to the invisible loan funding option in the planning of tertiary education in Imo State, Nigeria. It adopted the descriptive survey design, with all the state owned three tertiary institutions as the population. The lecturers and students responded to the instruments. The sample size was 168(Lecturers-87, Students-81), based on the stratified random sampling technique across the different disciplines. The instruments for the study were questionnaire and structured interview. The questionnaire was validated and the reliability determined through test-retest approach with the use of Pearson Product Moment Correlation which gave a reliability index of 0.81. mean and Standard deviation were used to answer the research questions while t-test statistics was used to test the hypotheses at 0.05 Alpha level of significance. The findings revealed that all the disciplines should be favoured by the invisible loan scheme, the loan should cover almost all the cost of acquiring higher education. Also, it showed that some strategies should be put in place to ensure effective repayment compliance on graduation. On the basis of the findings, some recommendations were made. They include: there should be national policy provisions for the effective implementation of the loan scheme, especially with respect to the scope of coverage and repayment modalities. Also, the principle of positive discrimination should be adopted in favour of those disciplines that will help address the manpower shortages in those critical areas of the economy

**Index Terms:** Positive discrimination, Invisible loan scheme, Tertiary education

## I. INTRODUCTION

The global acknowledgment of education as a veritable instrument for human advancement and national development is almost sacrosanct. The human capital thesis has provided a scholarly platform for this credo in education. It is on this premise that nations have relentlessly continued to commit huge amounts of resources (human and material), planning and re-strategizing through policy formulations and reforms in order to proactively respond to the dynamic environmental demands. This passion is more pronounced in this age among the developing nations who, not only are in dire need of economic development but are the worst hit by the current global economic crisis. Nigeria is a case in point. In the whole gamut of the educational process, tertiary education is critical, with particular reference to the development of high level manpower necessary for national development and global competitiveness. There is a positive relationship between tertiary education and the effectiveness of critical sectors of the economy specifically in generating the relevant manpower.

This relationship was highlighted by the Federal Republic of Nigeria (2014) in her National Policy on Education, in its definition of the goals of tertiary education. The goals inter alia, include to contribute to national development through high level relevant manpower, to acquire both physical and intellectual skills that will enable individuals to be self-reliant and useful members of the society. What it means is that the backbone and hub of a nation's drive for economic development remains unquestionably, her educational institutions whose statutory responsibility is human capacity building. Hence, skilled manpower of different types and categories are vital ingredients in the implementation of economic development plans in the various sectors of the economy (Obasi & Ohia, 2015; Agabi, 1999). Tertiary education occupies a very strategic position in national development process. This is the conviction of British Council (2012) as it stated that tertiary education sector has seen a massive expansion over the past decades,

generating significant and multiple direct, indirect and catalytic economic impacts such as human capital, research and innovation which result in well-established benefits, pertaining to both individuals and wider economies. It went further to state that universities contribute to global development and poverty reduction through a combination of collaborative research, direct teaching and capacity-building initiatives with partner institutions in the developing world.

Higher education is a driving force for the socio-economic development of nations and peoples, as an endogenous capacity builder. Higher education institutions, as centres of research, teaching and intellectual debate, play a crucial role in providing and sharing knowledge and preparing a broad range of professions. It must therefore endow their students with capacities, skill and opportunities, enabling them to continuously adapt to the requirements of knowledge societies (UNESCO, 2008).

In a more emphatic tone, UNESCO (2009) unequivocally maintained that at no time in history has it been more important to invest in higher education as a major force in building an inclusive and diverse knowledge society. The past decade provides evidence that higher education and research contribute to the eradication of poverty, to sustainable development and progress towards reaching the Millennium Development Goals (MDG) and Education for All (EFA). In the same vein, Peter(2014), stated that evidence suggest that as a greater proportion of a population benefits from higher education, it leads not just to an economic return in the form of faster economic growth, it also enhances general non-market welfare through higher social cohesion, leading to a lower crime rate, among others. Ipso facto, investment in the human person is the most valuable investment whose process renders education and training very critical. The acquisition of human capital can be channeled in such a way that investment in the human person should aggregate to the capability of a nation to develop the internal capability to achieve her development objectives over time. There-in lies the critical link between human capital and the crucial role education should play (Obioma, 2011).

The important role higher education plays in capacity building and national development is acknowledged by many. Hence, the National Conference of State Legislators (2017) remarked that the importance of post-secondary education has significantly increased in the last decade. It stated that a high school diploma is no longer sufficient in the 21st century. In order to be successful in today's global economy, a person must receive some form of post-secondary education. The economic stability of the state is tied to citizens who are employed and productive.

The planning and provision of education at all levels is capital intensive. The financial implication is enormous, daunting and challenging, especially at the tertiary level. It is not surprising therefore that its funding has continued to generate heated debates, controversies and divergent opinions at different fora. The line of argument is drawn between the two major schools of thought on the best approach to educational planning – Welfare and Investment. There is a seeming consensus on the adoption of the 'mixed economy approach' which is a hybrid of both approaches in the strategies or methods of financing higher education. In this wise, Enaohwo (1990) cautioned that the Third World problem in educational development cannot be resolved exclusively by the realignment of the different levels of educational finance. Rather, the issue of current importance in economics of education is the level of priority accorded to methods of financing education to be able to manage growth in enrolment within limits imposed by resources.

From the foregoing, it can easily be deduced that economics of educational planning is imperative to ensure economic rationality in the planning of the education system. To that extent, Agabi (2012) insisted that educational investment decisions must be profoundly influenced by expected economic returns. Hence, it is important to subject such decisions to rational economic analysis so that rational economic criteria can be designed to guide the collective provisions of such education and training. In the same vein, Halsey (1969) stated that as an economy develops, the need for skilled workers, experts and generally educated people increase almost geometrically. The search for talents to man the economy implies the democratization of access to education and the development of selective processes. Anyamele and Ofuase (2015) therefore pointed out that the financial crisis that confronts higher education in developing countries such as Nigeria is multi-faceted. One of them is the astronomical rise in student enrolment through liberal admission policies in order to increase access without the corresponding public expenditure. The report of the Committee of Vice-Chancellors and Principals of the Universities of the United Kingdom(2014), deserves urgent consideration. According to the report, investment in higher education must rise if the demands of a knowledge-based society are to be met. It is necessary to increase public funding per student. It recommended that the contribution to higher education should be set at a constant proportion of gross domestic product(GDP), which compares well with competitor countries. The report observed, sadly, that universities stand at a critical point in their history. By most counts, they are a resounding success, but their ability to build on that success and continue to deliver what individuals and country need is now in question. They are edging ever closer to a critical quality threshold. Student demand and choice are being held back by insufficient funding and outdated, inequitable and insufficient funding system. Consequently, there is mounting pressure to reform the financing of higher education in most parts of the world.

Ipso facto, one strategic funding option is the Invisible Loan Scheme in which case the government takes care of the tuition fees and other direct expenses such as books, research facilities. On graduation, both those in the employment of the government and elsewhere will be required by law to pay additional education tax to government for a specified period of time. Commenting on this scheme, Enaohwo (1990) remarked that no money is actually disbursed to the student beneficiaries and it is open to students of all backgrounds who are admitted into higher institutions of learning. This is done through the provision of free tuition, books, study kits and resources for research. On completion of their programme, whether they are employed by the government, elsewhere or self-employed, are required by law not to make any refunds to government but are meant to pay an additional educational tax for a period of at least two years so as to meet part of the expenses defrayed on their behalf by government.

However, the gross imbalance in the composition of the human capital stock (development of manpower) especially among the developing countries like Nigeria, is a source of worry in this period of economic quagmire. There are cases of surpluses and shortages in the manpower stock which is an avoidable colossal economic waste. This is what educational planning helps to reduce to

the barest minimum as echoed by Agabi (1999). He observed that most stakeholders in education such as parents, students, politicians, whose decisions significantly influence the direction and magnitude of educational activities are not sufficiently informed on the decisions they make and their consequences on resource allocation to achieve the usual economic objective of maximizing benefits. Hence, some decisions they make on educational activities are bound to run at variance with the societal requirements. This could be as a result of some labour market imperfections or their inability to interpret the indicators.

He therefore concluded that the obvious implication is that a properly planned education system will eliminate or reduce drastically the incidences of educated unemployed and the manpower imbalances in the labour markets which usually manifest in surpluses and shortages.

Based on economic rationality, a funding strategy that addresses this ugly trend becomes imperative. This is the deliberate adoption of the principle of positive discrimination. The application of the principle of positive discrimination in the implementation of the invisible loan is in favour of those critical areas that the economy perennially experiences gross shortages. Naturally, those professional areas that are favoured by this principle will attract more interest from students while they are at the same discouraged from going into the saturated disciplines.

## II. STATEMENT OF PROBLEM

Higher education is statutorily saddled with the responsibility of developing the relevant high level manpower required for national development, equip individuals with the necessary knowledge and skills for self-reliance and to be useful to the society. Records have it that on annual basis, Nigerian tertiary institutions churn out graduates in their thousands that the labour market is now over saturated. Two major economic issues that the Nigerian labour market is replete with are: (i) high level of graduate unemployment (ii) surpluses and shortages of high level manpower. The economic irony here is that while in some disciplines, there are many unemployed and employable graduates and in some critical areas, there is gross inadequacy of manpower resulting to the employment of expatriates. The attendant consequences of huge capital flight and compromising national security are obvious. Despite this ugly situation Federal and State governments continue to commit huge amount of resources to these institutions without the corresponding results. This is the concern of the researcher. Can the funding strategies and mechanisms be altered in favour of those critical areas that are experiencing manpower shortages?

## III. AIM AND OBJECTIVES OF THE STUDY

The aim of the study was to investigate the application of the positive discrimination to invisible loan scheme in the planning of higher education in Imo State.

The specific objectives of the study were:

- i) to determine the academic disciplines that should enjoy the invisible loan scheme in Imo State
- ii) to investigate the scope of the invisible loan scheme in Imo State
- iii) to determine the strategies for the implementation of the invisible loan scheme in Imo State

## IV. RESEARCH QUESTIONS

- Which of the academic disciplines should be favoured by the invisible loan scheme in Imo State?
- What is the scope of the invisible loan scheme in Imo State?
- What are the strategies for the implementation of the invisible loan scheme in Imo State?

## V. HYPOTHESES

- There is no significant difference between the mean responses of lecturers and students with respect to the academic disciplines that should be favoured by the invisible loan scheme in Imo State
- There is no significant difference between the mean responses of lecturers and students with respect to the scope of the invisible loan scheme in Imo State
- There is no significant difference between the mean responses of lecturers and students with respect to the strategies for the implementation of the invisible loan scheme in Imo State

## VI. METHODOLOGY

The study adopted the descriptive survey. The population of the study consisted of all the three state owned tertiary institutions. The lecturers and the students responded to the instruments with a sample size of 168 (lecturers = 87, students = 81), based on the stratified random sampling technique across the different disciplines. The instruments used were questionnaire and structured interview. The questionnaire was properly validated and the reliability determined through test – retest approach using

Pearson Product Moment Correlation. The reliability index was 0.81. Mean and Standard Deviation were used to answer the research questions, while t-test statistics was used to test the hypotheses at 0.05 alpha level of significance.

VII. RESULTS

**Table 1: Mean and Standard Deviation of the responses of Lecturers and students on the disciplines that should be favoured by the invisible loan scheme**

S/N	ITEMS	Lecturers		Remarks	Students		Rmks
		Mean	SD		Mean	SD	
	The following disciplines should enjoy the invisible loan scheme						
1	Arts	4.30	10.62	Accepted	3.18	10.11	Accepted
2	Social Sciences	4.12	12.09	Accepted	3.20	10.62	Accepted
3	Humanities	3.94	11.17	Accepted	2.96	7.79	Accepted
4	Engineering	3.20	5.05	Accepted	2.92	15.40	Accepted
5	Sciences	3.08	1.80	Accepted	3.20	3.91	Accepted
6	Agriculture	2.56	2.60	Accepted	3.10	6.10	Accepted
7	Law	3.34	7.30	Accepted	2.72	5.59	Accepted
8	Medicine	2.64	7.71	Accepted	2.70	7.26	Accepted
9	Pharmacy	3.46	4.15	Accepted	3.96	11.67	Accepted
	Average	3.40	6.94		2.99	8.72	

The results show that all the disciplines should be favoured by the loan scheme since all the items have mean values above the criterion mean of 2.50.

**Table 2: Mean and Standard Deviation of the responses of Lecturers and students on the areas the invisible loan scheme should cover**

S/N	ITEMS	Lecturers		Remarks	Students		Remarks
		Mean	SD		Mean	SD	
	The invisible loan scheme should cover the following areas						
10	Tuition	3.10	6.10	Accepted	2.56	2.60	Accepted
11	Books	2.72	5.59	Accepted	3.34	7.30	Accepted
12	Feeding	1.90	7.16	Rejected	2.64	7.71	Accepted
13	Accommodation	2.40	9.42	Rejected	3.46	4.15	Accepted
14	Transportation	2.30	4.60	Rejected	3.38	7.09	Accepted
15	Research kits/tools	2.70	7.26	Accepted	1.76	10.87	Rejected
16	Practical kits/tools	3.96	11.67	Accepted	2.46	3.64	Rejected
	Average	2.73	7.40		2.80	6.19	

The responses show that among the lecturers, items 12, 13 and 14 should not be covered. On the other hand, among the students, the areas that should not be covered are items 15 and 16, with mean values below the criterion mean.

**Table 3: Mean and Standard Deviation of the responses of Lecturers and students on the strategies that should be adopted in the implementation of the invisible loan scheme**

S/N	ITEMS	Lecturers		Remarks	Students		Remarks
		Mean	SD		Mean	SD	
	The following strategies should be adopted in the implementation of the invisible loan scheme						
17	Legal provision on the scope of the scheme	3.80	9.34	Accepted	2.92	15.40	Accepted
18	Legal provision on the duration for the repayment of the loan	3.62	8.44	Accepted	2.40	5.02	Rejected
19	Legal provision that makes it a criminal offence to default on the repayment of the loan	2.66	7.16	Accepted	1.86	7.76	Rejected
20	Every potential beneficiary must be suretied by a senior civil servant from the state	2.56	2.60	Accepted	2.40	9.42	Rejected
21	Every potential beneficiary must be suretied by	4.56	12.29	Accepted	3.72	14.44	Accepted

	his/her traditional ruler						
22	There should be a regular/annual update on the student beneficiaries to be published in one or two national dailies	3.34	7.30	Accepted	2.72	5.59	Accepted
23	Parents/guardians must sign an undertaking on repayment compliance	2.66	7.16	Accepted	1.86	7.76	Rejected
24	Students must sign an undertaking on repayment compliance	3.62	8.44	Accepted	2.40	5.02	Rejected
		3.35	7.84		2.54	8.80	

The result shows that the lecturers accepted all the strategies identified for the implementation of the loan scheme, while the students rejected items 18, 19, 20, 23 and 24, since they have mean values below the criterion mean.

**Table 4: T-test of difference between lecturers and students with respect to the discipline that should be favoured by the invisible loan scheme**

Groups	N	$\bar{X}$	SD	DF	Alpha Level	t-cal	t-crit.	Decision
Lecturers	87	3.40	6.94	166	0.05	2.57	1.96	Significant
Students	81	2.99	8.72					

The table shows that there was significant difference between the lecturers and students with respect to the disciplines that should be covered by the invisible loan scheme. This is because the calculated value of 2.57 is higher than the table value of 1.96. Hence, the study failed to accept the hypothesis.

**Table 5: T-test of difference between lecturers and students with respect to the areas that the invisible loan scheme should cover**

Groups	N	$\bar{X}$	SD	DF	Alpha Level	t-cal	t-crit.	Decision
Lecturers	87	2.73	7.40	166	0.05	0.53	1.96	Not Significant
Students	81	2.80	6.19					

The table reveals that there was no significant difference between the mean responses of lecturers and students with respect to the areas that the invisible loan should cover. The calculated value of 0.53 is below the critical value which is 1.96. Consequently, the study accepted the hypothesis.

**Table 6: t-test of difference between lecturers and students with respect to the strategies that should be adopted in the implementation of the invisible loan scheme**

Groups	N	$\bar{X}$	SD	DF	Alpha Level	t-cal	t-crit.	Decision
Lecturers	87	3.35	7.84	166	0.05	0.61	1.96	Not Significant
Students	81	2.54	8.80					

Table 6 shows that there was no significant difference between the mean responses of lecturers and students with respect to the strategies that should be adopted in the implementation of the invisible loan scheme. This is because the calculated value of 0.61 is below the critical value of 1.96. Hence, the study accepted the hypothesis.

### VIII. DISCUSSION OF FINDINGS

The study revealed that both the lecturers and students are of the opinion that all the disciplines should be favoured by the invisible loan scheme without any discrimination. This position is in line with that of Tewarie (2011) who stated that the expansion of tertiary access means that financial support will have to be made available to help a growing number of students pay for their tuition. Hence, countries will have to opt for an education loan system or taxation or some combination of the two. The significance of a loan or taxation system which targets the consumer of education is that it shifts the burden from the point of consumption to after graduation when the graduate is able to earn. Corroborating this position, Armstrong and Chapman (2011) maintained that human capital is important for socio-economic development. The most sensible way to enhance the quality of the human capital of a country is to promote education, especially at high educational levels. In developing countries, however, access to education, especially at the higher level, is limited because large numbers of the population are poor. Consequently, the government has to play an important role in establishing a student loan scheme to reduce inequality in education which will eventually increase the economic growth of the

country. However, this is not in agreement with the position of Wolanin (2015), who stated that, though solid financing is the backbone of a well-functioning higher education system, but the systems in East Asia's low and middle-income countries are not delivering the skills and research outcomes they need, as seen in the disconnects-often fund related. In part, this is because public financing goes to institutions regardless of whether they are addressing public goods. Public funding can address this disconnect. It is important to identify the priority areas for support and strategies to fund them.

Addressing the second question, the study showed that though some areas of education cost should not be covered by the loan scheme, but the average mean values show that all should be covered. To that extent, Oketch (2016) argued that loans should be sufficient to cover the full cost of university education, including acceptable personal expenses such as room and board, clothing and others. He went further to state that when loans are inadequate, they affect students learning and fail to serve their purpose. With respect to the third question on the implementation strategies, the study revealed that most of the implementation strategies that would help in making the repayment of the loans effective were accepted. On the strength of this, the Committee of Vice-Chancellors and Principals of the Universities of the United Kingdom (2014), recommended in their report that repayment of loans would begin once the graduate was earning and would be tied to National Insurance Contributions Thresholds. The monthly repayments would be flexibly related to earnings and not to the amount borrowed. This income contingency would protect graduates from the prospect of default and the risk of bankruptcy, thereby helping to reduce any deterrent effect. All graduates would have as long as they needed to repay what they borrowed. Once the loan is redeemed, repayment would cease and hence, the graduate contribution would not be an open-ended contribution.

## IX. CONCLUSION

On the strength of the findings, the study therefore concluded that the introduction of invisible loan scheme would be a welcome development as it will help increase access to higher education irrespective of the socio-economic background of prospective students. All the disciplines should be favoured by the loan scheme without bias and should be adequate enough to take care of the full cost.

## X. RECOMMENDATIONS

On Based on the findings of the study, the following recommendations were made:

- There should be national policy provisions to spell out the guidelines for the effective implementation of the loan scheme especially with respect to the scope of coverage and repayment modalities.
- Considering the huge financial implications of the loan scheme vis a vis the lean financial resources, the principle of positive discrimination should be adopted in favour of those disciplines that will help to address the manpower shortages in those critical areas of the economy.
- The guidelines and strategies for the implementation of the loan scheme should be regularly reviewed in the light of emerging situations in the economy and national needs in general.

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# School-Home Collaboration: A Synergistic Planning Strategy for Primary Education Management in Rivers State, Nigeria

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## **Abstract**

The study investigated school-home collaboration as a synergistic planning strategy for primary education management in Rivers State, Nigeria. It adopted the descriptive survey design, with a population of 941 primary schools and a sample of 30 schools. The instruments for the study were questionnaire and structured interview. Teachers and parents/guardians of the sampled schools responded to the instruments. They were 158 in number (teachers-77, parents/guardians-81). Six research questions and three hypotheses guided the study. The questionnaire was properly validated and the reliability was determined with the use of Pearson Product Moment Correlation with a reliability index of 0.83. Mean and standard deviation were used to answer the research questions while z-test was used to test the hypotheses. The findings of the study showed that there is some level of collaboration between home and school. However, this partnership is being rocked by poor communication, lack of mutual trust in sharing information and poor attendance to school programmes by parents. The study therefore recommended among other things that the Ministry of Education should make policy provision on the specific areas of collaboration between home and school. Also, every school administration should provide specific guidelines on their collaborative relationship with families. The study also recommended that every school should set up a committee comprising some teachers and parents to coordinate this partnership.

**Index Terms:** School, Home, Collaboration, Synergy, Planning, Primary education

## I. INTRODUCTION

The sanctity of human life is not only respected through its preservation but also in its proper development. The dignity of the human person is significantly expressed when the individual is integrally developed, taking into cognizance his composite nature. Hence, failure to effect this development, abandons the individual within the precincts with the lower creatures. Here comes the instrumentality of education that ensures that humans become what they ought to become. Acknowledging the inestimable value of education, Kant (1960) remarked that man can only become man by education and he is merely what education makes of him. There is no one who was neglected in his youth that can come to years of discretion and that the uncultivated man is crude. The undisciplined is unruly. Education confers skills, knowledge and attitude on the beneficiaries, thereby, improving the productive capacity of the individual. This is the basis for the Universal Declaration of education as a Human Right and subsequently a series of conventions for its promotion, such as the 1990 World Education For All (EFA) conference in Jomtien, Thailand.

Education For All (EFA) as a global project lays strong emphasis on basic education which is relative to the different countries. However, primary education is an integral part of basic education and in fact, the invaluable building block upon which the other levels of education can stand. Primary education is critical to the future academic and work life of an individual because it is the first stage of the formal academic adventure of any child. Primary education, according to Wikipedia (2013) therefore is the first stage of compulsory education also known as "elementary education". Its major goals include achieving basic literacy and numeracy amongst all pupils and also establishing foundation in Science, Mathematics and Social Science. At all levels, children are placed in

classes with one teacher whose primary responsibility is their education and welfare for that year. In the same vein, UNESCO (2011) stated that primary education provides learning and educational activities typically designed to provide students with fundamental skills in reading, writing and mathematics (i.e., literacy and numeracy), and to establish a sound foundation for learning and solid understanding of core areas of knowledge and personal development. It is preparatory for lower secondary education. This the reason why Philips (1975) remarked that, as the foundational stage of basic education, primary education is critical because it is not only the first level which has the role of covering the whole population as their human right, for most people in the world, it is and will be for a long time the only education experience. The fundamental reason for basic education of which primary education provides the foundation is to ensure that every Nigerian child acquires appropriate levels of literacy, numeracy, communicative and life skills, as well as ethical, moral and civic values needed for laying a solid foundation for lifelong learning. Hence, the goals of primary education include laying sound foundation for scientific and reflective thinking, to give citizenship education as a basis for effective participation in and contribution to the life of the society. It is also meant to give the child opportunities to develop manipulative skills that will enable him/her function effectively in the society (Federal Republic of Nigeria, 2014). At this level, children are introduced to concepts such as cooperation among peers, competitive and team sports coupled with academic basics. The purpose of primary education therefore, is to assist a child on many levels. During their primary education, they are taught to think critically, to strive to attain high standards, to meet the challenges posed by technological advancements and to develop citizenship and basic values. In order to achieve these goals, schools must provide orderly and safe environments, where supervised learning can take place. Primary education relies heavily on the child's engagement, which can be worked on both at home and school. Quality education in primary schools is vital to the success of the student's school career (Classroom, 2018).

The critical role primary education plays in the total development of the child and by extension, national development demands that different strategies be adopted to make it successful. One of such strategies is the mutual and reinforcing collaboration between the home and the school. These two institutions are vital to the development of the child but the home is the first school of the child. Byrne (2010) described the home as where the education of the child is to begin. Parents act as instructors and the child learns lessons that are to guide him throughout life such as lessons of respect, obedience, reverence, self-control, love and kindness. Academics will therefore follow naturally but the formation of right character must be conscientiously cultivated and trained. The collaboration of these two important institutions (home and school) is imperative for the effective education of the child. On the basis of this affirmation, Richert (2018) remarked that parent involvement is one of the most important factors in the academic success of students. Even though parents come in all forms and their level of involvement in the academics of students may or may not be ideal, always remember that they are an ally and not the enemy. They love their children and want them to be successful, and the vast majority will respond to the efforts of the teachers to collaborate with them to support the students. The family is a huge resource. Taking the time to collaborate with families will make the job of the teachers easier and increase the chances for students to succeed. Increasing family involvement in the education of a child correlates with grade improvement, attitude improvement, higher test scores, higher self-esteem and better school attendance. Partnership is reciprocal and involves listening as well as sharing. Partnership is not telling someone what to do. Instead, offer your expertise (academics) and encourage them to offer their expertise (knowledge about their children and the family environment) to brainstorm the best strategy to support the students. The Virginia Department of Education (2011) corroborated this position when stated that an inclusive education provides all students with the most appropriate. This relationship, according to Boss, Nahimias and Urban (1999) encompasses many areas including parent input on assessment and behavioural plans, medication monitoring and homework. The key to home-school collaboration in each of these areas is establishing systems that promote communication.

The benefits of this partnership are enormous especially when it is learner-centred. Christenson and Reschly and Henderson and Mappin NASP (2015) observed that when this collaboration is established, students demonstrate more positive attitude towards school and learning, higher achievements and test scores, improved behaviour, increased homework completion, greater participation in academic activities, improved school attendance. Education report greater job satisfaction and families experience enhanced self-efficacy, improved communication with their children and better appreciation of the important role they have in their children's education. Commenting on this partnership, Davila (2018) pointed out that parent-school engagement is all year round. It connects the two important contexts where children grow-home and school. Through communication across home and school, parents and teachers can share information about the progress of children. They can discuss their needs and interests to find the right opportunities to promote learning experiences. Meaningful conversation between parents and teachers creates mutual understanding. It also enhances both parents and children's experiences in school. Family-school relationships have been described as a safety net to promote children's learning and school experiences. Yet, parents differ in their skills, knowledge, resources and available time to support student engagement with school and learning. These differences are why cooperation and shared responsibility between parents and teachers are necessary to foster learning and students success in school. The shared responsibility works by ensuring the provision of an inviting and supportive climate for parents and families, examining and updating their practices partnering with parents to ensure children's academic success. It is also important to listen and respond to parents thoughts and desires for their children with respect. Always work from the idea that parents and schools both want the best for children. The National Association of School Psychologists (2015) therefore posited that partnership among families and educators require ongoing planning, development and evaluation. Consequently, schools should take the lead in providing opportunities for partnerships to be developed and sustained through the following methods (a) providing a positive environment that creates the conditions that welcome all families. School must make it clear that families are valued and are viewed as equal partners in their children's education. (b) Educators should encourage collaboration and foster an open dialogue between home and school and provide opportunities for families to develop partnership roles

in their children's education including having decision-making roles in school governance. We cannot educate our children without reaching out to their parents. When schools and families work together, children have a far better chance of not only being successful in school, but being successful in life as well. This partnership must be built on Respect, Responsibility and Relationships to be effective. The needs of the child come first and the child's needs form the basis for all interactions. Both recognize that the family perspective is invaluable in providing insight and information as to what a child needs to be successful in school. The parents are full partners in the decision making process because that information is very important and there is what is called open door policy at school. Open door in that there is a climate that welcomes parents and that expresses concern for their needs, the parents' needs as well as the needs of the children (Maksimovic, 2015).

Home-school partnership thrives on open communication, trust and complementarity for student-centred activities in order to ensure improvements in student achievement. On the strength of the above position, the United States Department of Education (2015) maintained that schools and families have essential roles to play in promoting the positive development of children and academic performance when educators and parents work together as partners, they create important opportunities for children to develop social, emotional and academic competencies. Parents who feel welcomed and wanted and wanted at school are most likely to participate in the education of their children. However, parents have different styles, skills and schedules, so, schools need to make a range of opportunities available to accommodate diverse parent interests and availability. In the same vein, Mapp and Kuttner (2013) added that under parent-teacher home visitation, teachers and other school staff visit the families with the goal of building relationships of trust and respect between home and school. These visits provide opportunities for educators to spend time in the neighbourhoods in which they work and listen to the perspectives of community members. The visits are designed to be respectful of families' assets and strengths and to build the capacity of both the educators and the family to support the academic and social success of every student. It is a process that must be nurtured, cultivated and guided. INPAPER MAGAZINE (2013) therefore cautioned that sending a child to good school and becoming indifferent about his or her educational needs can never bring forth positive results. Rather, true involvement of parents in their children's education means that they be available for them when needed.

## II. THE PROBLEM

Ensuring access to education, at least at the basic level demands that some critical strategic actions are taken to guarantee quality outcome. Integrating quality culture in the provision of education starting from the primary level which is the foundational base should be sacrosanct. However, the implementation of basic education has been inundated with a lot of challenges thereby rendering the attainment of the goals almost a wild goose chase. A critical assessment of primary education shows some manifestations of exclusion within, resulting to poor academic achievement, repetitions and drop-outs. One of the dimensions of exclusion includes those children in primary school who are at the risk of dropping out and they are technically categorized as out of school children. They manifest such characteristics as consistent lateness, irregular attendance, non-submission of homework, poor achievement, class repetition, general dissatisfaction with schooling (Nwogu, 2012).

The moral laxity among students at all levels which manifests in activities such as examination malpractices, cultism and other anti-social behaviour is a serious cause of worry. The poor performance in both academics and morals are not separable, but reinforcing. This systemic decimation of the noble cause of providing quality primary education bothers the researcher. On the basis of this disturbing situation, the question is: what is the level of collaboration between home and school, the two most critical players in the education of the child?

## III. PURPOSE OF THE STUDY

Basically, the purpose of this study was to determine the level of collaboration between the home and the school in ensuring effective primary education. Specifically, it was aimed to determine the following:

- the extent to which the school climate is positive for collaboration between the home and the school.
- the effectiveness of communication between the home and the school (for effective partnership) collaboration.
- the level of attendance to school programmes by parents
- the level of collaboration between the home and the school in making decisions concerning the child's education
- the level of collaboration between the home and the school for the effective management of homework issues
- the challenges inhibiting effective home-school collaboration in the education of the child

## IV. RESEARCH QUESTIONS

- To what extent is the school climate environment positive for collaboration between the home and the school?
- How effective is the communication between the home and the school for effective partnership?
- What is the level of attendance to school programmes by parents?
- What is the level of collaboration between the home and the school in making decisions concerning the education of the child?
- What is the level of collaboration between the home and the school for the effective management of homework issues?
- What are the problems inhibiting the effective school-home collaboration in the education of the child?

V. HYPOTHESES

- There is no significant difference between the opinions of teachers and parents/guardians with respect to the extent to which the school climate is positive for home-school collaboration
- There is no significant difference between the opinions of teachers and parents/guardians with respect to the level of effectiveness of communication between the home and the school for effective partnership
- There is no significant difference between the opinions of teachers and parents/guardians with respect to the level of collaboration between the home and the school for the effective management of homework issues.

VI. METHODOLOGY

The study adopted the descriptive survey design. The population was all the 941 primary schools in Rivers State. A sample size of 30 schools was drawn based on stratified random sampling technique, using the local government areas (23 in all) as the stratum. Three schools were sampled from 10 out of the 23 local government areas. The respondents were 158 teachers and parents/guardians of students from the sampled schools. Questionnaire and structured interview were the instruments used to generate the data. The questionnaire was adequately validated and the reliability determined using Pearson Product Moment Correlation, with an index of 0.83. Six research questions, three hypotheses guided the study. Mean, standard deviation and z-test were used for data analysis.

VII. DATA ANALYSIS

Research Question 1: To what extent is the school climate positive for collaboration between the home and school?

**Table 1: Mean and standard deviation of the responses on the extent to which the school climate is positive for school-home collaboration**

S/N		Teachers		Parents/Guardians		Average		Remarks
		MEAN	SD	MEAN	SD	MEAN	SD	
I	The school climate for collaboration between the school and the home							
a	The school makes it clear that families are collaborators in the education of the child	3.18	0.83	3.08	0.80	3.13	0.82	Accepted
b	There is a platform provided by the school where the school and families engage in positive interactions	3.00	0.99	3.18	0.83	3.09	0.91	Accepted
c	The school values and promotes family participation in the education of the child	3.08	0.80	3.03	1.03	3.06	0.92	Accepted
d	The school welcomes the involvement of the family in the learning community as an integral part of the child's education	3.28	0.86	2.87	1.07	3.08	0.97	Accepted

Table 1 shows that the average mean values of all the items that suggest a positive school climate are 3.13, 3.09, 3.06 and 3.08 are above the criterion mean of 2.50. They were therefore accepted.

Research Question 2: How effective is the communication between the home and the school for effective partnership?

**Table 2: Mean and standard deviation of the responses on the level of communication between the home and the school for effective partnership**

II	Communication between the school and the home to promote collaboration							
a	The school communicates frequently with the family	2.17	1.17	1.85	0.99	2.01	1.08	Rejected
b	The family communicates regularly with the school	2.01	1.22	1.92	0.79	1.97	1.01	Rejected
c	The communication channel is always open	3.28	0.86	2.94	1.02	3.11	0.94	Accepted
d	Information sharing between the school and the home is free and mutual	3.03	1.03	3.18	0.83	3.11	0.93	Accepted
e	Parents/guardians freely discuss with the school the observations made at home concerning the child	3.11	1.02	3.10	0.94	3.11	0.98	Accepted

f	The school freely discusses with the parents/guardians the observations made in the school concerning the child	3.18	0.83	2.89	1.03	3.04	0.93	Accepted
g	The communication is child-centred	2.87	1.07	3.10	0.94	2.99	1.10	Accepted
h	The email addresses and phone numbers of the school and parents/guardians are easily accessible	2.13	1.12	1.93	1.09	2.06	1.09	Rejected

Table 2 indicates that items a, b and g are accepted because their average mean values 2.01, 1.97 and 2.06 respectively are below the criterion mean of 2.50. However, items c, d, e and f with average mean values of 3.11, 3.11, 3.11 and 3.04 are accepted because they are above the criterion mean.

Research Question 3: What is the level of attendance to school programmes by parents?

**Table 3: Mean and standard deviation of the responses on the attendance level of parents to school programmes**

III	Parents/guardians' level of attendance to school programmes							
a	Parents/guardians regularly attend the school's open days/hours	1.92	0.79	2.17	1.17	2.05	0.98	Rejected
b	Parents/guardians regularly participate in PTA meetings	2.97	0.96	3.03	1.03	3.00	1.00	Accepted
c	Parents/guardians regularly attend other school programmes such as prize-giving ceremonies, inter-house sports, cultural day celebrations	2.94	1.02	3.18	0.83	3.06	0.93	Accepted

Table 3 indicates that item a with an average mean of 2.05 is rejected because it is below the criterion mean of 2.50, while items b and c with average mean values of 3.00 and 3.00 are accepted as they are above the criterion mean.

Research Question 4: What is the level of collaboration between the home and the school in making decisions concerning the education of the child?

**Table 4: Mean and standard deviation of the responses on the level of collaboration between the home and school in making decisions that concern the education of the child**

IV	The level of collaboration between the school and the home in making decisions concerning the child's education							
a	Parents/guardians are regularly involved in making decisions that concern their children's education	1.89	0.75	1.91	0.77	1.90	0.76	Rejected
b	Parents/guardians have decision making roles in the administration of the school	3.04	1.99	2.97	1.07	3.01	1.53	Accepted
c	Collective decisions are made in an atmosphere of trust mutual respect	1.87	1.03	3.11	1.02	2.49	1.03	Rejected

Table 4 shows that items a and c with average mean values of 1.90 and 2.49 respectively which are below the criterion mean of 2.50 are rejected while item b with an average mean value of 3.01 is accepted.

Research Question 5: What is the level of collaboration between the home and the school for the effective management of homework issues?

**Table 5: Mean and standard deviation of the responses on the level of collaboration between the home and the school for the effective management of homework issues**

V	The level of collaboration between the school and the home in the management of homework issues								
a	There are policies on homework that stipulate how frequently homework will be given, the roles and responsibilities of the school, the home and the child	2.94	1.02	2.83	1.07	2.89	1.05	Accepted	
b	Folders that contain homework plans and schedules are regularly made available for the active involvement of parents/guardians	1.85	0.99	1.92	0.79	1.89	0.89	Rejected	
c	Feedback information in homework issues are regularly and freely shared between the home and school	1.92	0.79	2.02	1.22	1.97	1.01	Rejected	

Table 5 shows that with the exception of item a with an average mean value of 2.89 which is above the criterion mean of 2.50, items b and c are rejected because they have average means of 1.89 and 1.97 which are below the criterion mean.

Research Question 6: What are the problems inhibiting effective school-home collaboration in the education of the child?

**Table 6: Mean and standard deviation of the responses on the problems inhibiting effective home-school collaboration in the education of the child**

VI	The following problems inhibit effective school-home collaboration in the education of the child							
a	Lack of positive and friendly school environment for school-home collaboration	2.18	1.17	1.67	0.79	1.93	0.80	Rejected
b	The school does not treat parents/guardians as partners in the education of the child	2.02	1.22	2.01	1.22	2.02	1.22	Rejected
c	Lack of mutual trust between the home and the school	2.87	1.07	2.94	1.02	2.91	1.05	Accepted
d	Poor attendance to school programmes by Parents/guardians	3.28	0.86	3.10	0.94	3.19	0.90	Accepted
e	No platform to discuss observations made in school/home concerning the child	2.23	1.21	2.47	1.02	2.35	1.28	Rejected
f	Poor attitude of parents/guardians towards school activities	2.94	1.02	2.89	1.03	2.92	1.03	Accepted
g	The school does not communicate freely and regularly with the home	3.03	1.03	3.03	1.03	3.03	1.03	Accepted
h	The home does not communicate freely and regularly with the school	3.04	1.99	3.28	0.86	3.16	1.43	Accepted

Table 6 indicates that with the exception of item b with an average mean value of 2.02 which is below the criterion mean of 2.50, all the other items a, c, d, e, f, g, and h with average mean values of 3.13, 2.91, 3.19, 2.89, 2.92, 3.03 and 3.16 which are above the criterion mean are accepted.

Ho<sub>1</sub>: There is no significant difference between the opinions of teachers and parents/guardians with respect to the extent to which the school climate is positive for home-school collaboration.

**Table 7: Z-test of difference on the opinions of teachers and parents/guardians with respect to extent to which the school climate is positive for home-school collaboration**

s/n	Category	N	X	SD	df	z-cal	z-crit	Sign level	Remarks
1	Teachers	77	3.14	0.87	134	0.65	1.96	0.05	Not significant
2	Parents/Guardians	81	3.04	0.93					

Table 7 shows that the calculated value which is 0.65 is less than the table value of 1.96 the study therefore upheld the hypothesis.

Ho<sub>2</sub>: There is no significant difference between the opinions of teachers and parents/guardians with respect to the level of effectiveness of communication between the home and school for effective partnership.

**Table 8: Z-test of difference on the opinions of teachers and parents/guardians with respect to the level of effectiveness of communication between the home and the school for effective partnership**

s/n	Category	N	X	SD	df	z-cal	z-crit	Sign level	Remarks
1	Teachers	77	2.81	1.03	134	0.04	1.96	0.05	Not significant
2	Parents/Guardians	81	2.74	0.95					

Table 8 reveals that the calculated value of 0.04 is lower than the critical value of 1.96. The study therefore failed to reject the hypothesis.

Ho<sub>3</sub>: There is no significant difference on the opinions of teachers and parents/guardians with respect to the level of collaboration between the home and the school for the effective management of homework issues.

**Table 9: Z-test of the difference on the opinions of teachers and parents/guardians with respect to the level of collaboration between the home and the school for the effective management of homework issues**

s/n	Category	N	X	SD	df	z-cal	z-crit	Sign level	Remarks
1	Teachers	77	2.61	0.92	134	1.10	1.96	0.05	Not significant
2	Parents/Guardians	81	2.79	1.01					

Table 9 shows that since the calculated value is 1.10 which is lower than the table value of 1.96, the study failed to reject the hypothesis.

### VIII. DISCUSSION OF FINDINGS

The study showed that the school climate was clement enough to foster collaboration between the home and the school. This is true to the position of the National Association of School Psychologists (2015) that recommended that schools should create an environment that foster trust and convey a genuine sense of caring among the faculty, staff, students and families. They should provide multiple opportunities for engagement that account for busy family schedules, transportation challenges and the potential need for child care. Teachers and other staff should be provided with the necessary resources required to maintain collaborative efforts. In the same vein, Virginia Department of Education (2002) stated that it is the responsibility of the school to provide an environment that is welcoming for all families. The school must send consistent messages to families that their contributions towards forming effective partnerships are valued. This is because, school climate can have significant influence on school-family relationships. Care should therefore be taken to ensure a climate that is welcoming and that fosters trust between the home and the school. This is particularly true when there are social and/or physical distances between homes and schools or when there is history of poor relationships between families and the school.

It was the finding of the study that though there is good communication between the home and the school, however it is not regular and therefore not very effective. To that extent, the National Association of School Psychologists (2015) recommended that schools should engage parents as active and equal partners in the education of their children by initiating dialogue regularly, making communication two-way and being consistent and open to input. It should be ensured that communication and other interactions are culturally and linguistically responsive. Open communication is essential in order for families and educators understand and respect each others perspectives.

The study showed that parents/guardians level of attendance to school programmes is not very encouraging. It is on this basis that the National Education Association (2011) remarked that the involvement of parents and guardians in Parents Teachers Associations can help boost student achievement by encouraging parent engagement, helping to breakdown language barriers and fostering a sense of community among parents and educators. Having such an association the schools of their children gives parents a sense of empowerment and belonging. In addition to the compulsory meetings, some parents regularly arranged social activities, where pupils, parents and teachers would come together in order to get to know each other. This engaged parents and built their trust. This is intended to ensure that we know each other in a different arena to create the opportunity to engage the parents that might have negative relations to the school as a distant thing (Helgoy& Homme, 2017).

The level of collaboration between the home and the school is poor, as revealed by the study. On the strength of this finding, Virginia Department of Education (2002) admonished that the school should ensure that parents voices are heard on school decisions.

There should be parental right to inclusion in decision making process. Educators believe in including parents when addressing concerns about student learning. Again, children do best when parents can take on various roles in their learning, helping at home, participating in school events and activities, guiding their children through the system and taking part in key decisions about the school programme (National Education Association, 2011).

The findings of the study also showed that collaboration between the school and the home in the management of homework issues was inadequate because critical information in this regard are not mutually shared. In order to deal with such a negative situation, the Virginia Department of Education (2002) insisted on the development of effective two-way, frequent, systematic communication between home and school about school programmes and the progress of children. One sample practice educators should consider is to create parent-teacher-student partnership agreements to specify roles and responsibilities. Hence, if parents and educators share information about the interests of the children, needs and progress and are informed about what each other expects with respect to student behavior, achievement and discipline, the partners have a better understanding of the performance of the students.

Among the problems inhibiting effective partnership between the home and the family in the education of the child, as revealed by the study include lack of mutual trust, poor attendance to school programmes by the parents and poor communication. This finding corroborated the position of the National Association of school Psychologists (2015) which stated that families and educators often differ in their expectations, goals and communication patterns that sometimes lead to frustration and misunderstanding among students, families and educators. When these differences are not recognized and addressed, a lack of communication between home and school further divides and separates the two most vital support systems available to the state.

## IX. CONCLUSION

On the basis of the above findings, the study therefore concluded that though there is some level of collaboration between the home and school in the education of the child, the partnership is still dogged with some challenges such as poor communication, lack of mutual trust in sharing information and poor attendance to school programmes.

## X. RECOMMENDATIONS

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

- The Ministry of Education should make specific policy provisions that should be in the public domain on the specific collaborative areas between the home and the school
- Every school administration should develop detailed guidelines on their collaborative relationship with the families of their pupils/students
- Schools should provide multiple collaborative platforms that will encourage families that they are indeed an integral part of the education of their children
- Every school should set up a committee that would comprise some members of the school staff and some parents/guardians to be charged with the responsibility of coordinating this collaborative relationship and providing a detailed plan for this partnership especially in the areas of homework, attendance to school programmes and decision making processes
- Both the home and the school should put in more effort to develop mutual trust between them so that communication will be more open, two-way and regular.

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# Gel Strength, Viscosity and Amino Acid Profile of Gelatin Extracted From Fish Skin of Lencam (*Lethrinus lentjan*)

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**Abstract-** Gelatin is a polymer of amino acids that are found in collagen on skin tissue and animal bones. The skin of lencam (*lethrinus lenjan*) is one of gelatin source. Gelatin can be obtained from collagen by acid treatment (type A) or with base treatment (type B). Gelatin from fish skin generally obtained by acid treatment, because the collagen tissue of fish skin is softer than tissue on bones. Gelatin from lencam skin is extracted by phosphoric acid in concentrate 1%, 2%, and 3%. For the higher gel strength 14,04 N, viscosity 6,8% and the higher amino acids is Glycine 24,48%. Overall, there are 15 amino acids profile that contain in fish skin gelatin. Amino acids composition determined by UPLC (*Ultra Performance Liquid Chromatography*).

**Keyword:** Gelatin, Gel Strength, Viscosity, Amino Acids Profile

## I. INTRODUCTION

Gelatin is a polymer of amino acids that obtained through hydrolysis of skin tissue and animal bones. Gelatin can be hydrolyzed using an acids or base solution which will be denatured. Gelatin consist of 85-92% proteins, while the rest is water and mineral salts that are left after drying.<sup>1</sup> Gelatin made of partial hydrolysis of collagen. Collagen is a kind of protein that sometimes encountered in animals and humans. Collagen is proteins that arrange gelatins. The composition of amino acids that contained in gelatin is almost similar to collagen, which is 2/3 amino acids are dominated by glycine.<sup>2</sup>

Gelatin contains amino acids that are connected by peptide bonds to form long polymer chains. The gelatin compound is a linear polymer composed of amino acids Glycine-Proline-Proline or Glycine-Proline-Hydroxyproline. Amount of Glycine (Gly) is abundant in gelatin. Amino acids in gelatin are influenced by gel strength and viscosity where the higher the gel strength and viscosity, the higher the amino acid level.<sup>1</sup>

Gel strength and viscosity are important parameters in gelatin. The gel strength of the gelatin gel is an important parameter in determining the best gelatin treatment because one of the important properties of gelatin is being able to convert liquids into solids or turn the solids into reversible gels. The high and low of gel strength suspected because there are differences in amino acids content and the type of fish.<sup>3</sup> While the viscosity test is carried out to determine the level of viscosity of gelatin as solution at a certain concentration. The quality of viscosity is influenced by two factors such as treatment when processing gelatin and the raw materials.<sup>4</sup>

## II. MATERIALS AND METOD

Material needed are lencam skin (*lethrinus lenjan*) that was acquired from PT. Alam Jaya Surabaya, phosphoric acid ( $H_3PO_4$ ), aquadest, aluminum foil and calico fabric.

The method used in this study is an experimental method. The treatments are used in this study is variation of the concentration of phosphoric acid solution ( $H_3PO_4$ ). The experimental design used in this study was a completely randomized design with 3 treatments and 6 replications. The phosphoric acid concentration used were 1%, 2% and 3%.

### III. RESULT

Results of the study showed that the higher concentration of acid caused the strength of the gel strength and viscosity increase. The highest gel strength was 13.88N and the highest viscosity was 6.67 cP at 3% phosphoric acid concentration. While the lowest gel strength was 5.77N and the lowest viscosity was 4.0 cP at a concentration of 1%. The results of the amino acid profile test showed that the highest amino acid of lencam gelatin was Glycine at 28.84% and the lowest was L-Tyrosine at 0.76%.

Table 1. Gel Strength

Treatment	Unit	Result
1%	N	5,77
2%	N	9,33
3%	N	13,88

Table 2. Viscosity

Treatment	Unit	Result
1%	cP	4,00
2%	cP	4,67
3%	cP	6,67

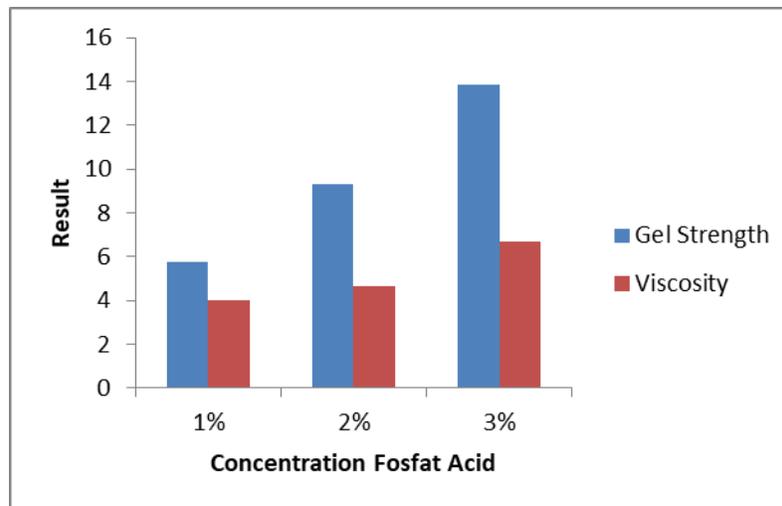


Figure 1. Diagram of Gel Strength and Viscosity

Table 3. Amino Acids Profile

Parameter	Unit	Result
L-Serin	%	3,37
L-Asam glutamate	%	6,96
L-Fenilalanin	%	3,74
L-Isoleusin	%	0,93
L-Valin	%	2,01
L-Alanin	%	8,84
L-Arginin	%	12,79
Glisin	%	28,84
L-Lisin	%	2,10
L-Asam Aspartat	%	3,52
L-Leusin	%	2,43
L-Tirosin	%	0,76
L-Prolin	%	11,78
L-Threonin	%	3,29
L-Histidin	%	1,19
<b>Total</b>		<b>92,55</b>

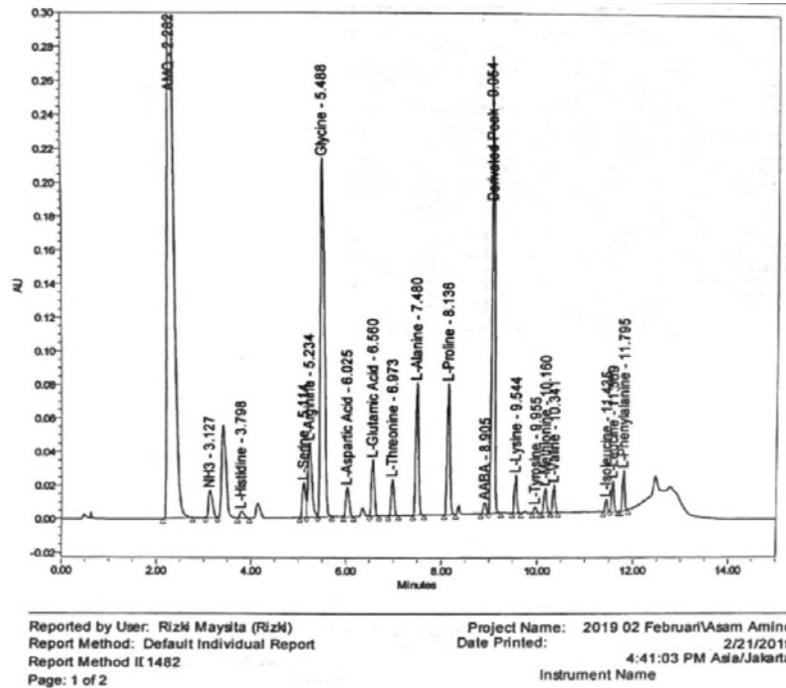


Figure 2. Chromatogram of Amino Acid Profile

#### IV. DISCUSSION

The gel strength of the lencam gelatin was showed differences in each concentration. At 1% phosphoric acid concentration showed the gel strength was 5.77 N or 250.63 g/bloom; at 2% concentration the gel strength was 9.33 N or 393.57 g/bloom and 3% concentration had 13.88 N or 575.75 g/bloom in gel strength. Gel strength has increased with increasing concentration of phosphoric acid solution. The gel strength with 1% phosphoric acid treatment (250.63 g/bloom) in this study appropriate to the standards which set by the *Gelatin Manufactures Institute of America* (2012), which is 50-300 g/ bloom. While the strength of the gel with a concentration of 2% and 3% had a gel strength higher than GMIA standard.<sup>5</sup> Based on the ANOVA results, the gel strength of fish skin gelatin was found to be significantly different ( $P < 0.05$ ) so that it was concluded that the concentration of phosphoric acid had an effect on the gel strength of the lencam gelatin. Based on Tukey's advanced test, the gel strength of lencam gelatin with phosphoric acid concentration of 1%, 2% and 3% were significantly different and influential on other treatments.

The viscosity of lencam gelatin showed differences in each concentration. At 1% phosphoric acid concentration showed a viscosity of 4.0 cP; 2% concentration of 4.67 cP and 3% concentration of 6.67 cP. Viscosity increased with increasing concentration of phosphoric acid solution. The value of viscosity with the treatment of 1%, 2% and 3% phosphoric acid produced in this study appropriate the standards set by the *Gelatin Manufactures Institute of America* (2012), which is 1.5-7.5 cP.<sup>5</sup> The results of the study of lencam gelatin viscosity with a concentration of 3% was 6.67 much higher than commercial gelatin according which was 5.9 cP.<sup>4</sup> The difference in the value of viscosity could be caused by the extraction process and the composition of the raw materials that used. Each material had different levels of cross-linking strength of the trophagenagen.<sup>6</sup> Based on the ANOVA results, the viscosity of fish skin gelatin was found to be significantly different ( $P < 0.05$ ) so that it was concluded that the concentration of phosphoric acid had an effect on the viscosity of the lencam gelatin. Based on Tukey's advanced test, the viscosity of lencam gelatin with phosphoric acid concentration of 1%, 2% and 3% were significantly different and influential on other treatments.

The highest amino acid levels in the lencam gelatin that treated with 3% phosphoric acid was Glycine at 28.84% and the lowest amino acid was L-Tyrosine at 0.76%. This was because glycine was the most common amino acid found in gelatin. This type of amino acid accounts for 23% of the total amino acids. It has known that thermal stability is influenced by the number of amino acids. Gelatin is made from the partial hydrolysis of collagen. The alpha chain in collagen generally has repeated sequences of Glycine-X-Y. Proline often occurs at X position and Hydroxyproline almost always at Y position so amino acids are most abundant in gelatin. The composition and sequence of amino acids in gelatin different from one another depending on the species and type of tissue but always contain high percentage namely Glycine, Proline, Hydroxyproline. The gelatin compound is a linear polymer of amino acids. In general, the polymer chain is a loop of the amino acid Glycine-Proline-Proline or Glycine-Proline-Hydroxyproline. This amino acid analysis aims to determine the type and amino acid composition of gelatin products from fish skin with a soaking process using different types of acids.<sup>7</sup> The amino acid level of gelatin with acid extraction resulted the loss of amino acids during hydrolysis of collagen at acidic immersion.<sup>8</sup>

## V. CONCLUSION

The best fish skin gelatin was obtained at 3% phosphoric acid concentration with gel strength 14.04% and viscosity 6.8%. In addition, the highest amino acid content was glycine 28.84% and the lowest amino acid was L-Tyrosine 0.76%.

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# Birth After One Caesarean Section

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**Abstract-** Increasing rate of caesarean section in all over the world made us perform study on trial of labour in patient with one previous caesarean section in Alzahra Hospital , the center of gynecology obstetric in Najaf , We take number of patients in labour room start labour spontaneously with previous one of caesarean section, lower segment transvers, including case was selected for elective caesarean section but suddenly start labour number of them delivers by emergency caesarean section we compare this percentage with other study the result was acceptable we encourage trial of labour after one caesarean section as a safe mode of delivery that decrease rate of caesarean section and its complications we recommend farther in this evaluate field.

## I. INTRODUCTION

Vaginal birth after one previous caesarean section is changed in modern obstetric practice Prior( 1970) almost every north American hospital maintained the policy that all women with caesarean section undergo repeated caesarean section, between 1960 and 1980 several studies conclude that vaginal birth after caesarean section was a reasonable Option, in this base vaginal delivery rates increase from pervious (3.5in 1980 ) almost 25% in united states Birth after one caesarean section could be of spontaneous onset of labour or in many centers could be occur after planning for delivery after one caesarean section by either induction by prostaglandin or oxytocin or by amniotomy after (39weeks ) gestational age of pregnancy The great test concern about the trial of labour (TOLAC) is the rupture of uterus .Two to three fold increase risk of uterine rupture and around (1-5) fold increase in caesarean section deliveries in induced and or augmented labour compared with spontaneous vaginal birth after caesarean section (VBAC) .

certain criteria should be present for (TOLAC)

1. no more than one caesarean section or other uterine scars history of previous uterine rupture
2. (TOLAC) should be in center when caesarean section can have performed easy according to need.
3. no other medical disease such as hypertension or diabetes mellitus
4. baby should of average size
5. No abnormality in pelvis as contracted pelvis or placenta previa
6. 6-No fetal malposition previous

Vaginal birth is best predictor for success rate of (VBAC) and associated planned (VBAC) success rate of (85-90%) Trial of labour carry many risk such as risk of rupture of uterus,

risk of damage to Bladder to premium or cervix and risk of infection if (TOLAC) is failed. Repeated caesarean section carry risk of increase rate of ectopic scar and abnormal placentation also risk of injury to abdominal organs with risk of thrombosis, long period of stay in hospital with risk of fetal respiratory problem, all this complications should be discussed before decision of (TOLAC )

## II. METHODS.

In Al Zahra hospital center in Al Najaf for Gynecology and obstetrics, our study was performed in (2018) for two months November and December on 173, patients over two months entre labour room with spontaneous onset of labour including cases for elective caesarean section but established labour in retrospective study.

## III. RESULT.

Our study performed In Al Zahra hospital center in Al Najaf performed in (2018) for two months November and December rate of birth after single lower segment transverse caesarean section whether the birth vaginal or caesarean section 173, patient was taken in retro spective study patients started labour spontaneous not planned for (VBAC) In November 73 women enter labour room starting labour with previous one as 44 women delivered vaginally (58.6%) 31 women delivered by emergency caesarean section (41.3%) In December 97 women entre in labour room with sudden onset of labour with previous one as 46 women delivered vaginally (47.4%) but emergency caesarean section was (51) women (52.5%).

## IV. DISCUSSION.

Many factors cause increase rate of caesarean section as increase in rate of primary caesarean section itself, decline rate of (VBAC) from 28.3% in 1996 to 8.5% in 2006 In Al Zahra hospital at November from 2018, rate of vaginal birth for ( 44 women ) after caesarean section was 58.6% and emergency caesarean section was (31 women) 41.3% In December from 2018 In Al Zahra hospital vaginal birth was for (46 women ) 47.49% after one caesarean section with spontaneous onset of labour but emergency caesarean section was (51 women ) 52.5% emergency caesarean section include cases for elective caesarean section that established labour spontaneously Similar studies from developed world revealed that 60-80% success rate of (TOLAC) .(Cuise et al 2005) 42.4%in south Africa (Bogactr 2004) 53.6%in India In

tertiary medical center in Taiwan (TOLAC ) was (70-80%) caesarean section rate 19.3% In Yemen study was performed in Sana success rate of vaginal birth was 87% with on maternal or fetal death . Our study in comparison with other study is reasonable and accepted giving hope in reducing rate of caesarean section and increasing rate of (VBAC) without maternal or fetal morbidity No complication in our study no material or fetal morbidity and mortality Our study included case established labour spontaneous in retrospective aspect so (VBAC). Should en courage and discussed with patient with single lower uterine segment caesarean section with its advantage and disadvantage.

#### V. CONCLUSION.

(TOLAC).is safe mode of delivery with low maternal and fetal mortality with careful antenatal and Antepartum monitoring can reduce rate of caesarean section safely in selected cases that exclude cases which carry high risk of rupture uterus during labour. spontaneous established (VBAC). Labour more safe than planned (TOLAC). With low complications.

#### VI. RECOMMENDATION.

The subject of births after single lower uterine segment caesarean section is very important in decreasing rate of caesarean section and it's complication with decreasing fetal and maternal morbidity and mortality need, further studies and evaluation with more details for each risk factor.

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# Amino Acid Profile of Gelatin Extracted From The Skin of Starry Triggerfish (*Abalistes stellaris*) and Determination of its Physical Properties

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**Abstract-** Gelatin is widely used in the food, pharmaceutical, and cosmetic industries. The demand for gelatin increases every year, gelatin derived from pigs and cows is the main source of gelatin in the market. Gelatin that is sourced from other animals such as from poultry and fish is only about 1%. Gelatin from fish becomes a better prospect to develop. Gelatin raw materials can be obtained from the skin, bones, and fish fins. Fish skin is a waste processing of fishery products. The extraction method, fish type and intensity of the treatment determines the fate of produced gelatin. The purpose of this research determined the amino acid profile of starry triggerfish gelatin which was extracted using 2.5% sulfuric acid. In addition, it also contains the physical properties of gelatin which contains the yield, gel strength and viscosity. The results showed that gelatin products had a composition of essential and non-essential amino acids with the highest percentage of glycine, and then proline, alanine, glutamate acid and arginine. While the lowest was amino acid tyrosine. The average yield of gelatin reached 15.4%, gel strength 15.4 N and viscosity 7,2 cP. The use of sulfuric acid with high concentration can decide amino acids that have been formed so the amino acid chain of the broken gelatin causes the gel strength decreased. While the use acid solution with low concentration can result in small gel strength because collagen converted into gelatin is less. So the type of acid and optimal concentration will affect the acid amino composition and physical characteristics. This is related to the structure of the gelatin Ala-Gly-Pro-Arg-Gly-Glu-Hyd-Gly-Pro which affects the gel strength of the gelatin, where the length of the amino acid chain, the gel strength of gelatin is also getting better. Gel strength will affect viscosity and yield.

**Keywords :** amino acid, fish skin, gelatin, physic properties

## I. INTRODUCTION

Gelatin is a protein obtained from the partial hydrolysis of collagen from the skin, connective tissue and bones of animals. As the global demand for gelatin is continuously on the rise, many potential sources are being sought for combating this growing need. The global production of gelatin reached 326 thousand tons. Majorly derived from pig skin up to 46%, bovine hides 29,4%, bones 23,1% and others sources only 1,5%. Industrial utilization of gelatin is very wide. Gelatin makes an ideal food ingredient with high digestibility in certain types of diets. As an additive, it improves water holding capacity, texture, elasticity, consistency and stability of foods. Additionally, it has been used as a stabilizer, emulsifier, clarifying agent and as a protective coating material. Desserts, ice cream, jelled meat, confectionary, dairy and bakery foods are few of the main consumption areas for gelatin. Moreover, in pharmaceuticals, it is used in manufacturing of capsules, tablet coatings, emulsions, ointments and skincare products.

The main sources of industrial gelatin are limited to those from pigskins and bovine hides and bones. According to Plavan *et al.* (2014), the occurrence of Bovine Spongiform Encephalopathy (BSE) and Foot and Mouth Disease (FMD) along with religious constraints has resulted in an anxiety among users of gelatin from land-based animals. In recent years, increasing attention has been paid to alternative gelatin sources, such as fish skin, which comprise about 30% of the total fish weight available after fish fillet preparation. One of gelatin sources is starry triggerfish (*Abalistes stellaris*). It is estimated that nearly 7.3 million tons of by-product waste are produced annually. Partial use of them, on one hand, leads to the loss of an important protein based product and other purposes, and to the other, to reduce the pollution.

In the conversion process of collagen to gelatin, acid pretreatment hydrolyze the cross-linking bonds between polypeptides and irreversibly results in gelatin. The gelatin is water soluble and forms thermo-reversible gels with the melting temperature near to the body temperature. The amino acids that make up gelatin are bonded to each other through a peptide bond to form gelatin with the Gly-X-Y rearrangement unit, where X is proline and Y is hydroxyproline. The composition and sequence of amino acids gelatin differ from one another depending on the species and type of tissue but always contain high levels of glycine, proline, hydroxyproline. The quality of resultant gelatin is determined by its physicochemical behavior that is further based on the species as well as the process of

manufacture. Moreover, the specific amino acids and their respective amounts determine physical and functional behavior of gelatin. The higher the level of proline and hydroxyproline, the higher will be the viscosity and gel strength (Bostaca *et al.*, 2103).

So far, there has been no research of the potential of protein in starry triggerfish (*Abalistes stellaris*), especially regarding the profile of amino acids making up proteins of starry triggerfish skin that have been hydrolyzed into gelatin product. The importance of this research, given the potential for hydrolysis of collagen protein to gelatin is a potential product that is very much determined by its constituent amino acids. The aim of this research was to identify amino acid profiles in the gelatin of starry triggerfish skin. Besides that, also to find out the physical characteristics of gelatin extracted from of starry triggerfish skin used acid pretreatment.

## II. MATERIALS AND METHODS

### 2.1 Materials

As an object of our research was used skin of starry triggerfish obtained after filleting of the fish. Typically, this waste are not reused and disposed to the landfills. Wastes were preserved cutting into small pieces and washed with water. The chemical composition of the starry triggerfish skin is presented in Table 1.

Table 1. The chemical composition of the starry triggerfish skin

Parameter	Composition(%)
Protein substances	24,52
Fatty substances	0,13
Water substances	53,49
Mineral substances	17,75

In the pre-treatment gelatin extraction process with acid treatment aims to hydrolyze collagen in fish skin by breaking down intramolecular bonds in collagen triple helix molecules. The results may form three free alpha chains, or the formation of beta chains and gama chains and to dissolve minerals in bone and fish skin which will affect the physical characteristics and amino acid gelatin. The types of acids used are from organic acids such as  $\text{CH}_3\text{COOH}$ ,  $\text{C}_6\text{H}_8\text{O}_7$  or  $\text{C}_4\text{H}_6\text{O}_5$ . While the inorganic acids used are  $\text{H}_2\text{SO}_4$ ,  $\text{HCl}$  or  $\text{H}_3\text{PO}_4$  with different concentrations.

After the preliminary study, the best gelatin extraction method was obtained using  $\text{H}_2\text{SO}_4$  as acid pre-treatment with concentration of 2.5%. Because the acid solution with very high concentration can decide the amino acid that have been formed so the chain of amino acids will break up and causes the gel strength will decrease. While the low concentration of acid can also cause decreasing the gel strength because collagen converted into gelatin is also less.

This is the most widely adopted processing method where mild to harsh acidic treatment is involved. The fish skin was washed under running tap water for around 1 hour to remove the superfluous materials. Then the cleaned raw material was soaked in 2,5%  $\text{H}_2\text{SO}_4$  for 20 hours at room temperature by maintaining a ratio of 1:3 skin/solution (w/v). After the given time of treatment, the solution was neutralized. The treated material was blended with distilled water in 1:3 ratio (w/v), and extracted at 70 °C for 5 hours used waterbath. The extracted material was filtered through double-layered cheese cloth. The filtrate was dried at 60 °C in a hot air oven earlier for 48 hours. After that gelatin in the form of sheets will be mashed into powder. All gelatin samples were weighed, calculated for extraction yield, amino acid analyze, gel strength analyze and viscosity analyze.

### 2.2 Yield Analyze

Gelatin was calculated by the following equation. 
$$\text{Yield (\%)} = \frac{\text{weight of dry gealtin (g)} \times 100}{\text{weight of initial dry starry triggerfish (g)}}$$

Where the weight of dry starry triggerfish was calculated by subtracting moisture content determined by AOAC (2000) from the initial wet weight.

### 2.3 Amino Acid Analyze

0.2 g of gelatin sample was prepared in a closed test tube and 5 mL of 6 N. And then HCl was added. The sample was put in an oven with a temperature of 100°C for 18-24 hours. Next the sample is filtered with Whatman 40 filter paper. The hydrolysis results are piped as much as 10µl and put in a test tube. Then add 30 µl of the drying solution, then dry it with a vacuum pump. The dried sample was added 30 µl of derivatate solution and left to dry for 20 minutes. The sample was then diluted with 200 µl of 1M sodium acetate dilution solution. The sample is ready to be analyzed by HPLC.

### 2.4 Gel Strength Analyze

Gelatin gel was prepared by the method of Kaewdang *et al.* (2015), gelatin was dissolved in distilled water (60 °c) to obtain a final concentration of 6.67% (w/v). The solution was stirred until the gelatin was completely solubilized and then transferred to a cylindrical mold with 3 cm diameter and 2.5 cm height. the solution was incubated at the refrigerated temperature (4°C) for 18 h prior to analysis. the gel strength was determined at 8-10°C using a texture analyzer with a load cell of 5 kg and crosshead speed of 1 mm/s. A 1.27 cm diameter flat faced cylindrical teflon plunger was used. The maximum force (grams), taken when the plunger had penetrated 4 mm into the gelatin gels, was recorded.

### 2.5 Viscosity Analyze

To determine the viscosity value is a gelatin solution with a concentration of 6.67% prepared with distilled water (7 g gelatin plus 105 ml of distilled water) then the solution was measured for viscosity using a *Brookfield Syncro-Visric Viscometer*. Measurements were carried out at 60°C with a shear rate of 60 rpm using a spindle. The measurement results are multiplied by the conversion factor. This test uses spindle no.1 with the conversion factor being 1, the viscosity value is expressed in units of centipoise (cP).

## III. RESULTS AND DISCUSSION

### 3.1 Amino Acid Composition

Fish gelatin properties are affected by the presence and concentration of amino acids, molecular weight and particular structural fragments. In general, glycine, proline/hydroxyproline and alanine are the predominant amino acids with respective percentages of 33, 20 and 11%. In a comparative study designed by Mahmood *et al.* (2016), it was observed that proline and hydroxyproline contents in mammalian, warm-water fish and cold-water fish gelatins are 30%, 23% and 17%, respectively. Table 2 presents a comparative list of amino acids that are found in gelatins obtained from different sources.

Table 2. Amino acid composition of different types of gelatins

Amino Acids	Gelatin of Starry Triggerfish Skin (%)	Gelatin of Yellowfin Tuna Skin (%)*
L-Histidin	0,9	0,9
Threonine	3,3	3,7
Prolin	13,0	11,6
Tirosin	0,6	0,5
Leusin	2,4	2,7
	6,5	3,5
Asam aspartat		
Lisin	4,3	3,5
Glisin	26,1	27,7
Arginin	9,5	10,0
Alanin	11,9	8,1
Valin	2,9	2,1
Isoleusin	1,1	1,2
Fenilalanin	2,2	2,6
	11,2	8,2
Asam glutamat		
Serin	4,0	4,1

\*) Nurilamala *et al.*, 2017

Amino acids composition starry triggerfish gelatin are different from yellow fin tuna gelatin, these are caused by the use of different raw materials. Grouping of amino acids according to Silva *et al.* (2014), can be grouped into 2, namely amino acids that cannot be produced by the body and amino acids that can be produced by the body. Amino acids that cannot be produced by the body are usually called essential amino acids, which can be added to food intake to fulfill them. While the amino acids that can be produced by the body are called non-essential amino acids. Examples of amino acids included in essential amino acids are like lysine, methionine, valine, histidine, phenylalanine, arginine, isoleucine, threonin, leucine, and tryptophan. In non-essential amino acids there are aspartic acid, glutamic acid, alanine, tyrosine, cystine, glycine, serine, proline, hydroxylysine, glutamine, and hydroxyproline.

Starry triggerfish gelatin extracted by acid treatment using 2.5% sulfuric acid has 8 essential amino acids from a total of 10 known essential amino acids. The highest essential amino acid in Starry triggerfish gelatin was 9.5% arginine and 0.9% histidine lowest. While the highest non-essential amino acid composition was glycine 26.1% and the lowest tyrosine was 0.6%. According to Gaidau *et al.* (2013), the structure of gelatin in fish skin is dominated by amino acids which include 14% hydroxyproline, 16% proline and 26% glycine, it depends on the composition of collagen contained in the raw material. Collagen protein is a fibrous protein containing 35% glycine and about 11% alanine and a fairly high proline content. Collagen has a range of strengths, a special structure containing hydroxylysine and hydroxyproline, which are amino acids that are not present in other proteins. The collagen triple helix structure is assembled from the  $\alpha$ -specific polypeptide with the position of Glysin-X-Y, where position X is filled with proline amino acids and at position Y is filled with hydroxyproline amino acids. Proline amino acids are amino acids that can create curves in the  $\alpha$ -helical structure and hydroxyproline functions in increasing collagen stability.

The triple helix is the basic structural unit of collagen called tropocollagen. The breakdown of the structure of tropocollagen into a random twist uses this acid solution called gelatin. Conversion of collagen to gelatin can cause changes in amino acid composition, this is related to the method used. Extraction of gelatin with an acidic process generally contains more glycine and less tyrosine. The type and concentration of acid solution can affect the characteristics of the gelatin produced.

The use of sulfuric acid with high concentration can decide amino acids that have been formed so the amino acid chain of the broken gelatin causes the gel strength decreased. While the use acid solution with low concentration can result in small gel strength because collagen converted into gelatin is less. So the type of acid and optimal concentration will affect the acid amino composition and physical characteristics. This is related to the structure of the gelatin Ala-Gly-Pro-Arg-Gly-Glu-Hyd-Gly-Pro which affects the gel strength of the gelatin, where the length of the amino acid chain, the gel strength of gelatin is also getting better. Gel strength will affect viscosity and yield.

### 3.2 Extraction Yield

Different extraction methods result into gelatins with different functionality. In general, fish gelatin holds some characteristic properties that make it different from other sources. Conversion of collagen to gelatin modifies its solubility, making it water soluble. It is readily soluble in hot water, swells in cold water, while insoluble in alcohol or non-polar solvents. It is colorless to yellowish, tasteless, transparent to slightly translucent, powder or flakes or sheets. Mainly, the physicochemical properties are based on the source of collagen and the given treatment of extraction. However, the intensity of treatment and hydrolysis also impart significant variations in the end product. The gelatin yield of starry triggerfish skin used 2.5% sulphuric acid reach 15.4%. According to Karim and Bhat (2009), the gelatin yield is varies from 6-19% on wet weight basis, is less than the mammalian sources.

In the previous study, gelatin yield from stingray fish between 5.79% and 10.90%, gelatin from kuma-kuma skin was 18.27%, gelatin from tilapia skin was 5.4%, gelatin from shark skin was 17 % and yellowfin was 20%. The difference in the yield of gelatin produced from the extraction process of fish skin collagen tissue produces different yields depending on the method used.

### 3.3 Gel Strength

One of the most important properties of gelatin is its gel strength, also termed as bloom strength. The molecular weight (of  $\alpha$ ,  $\beta$  chains) in gelatin defines the strength of bloom. Figure 1 presents the hypothetical model of polypeptide chains in collagen. Bloom strength is also correlated to the viscosity of the gel, and is an important criteria for its application in food. Typically, fish gelatin gel bloom varies from 50 to 300. Nonetheless, factors such as temperature, pH, acids, bases, enzymes and bacteria may alter the strength variably. The thermo-reversibility of gels is one of the most interesting inherent property of gelatin that make its use in jellies possible (Gómez-Guillén *et al.*, 2011).

Based on the results of this research, the average gel strength of starry triggerfish gelatin obtained from immersion solution with 2.5% sulfuric acid treatment was 15.7 Newton or 220 bloom. Furthermore shorter the chain of amino acids causes low molecular weight so that gel strength becomes low. Furthermore according to Karim and Batt (2009), gel strength, viscosity, melting point are influenced by many factors, such as molecular weight distribution, concentration of gelatin solution, and salt content. The molecular weight of gelatin is related to the chain length of the amino acid bonds that make up the gelatin. The longer the chain of amino acids, the greater the molecular weight and the higher the value of the strength of the gel

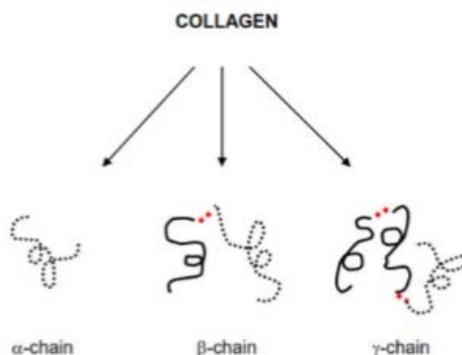


Figure 1. Typical polypeptide strands in fish gelatin

### 3.4 Viscosity

Another considerable functional property of gelatin is its viscosity, highly related to bloom strength. Various calibrated viscometers or pipettes are used for viscosity measurement, where a standard solution of 6.67% gelatin is used. The viscosity of gelatin from the skin or fish bone is relatively higher compared to gelatin from mammals. This is because fish have a relatively shorter lifespan than mammals, allowing inter and intra-molecular bonds of collagen contained in the skin and fish bones to become less stable in forming triple helical conformation resulting in high viscosity values.

Based on the results of this research, the average viscosity of starry triggerfish gelatin obtained from immersion solution with 2.5% sulfuric acid treatment reach 7.2 cP. Viscosity is influenced by the structure of the protein in gelatin, a longer chain of amino acids

will result in higher protein molecular weight, which will increase the viscosity value. Decomposition of collagen's triple helix bond into a single chain by acid causes shorter amino acid chains and smaller molecular weight so that the viscosity value will be smaller.

#### IV. CONCLUSION

Skin from starry triggerfish (*Abalistes stellaris*) could be an alternative source of gelatin. Gelatin was extracted by 2,5% sulphuric acid ( $H_2SO_4$ ) as acid pre-treatment had complete amino acid composition, highest extraction yield, highest gel properties and viscosity. Being unique to its properties, gelatin is overwhelmingly used in different food recipes. Mainly, mammalian gelatin is leading the market, but concerns for Halal or Kosher applications create a need to find some alternatives. In this regard, fish gelatin is getting commercial interests. Fish gelatin is thoroughly studied for its physicochemical and functional properties that allowed to optimize its use in various applications.

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# She Is Fit to Serve Thee

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**Abstract-** The aim of this research paper is to present before us the quagmire of a women. The feminine gender have been constrained under the ramparts of conventional, traditional stereotypes of men. Men who all the while brandishes the hammer of..., like the mighty and robust God Thor, the redound-er of all their miseries. Is entirely being looked down upon in every dimension of life, a subservient and as a mere paltry thing, trash indeed. Forsooth, an organizations have been made, schemes have been launched, endeavours are functional now, maneuvering adroitly for the welfare, betterment and upliftment of women, but still we witness the whopping assaults in practice perseverantly over the sex. It would not be an exaggeration to enunciate that women's reputation are in serious jeopardy. If we cannot do anything in defense now, a clock will strike..., when we will descry the women in emulous resolution like the macabre Zombies. Thus, to curb this nuisance we need to take stand against these menaces via the algebra of humanity. Such a vanguard, I assure you shall panacea all ills and evils which are in vie with women. So, be an alchemist today and prepare a dose of such an alchemy that will ameliorate the vibe of blunders which are in vogue against women.

**Index Terms-** Woman, Literary Aesthetics, Women, Romance, Bestiality, Social Constructs, Passion, Explosive Sperms, Sex Machine, Doll, Orgasmic Pleasure, Misogyny, Male Chauvinism, Concupiscence, Absurdity, Zabbarwan Hill, Marginalized, Complementary, Subservient, Masculinity, Androcentric posture, Syndrome, impotency, Genuflect, Phallogocentrism, Submissive, Dominant, Libido, Eros, Oppression.

## I. INTRODUCTION

To be intact underneath the stunning effects of literary aesthetics and simultaneously try to absorb yourself in the world of romance. Oops! for them it could be mere lust. Then proffer forth that still, " I didn't savour verily the love of my darling, that makes it, you have not donned an absolute attire to your enamoured passions □ your bestiality. Penetrate her fully down to the depths of an unfathomable disappear. Or, I can assert my standpoint via the more valid social constructs that has been engineered for the derogatory use of women. Soak her nipples with the strokes of moistured licking, for which slobber is dribbling now as over from the fangs of canine drools down the infectious virus: rabies, or as from the clutches of fierce hounds does slip the flossy hare. And you relate capriciously fore, " she doesn't purveyor me the potion of oblivious exeunt, from so much 'refuses' and scores of get losts".

Men are always in the lurk to escape or to put it through the other way round, pecking and urinating like dogs via the ill-

reputed corners of harlots, in order to satiate the thirst of bestiality and shape their leering concupiscent desires. For them it does only mean the moments dereliction from the anxiety of routine triviality. But what about the horrendous anxiety of women? that slowly and gradually corrodes her luster and pleasant gleams away. As a rust eats away the permanency of wrought iron, sunshafts to snowflakes, termites to woods, maggots to carrion, blight to greenery, canker to trees, foliage to leaves, et cetra. So does t'is rudeness of parasitic man to woman. Thus, stealing away from the ground as a feeble cat when the dog trespasses into her premises. It's a total façade elevation which is persistently enveloping the current ambiance around in its grip of absurd vileness and that ever after stinks obnoxiously foul.

Truely, this is an obvious stance of cross sensuous dichotomy of the 'abstract' and the 'concrete'. Relishing the extraction of 'explosive sperms' while being under the spasm of 'iron hot' gratification. The headlong plunge into the game of carnal flesh, or nowadays everyone puts it by the manner of daily idle gibberish; immersed in the sea of roving indulgences, pure debauchery, dreaming about the tints of menstruation. Men have more knowledge about the periodic order of catamenial cycle than the gender themselves. All this and other swampy undergrowth of women should have been concealed in vicinity with the organic development of the class. But a kind of an unfortunate one could say, it turns to the gossip among relatives and develop into the dinner talk betwixt affinity, fraternity and afterwards gets divulged among some talebearer friends, . . . that "I have spent a night on the precipice of *Zabarwan* with the 'other' rather docile contestant", she was faithful as a cow. What a fun ah! The cream (lipsticks) of her lips, the sugar of her tongue, mouth full of caramel. The scintillating crystals of perspiration on her chubby cheeks were coruscating sparks like the twinkling stars out of Milky Way. Those moments with her were sulky enough to call her 'pataka' 'aafat' and some Hinglish constructs she is a 'rocket' fierce as a red 'bullet' loaded as the Russian 'tank' of lethal ammunition and the likelihood. Words used for the physical charms of women, are the "social construct" for an anatomy, the prevailing concept regarding the gender stereotypes. Traits that are conjectured to constitute, what is masculine and what's feminine. Are partially if not fully, generated by the androcentric ideology that has been scribbled up to now, mainly by masculinists to masculinity. Typically, the highly pivotal androcentric literary stuffs which directs the square attention on male protagonists: Oedipus, Ulysses, Hamlet, Faust, the Three Musketeers, Captain Ahab, Huck Finn □ who embody masculine characteristics and ways of feeling and pursue male-centred interests. To these male protagonists the female characters, when they act their role, are marginalized and are displayed either as complementary and in

subservient to masculine desires and enterprises. However, if they had to act in a leading part, they need to assume the guise of an androcentric posture. But it's incredibly an impregnable feat to accomplish: to have the taste of two dishes □ varied in flavour and colour □ under the canopy of same palate. Having such a serious melancholic syndrome of impotency in one's own person. You held her accountable for it. Nay no, not only t'is you (man) hurl the drugs (Viagra) □ gulped them down in profuse amount into the sluice of spermaduct for the long orgasmic pleasure, □ and what not around recklessly, available at the spot, as the mad bulls of Latin country; Spain. Held them responsible for the bitterness and lanky taste in intercourse. Yes man, you are in reality doddering, undergoing from erectile dysfunction. Then, why do you bear the trenchant malice in your bosom against her? Always yelling at her; the 'lady of the bed' 'the decorum of kitchen' 'the comfort of blanket', so on and so forth. These are the epithets among in abundance, women has earned so far. Malignancy in men that she has grown austere, barren, infertile.

Nonetheless, you went on to the extreme of saying, that she is not fit now for the business of aggressive activity, coitus, blood phallic entertainment. No man, I do have a sheer indignant repugnance for it, for why, when she surrender herself and her everything ( including her body) to you, she had to deflate absolutely her majesty down to the savage dust, for an ounce of love from your part. For the camphor (here it's the perfume of love) of this mean and base love of today, she mingles herself and her portraiture of self status into the savage acts of male chauvinism. But you the man cast her aside after a company of couple of minutes. Sex machine the bizarre constructed noun for which she is notorious, a sort of toy that warms up the chambers of men (got freezed by the trenchant *Tcheliàklaan*) at night or at any time, for now there is no stipulated requirement, date or time for a man to have or to engage in sexual intercourse with a woman. Poor women can do naything except to comply to mens lustful needs. I surmise it the stupid genuflect of submission from her part to stoop or to yield in front of a man and to tour his beast (organ) in her hollow cavity (slit). And when it's over, men argue insane that she was/is not fit to serve thee.

## II. WOMEN IN THE CANON OF INDO-EUROPEAN LITERARY THOUGHT:

It's was quite or probably is still now an acclaimed matter of fact and also from the perspectives of stalwarts of western literary canon, that west is unsurmountable in the shelves of imperial literature and which is fairly of high importance. The huge repertoire of academia is laden in the gigantic libraries of Europe more crucially involved the ledges of Oxford and Cambridge Universities' which are fraught with such a precious treasure. Thomas Babington Macaulay laid it once, " I have never found one among them [advocates of Indian tradition] who could deny that a single self of a good European library was worth the whole native literature of India and Arabia". But even in western literary canon women was (is) totally being looked down upon, as a mere paltry thing, trash indeed, suitable only for the purpose of sex, and kitchen chores. But with the advent of Mary Wollstonecraft's " *A Vindication of the Rights of Woman*" (1792) John Stuart Mill's " *The Subjection of Women*" (1869) American Margaret Fuller's " *Woman in the Nineteenth Century*" (1845).

And Camille Paglia's " *Vamps and Tramps*" (1994). By t'is concerted approach of theirs' via the canonical landmarks, have been catalogued above, the panorama of feminist studies started to lengthen into wide prospect. Simone de Beauvoir's " *The Second Sex*" (1949), a wide-ranging critique of the conventional opinionated misogynist views and stereotypes on women, more aptly on the identification of the gender, reserved merely for negative objects, even "Other" to man as the dominating "Subject", who is assumed to manifest humans and humanity. Still the gadfly of misogyny - curse that continue to hover over womens' acme persistently. Writers and artists of variegated genres depicted the women gender under the subordination of mens phallus, (from the Phallogocentrism of Jacques Lacan) instances are: D.H. Lawrence, Jean Genet, Norman Mailer, Henry Miller, poet Robert Browning, and to some extent is evident in the erotic poems of John Donne, Pablo Neruda, Lord Byron et cetra, the latter even vehemently remarked it once " *I regard them (women) as very pretty but inferior creatures*" .

In India, the poetess Kamala Das, describes via her art the predicament of women in a contemporary society. Through her subtle art of poetry she quite ably fetch the trauma of womens mind forth into the surface level. In her poetry we commonly trace the committed theme: the quagmire of a women in general. But in particular the woman which has been bound under the conventional traditional clichés of man. And the way she has portrayed the man in her art as a fierce tiger who always ready on his quadruped hind legs to pounce upon the 'dove like antelope' and compared him to the mighty and thunderous god Thor. Who all the while brandishing the hammer. The redound-er of all the miseries.

Also, even the singers and the song composures does promote the content of their albums' by degrading, expunging and abrading the speciality of women. Some specimens are; T. Pean, Justin Bieber, Akon and Enrique Iglesias. Spanish singer and songwriter, composure: Louis Fonsi and the rapper Daddy Yankee. I have listened to some of their songs □ and savour the music □ which are appealing to the senses, ex. gr., the recent made fiery hit blockbuster song, " *Despacito*", references of 'magnet' and 'metal' have been employed by the songwriter in the song which telescopes the ardent lascivious virility of men towards women. In the context of Indian Bollywood cinema, look at Bohemia, Honey Sing, Raftaar et cetra, et cetra. Young generation is totally engulfed in their fashion of nude rapping. They're entirely tearing women's clothing apart, at first they were doing so taciturnly, now in front of all - on stage, in film industry. What an irony, those whom should be put behind the bars, should be suspended by the gallows, or at least should be appended by the mulct for doing so, are roaming in luxury, are being festooned by roses and garlands decked by the beads of diamond. They're the masters of an engines: *Rolls-Royce*. Twenty four carat *Rolax* timepiece loose round their wrists and eyes draped via the golden rimmed spectacles of *Ray-Ben*. The brim of their hats decorated by myrtles. Houses embellished by the grains of gold. All this magnificence of creamy layer has been garnered by them at the invasion which they had raked at women together in the maxillary convulsions. They call it the business, to get it right, in whatever way possible, right or wrong they don't bother an ounce about anything or about anyone. Made her their property. Now there is an industry of them.

The author Simone de Beauvoir claims that, "... One is not born, but rather becomes, a woman... It is civilization as a whole that produces this creature..., which is described as feminine. "

Not only this alone, women is now on buffer-stock, if you are in the business of écriture (writing) and looking for the stroke of inspiration then make woman your muse (pretending) the 'submissive' and you the 'dominant'. Muse which in your language you pronounce the inspiration. Is in actuality the woman whom you use, re-use, mis-use and after you satiate your libidinal hunger of eros then abuse her, hurl her down to the dungeons of greasy abyss, to the extreme of south pole, among the blood-sucking leeches and blind annelids. Ah! man, what is this? The lady, what will become of her? to whom you had once said, " You are the most beautiful girl/lady/woman, my eyes have ever profound." Then prioritizes the process of woolgathering, dreams in a La La Land, Castles in the Air, and a tour to the Disney World. But let me tell you t'is all is a fancy, a mere fabrication from his part, it's a hoodwink to those who did believe or listen to his boggy contrived faux love story. Because at the last sec. when she needed you the most as compared to her father and mother, you tell her " excuse me, I'm changing the narrative altogether " " She is not fit to serve thee", I abhor you the most, you slut" still calling it the inspiration, fie upon you men. What have become out of you? Pooh! man.

Woman the reservoir of patience against whom from ancient times it has been levied that savage battles have been fought, empires have been demolished, ships have been launch'd, and a massive bloodshed occurred. Solid example is the paramour 'Helen Of Troy'. Everybody was (is) concerned about the death and destruction caused by the infidelity of Helen, but no one paid heed to the quagmire of Helen's mind. Or, have a look at the Duchess in Robert Browning's " *My Last Duchess*", when the psycho Duke (psycho out of my frenzy for his inhumane act) uttered;

... " *Much the same smile? . . . I gave commands;*

*Then all smiles stopped together". (Verse, 47-48)*

Robert Browning (*My Last Duchess*) Collection, Bells and Pomegranates (1841-1846).

She was innocent, neutral from prejudices, still the Duke of Ferrara usurp her life from her. Of which he had no provision to take, control, steal or to usurp. I must promulgate it here " that beauty is the body of a woman, " for men there is no other truth beauty besides the subtle beauty of womens' frothing breasts. Swollen as the pregnant grapes of an Arabia. Men is in love with a body of women, her waist, curves and bends and in her millionth place of virtue. That was then only in ancient Greece in Helena's possession. For her everyone was insanely after, she was the subject of dreams of everymen, the darling Scuba of passionate youths. The cause for the bramble and contest, the spill of mandragora in streets, especially the sheer idiosyncratic shower of morning. As in every night the film of my dreams does flicker languidly for my intended, but when morning come into consciousness, severe our congealed ties apart. Only moan and penetrating suspiration at hand. And the numb ache of my heart.

Whatever there may be, in reality she is your part not what you have surmised her from times immemorial, your servant, sole mate, property and possession, and can exploit her the way you want. And among the top elemental requirements she is your basic need. Then why are you catapulting her thus, into the malign eyes

of public. Modern technology has made people savvy, well-informed, shrewed but abreast with it made them savage, barbarous, peevish, crude, selfish, so their acts are uncanny enough to demolish her. Slyly acting under the disguise of humanity but in actual they have the viperish adjectives, they don't care for anyone except the benefaction of their own. Public cannot contribute to cast her identity high towards the prismatic affects of welkin, rather they're keenly interested in the soap opera. No matter, where and what about, but there should have to be something for gossip and they love in adhering to comments on, ... Fiction have taken people by the hip, evacuated the pith of reality from their minds out, indoctrinated by the steroids of fallacious dogmas. So does their ideology that is totally perverted. They're absorbed entirely in the dramatology or dilemmas of others, so tenacious to it, as their cycle of life are driven forth by the sprockets of (its) fabric mechanism, automatically fleeing from the functional reality.

Nevertheless, t'is all to women, is not quite appropriate, an utter change in global scenario is in regard against such a vitriolic syndrome. Because she is now an insufficient fellow garbed herself in the cloaks of vanity. She is looking for fulcrum, which only you can provide her. If you can't, then be ready for her resolution (that could be about anything). It reminds me of a dialogue from a movie " *Chennai Express* ", produced back in ten's, if applied in reverse on men, can sound like this " *Don't underestimate the power of a common nari* " a hindi word for a woman. She is fully capable in deracinating the roots of foundational edifices. One such prototype in literature is discernible in the character of Bertha Rochester, who set into ablaze the gigantic château ( literally the English mansion- the Thornfield Hall, but was grand and adorably spectacular like the French château) of Mr Rochester.

However, Sandra Gilbert and Susan Gubar's " *The madwoman in the Attic*" (1979; rev. 2000), aptly provides the mental quagmire and psychodynamics of women writer in the nineteenth century literature. The intention is the 'anxiety of authorship', resulting from the platitudeness that literary creativity is an exclusively male prerogative, effected in women writers, such as; Brontë Sisters and George Eliot (Mary Ann Evans), a psychological duplicity that projected a monstrous counterfigure to the idealized heroine, typified by Bertha Rochester the mad woman in Charlotte Brontë's " *Jane Eyre*", such a figure is usually in some sense the authors double, an image of her own anxiety and 'rage'. God has given her the powers of defiance to defend the atrocity of men. She knows very well how to put the power of that God-given potential into practice, in order to eke out her ends from the men. But she is abiding what we call now 'on significance'. Otherwise, she does have had ever a subtle knack to put into proof her might for devastation. Translating one Kashmiri proverb into English, when a Maharaja (compound word of Sanskrit and Hindi for the king) once reigned being told by the praja common word for people, to whom he was serving, " Your majesty, an elephant has grown out of control, " he descended but not in jiffy, rather via retaining composure and replied in calm reticence, " Thank God woman hasn't". Means that it's very easy to command the furious beasts and their ferocity, but once woman knows her bounds for ..., she becomes invincible.

Hence, stop trying to be the godfather to women. Gender is crooked by birth, don't try to straighten her thus. " *She is a*

*delicate sex, she needs to be protected*", a statement once made by the stalwart, the column, the beam of feminist studies in Kashmir university's English department, Prof. Hamida Nayeem ( quote from her lecture). When she was delivering the lecture on Henrik Ibsen's, social play, " *A Doll's House*" (1884) . She vividly demonstrate before the girl students the role model of Nora, ( But in actuality, she was in concitation: instigating them to be resilient against the tyranny and oppression of men). Nora was trying to please her husband, in everyway possible, she can. But how was he in contrast piling up her miseries in one way or other. Absolutely he had made her situation bizarre, which she had thought she would never conquer. But it's an incredible that she overcame him and dexterously overpowered his bulwarks of male strength. Thus, she deem it quite appropriate to step outside from the ramparts of patriarchal construction into the world where women is liberate to inhale in the free air, roam un-fettered in the buoyancy of euphoric winds, where there are no shackles to cuff her hands or manacles to inhibit the foot.

*Helmer. Nora, Nora, not now! Wait till tomorrow.*

*Nora(putting on cloak). I can't spend night in a strange man's house. (Act.3rd.page no.121)*

herself into the world of women where they are being given an absolute authority of their own. Where there are no complexes of any sort: superiority or inferiority, no boss nor client. No 'submissive' no one 'dominant'. Where she could make her own individual choices. That she does, when she slammed the door at her husband and become at the first time: The Nora' for her own self.

### III. CONCLUSION

Therefore, consider if there is a provision for individual choice. Then why don't you understand, in that estimated proportion comes the provision for womens rights too. Where they could rise their images above from the weight (figure) of mere

sexual toy. So, come forth and forward today the helping hand, I can assure you of that it doesn't need any herculean approach to consummate. Come then let's do it man, what are you waiting for? As it has been proclaimed by someone, "Board now onto the Noah's Ark: propelling via the fierce cyclones, contrite solemnly ere it shall too late".

If you can't, then at least don't manifest her thus. "She is fit to serve thee." If you consider her that she is not fit for you, then you aren't either fine for her. Go to hell you stupid fellow, you ought to die in a ditch somewhere or in a pound of shallow water. Like some old oblivious frog... . Man, that you rightly are, plus parallel to spiky monster. Pooh! Man.

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# Numerical Investigation of Influence of Cavity Air Injection Panels in Ultra-Compact Combustor

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**Abstract-** Ultra-Compact combustion presents an innovative solution to address the demand for increasingly compact, efficient, and low weight aircraft gas turbine engine propulsion systems. An Ultra-Compact Combustor (UCC) operates by diverting a portion of the compressor exit flow into a cavity about the engine outer diameter. Injection into the cavity can be done at an angle to induce bulk circumferential swirl. Swirl velocities in the cavity then impart a centrifugal load of approximately  $1000g_0$ .

Computational results from the test rig are presented, prioritizing on establishing the design flow split through the diffuser into the circumferential cavity. The implementation of a core channel plate was instrumental in control of the mass flow splits. Computational Fluid Dynamics (CFD) supplement the experiments and enable a more detailed understanding of the interactions within the diffuser and the interactions between the air injection jets and the fuel jets. Three different conditions of cavity air flow rate were studied by changing the diameter of the cavity air injection panels three times respectively. The results show that the dimension of cavity air injection panels is directly related to the centrifugal acceleration of the gas mixture in the combustion ring. The panels with the smallest diameter achieved the highest combustion temperature in the cavity. Varying the diameters of cavity air injection panels with respect to core channel restriction plate caused a change in the core flow development which then had a secondary effect of aiding the combustion process within the cavity.

**Index Terms-** Analysis, Cavity air injection panels, Computational Fluid Dynamics, Ultra-Compact Combustor

## I. INTRODUCTION

The traditional jet engine combustor is axial in flow. The compressor diffuses the air as it leaves the compressor, so the flow is at a low Mach number when entering the combustor, where fuel is introduced to the airflow, mixed, and burned. The hot combusted gas is then sent to the turbine to be transferred into work to power the compressor and the electrical systems of the aircraft. The combustor must be long enough for the air-fuel mixture to burn completely before entering the turbine. An alternative to the traditional combustor is the Ultra-Compact Combustor (UCC) which performs the combustion process in the circumferential direction. The UCC utilizes the circumferential direction to create the needed residence time for combustion, while effectively reducing the overall length of the combustor. The centripetal acceleration in the cavity causes a g-load effect in the cavity. This concept has been termed an Ultra-Compact Combustor, and it is illustrated in Figure 1 through comparison with a traditional combustor.

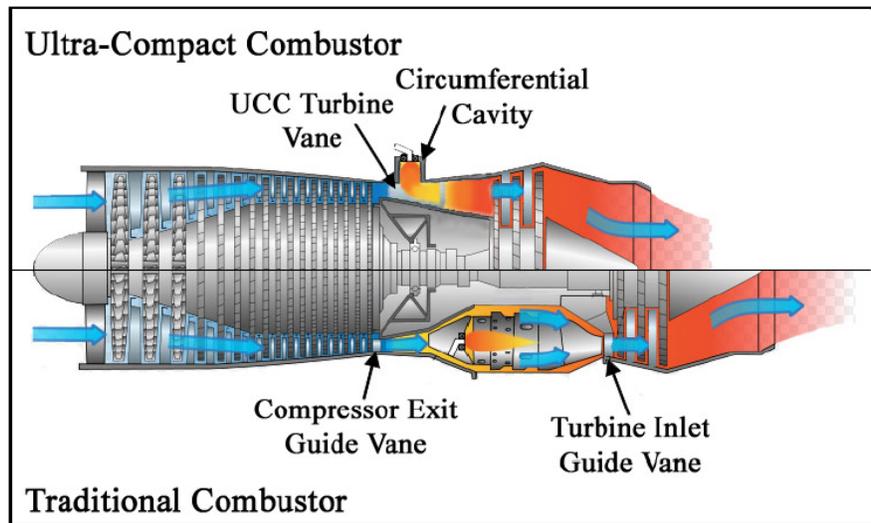


Figure 1: Axial length comparison of traditional and Ultra-Compact Combustors

## II. BACKGROUND

In 1973, Lewis [1] first proposed the theory of centrifugal combustion to accelerate the flame propagation velocity. Zelina et al. [2] experimentally confirmed that the ultra-compact combustion chamber flame length is at least 50% shorter than the conventional combustion chamber. Sirignano et al. [3] analytically demonstrated the benefits to engine cycle performance realized through the addition of inter-turbine combustion stages. In recent years, The US Air Force Research Laboratory (AFRL) has further explored the practical application of ultra-compact combustors. In 2013, Bohan and Polanka [4] designed a full-scale (fighter-sized) computational UCC model to quantify performance with non-reacting and reacting air. Their work also resulted in the foundation for the current "hybrid vane" design incorporated in the UCC core flow. The hybrid vane fulfills the roles of both the compressor exit guide vane and the turbine inlet guide vane, thereby further capitalizing on the ability of the UCC to reduce overall engine length and complexity. The combustion cavity circles above the vane, therefore the hybrid vane plays a crucial role in the recombination of the combusted cavity flow and the core through-flow. In 2013, Wilson [5][6] proposed a low Rayleigh loss centerbody design of the UCC.

For the first time in 2013, Conrad [7][8] improved the direction of core and cavity air flow intake, realized axial and radial intake of core and cavity flow, effectively reduced the radial scale of ultra-compact combustion chamber, and significantly promoted the practical application of UCC. Conrad developed a new annular UCC rig that diverts the axial airflow by adding a diffuser in front of the combustion ring and arranging the cavity air injection panels obliquely in the front wall of the combustion ring to ensure swirling combustion in the combustion ring. In 2014, Miranda [9] based on the Conrad experimental device and using hybrid vanes for experimental research, it was expected to achieve core-to-cavity mass flow distribution 60/40, 70/30, 80/20 by changing the core and cavity flow area ratio. Both Conrad [7] and Miranda [9] found that it was difficult to drive the desired mass flow rate into the circumferential cavity due to the relative pressures between the core and cavity flow paths. There were minimal restrictions to the core flow, whereas the cavity flow was diverted through a narrow channel and forced through a series of small injection holes in the air driver plates. The injector plate caused a pressure drop that was not seen by the core flow and resulted in a lower than expected mass flow rate into the cavity for each of the middle diameter splits. Cottle et al. [10] were able to correct this problem using a flow restrictor plate located downstream of the support vanes in the diffuser core flow but before the hybrid vanes. The plate provided the necessary pressure drop in the core flow to allow the pressures between the two flow paths to behave predictably. With the addition of the flow restrictor plate back pressuring the core flow, the mass flow rate split was nearly matched to the diffuser split ratio. However, the entire flow field analysis is limited to the cold flow of the combustion chamber.

In the same year, Cottle and Polanka [11] conducted a numerical analysis to look at the velocity profile through the diffuser passage that leads to the circumferential cavity. They found that the velocity profile was not a typical parabolic channel flow profile with the maximum velocity in the center of the passage. Instead, they found that the maximum occurred at a non-dimensional height of 0.1. Additionally, at a channel height of 0.7 to 1.0 there was reversed flow in the passage. One possible cause of the irregular pattern could have been to the placement of the leading edge of the diffuser middle diameter ring. In Figure 3 it can be seen that the tip of the middle diameter ring is in-line with the OD of the air supply line creating a situation where it was difficult for the flow to remain attached to the outer wall as it diffused.

Sun Ming Shan [12] in 2018 performed numerical investigation of blockage plate in the UCC model of Conrad [7] and Miranda [9]. The results showed that the low-pressure area created by restriction plate enhances the radial flow migration and enforce the mixing ability between high-temperature gas and core flow, which benefits the performance of temperature profile in outlet plate. Moreover, the simulation results also concluded the restriction plate could enlarge the size of vortex that exists in the cavity ring and improve the

stability of combustion. This current report will document the continuation of the numerical investigation of the restriction plate along with the air injection cavity flow.

### III. COMPUTATIONAL METHODS

For the past decade, the Air Force Institute of Technology (AFIT) and the Air Force Research Laboratory (AFRL) have been investigating and advancing the development of an Ultra-Compact Combustor (UCC) as a means to improve efficiency and reduce the size of aircraft engines. The complete structure of the AFIT test rig of UCC is shown in Figure 2. It is mainly composed of a diffuser, a combustion ring, a restriction plate, and a center body. According to the sectional view of the combustion chamber, the air enters the combustion chamber through the inlet, and diffuser divides the airflow into a core flow and a cavity flow. The cavity flow is inclined at an angle into the combustion ring, mixed with the fuel injected from above the combustion ring, and then swirled and combusted. The diffuser support vanes guide the core flow, then passing through the core channel restriction plate to the circumferential cavity. The core flow then gets blended with the combustion ring products, which is then discharged along the hybrid guide vanes.

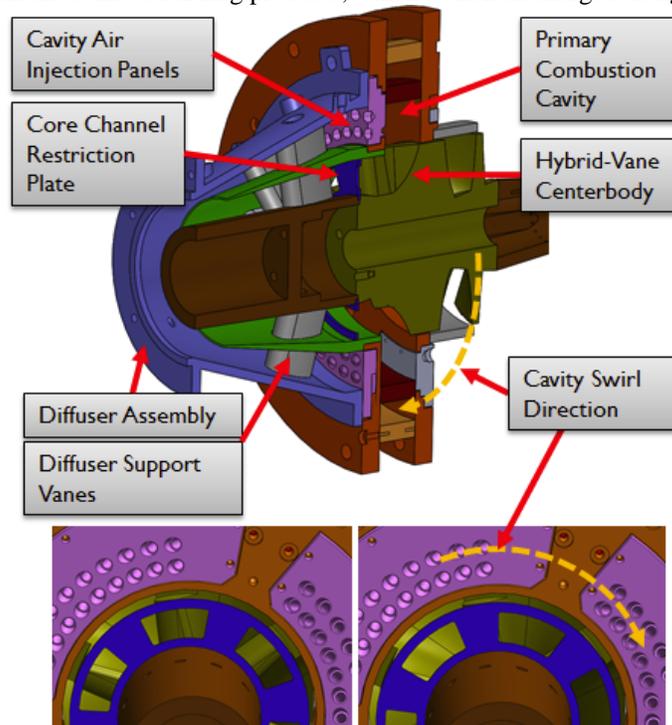


Figure 2: AFIT common-source hardware components (top) and restrictor plate detail “on-vane” (bottom-left) and “in-passage” (bottom-right)

#### A. Geometric Model

Siemens NX 11.0 was used to model the geometry of AFIT test rig. The total length of the combustion chamber is 449 mm; the diameter of the combustion ring is 159 mm. Location "D1" corresponds to a position roughly 30 mm downstream of the diffuser flow-split, while locations "C1" and "C2" are each about 5 mm from the fore and aft cavity sidewalls, respectively. The domain includes the full annulus (no periodic or symmetric boundaries).

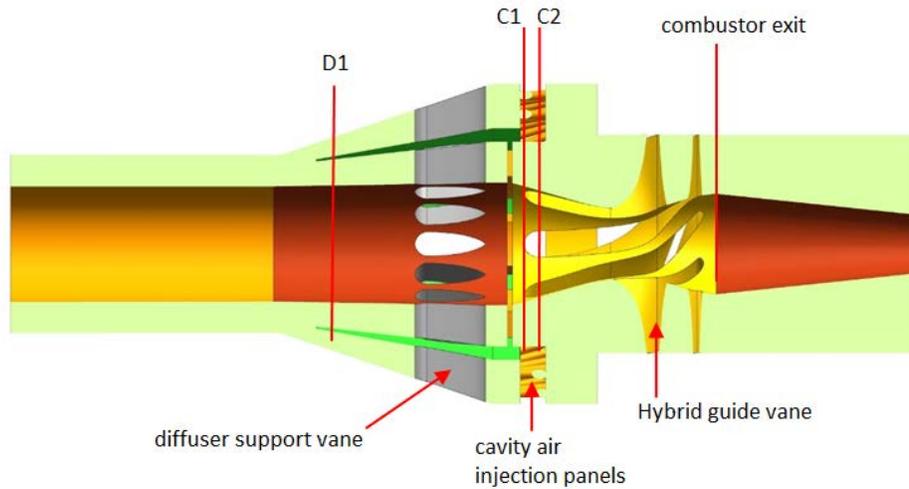


Figure 3: Axial reference positions

The outer passage of the diffuser directs the flow into the combustion cavity via cavity air injection panels. The nominal diameter of those holes in AFIT UCC is 4.5 mm. There are 60 such holes to guide the cavity airflow into the combustion cavity, angled at 30° relative to the engine axis.

Cottle [10] performed simulations using channel plate design of  $\lambda = \{0.7, 1.0, 1.3\}$ , where  $\lambda$  is a non-dimensional factor used to design the core blockage channel plate.

$$\frac{A_{channelPlate}}{A_{core}} = \frac{\lambda A_{injectionHoles}}{A_{cavity}}$$

$$A_{core} = \pi(r_{core,outer}^2 - r_{core,inner}^2) = \pi R_c$$

$$A_{cavity} = \pi(r_{cavity,outer}^2 - r_{cavity,inner}^2) = \pi R_v$$

$$A_{injectionHoles} = N\pi r_h^2, \text{ where } r_h = \text{radius of injection holes}$$

$$A_{channelPlate} = \frac{6\phi\pi}{360}(r_1^2 - r_2^2)$$

From the model,

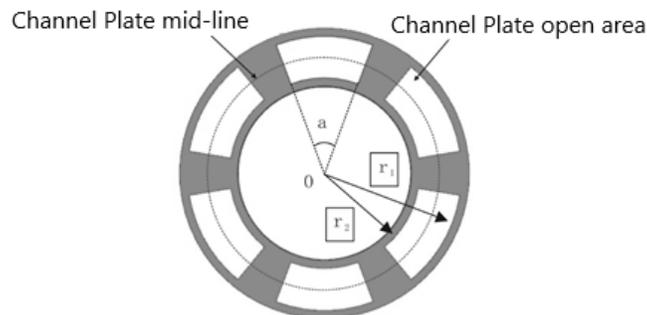


Figure 4: Core Blockage Channel Plate Schematic

$$\frac{12h^2}{\pi R_c} = \frac{\lambda N r_h^2}{R_v}$$

$$h = r_1 - r_2$$

So, keeping all the other parameters constant, values of  $r_h$  are calculated from the values of  $\lambda$  used by Cottle [10].

$\lambda$	$r_h(mm)$
0.7	2.5
1.0	2.25
1.3	2.0

So, three different cases with diameter of cavity air injection panels of 5.0 mm, 4.5 mm and 4.0 mm are used for simulation.

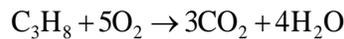
**B. Computational Grid**

Due to the complex geometry of the model, and considering the problem of computational accuracy caused by the periodic processing of the model, the model was divided into structured polyhedral mesh. During meshing, the model is divided into various details of the combustion chamber, such as fuel inlet, air inlet, wall, fluid regions, etc., and these areas are mesh-encrypted. The total number of cells is around 1.7 million.



Figure 5: UCC grid schematic

The flow solver used for this study was Fluent 18.0. The solver used the settings based on the recommendations of Mongia [13]. The turbulence model uses a realizable model with high accuracy in combustion chambers [14], and the normal wall function is used in near-wall areas where turbulence development is insufficient. The combustion model uses a component transport model, the reaction rate using eddy-dissipation model (EDM), and the combustion reaction using propane single-step reaction, such as equation (1):



Separate implicit steady-state solver was used, and each discrete item adopted a second-order precision discrete format, which was calculated by SIMPLEC algorithm.

**C. Boundary conditions and calculation parameters**

Table 1: Boundary conditions of inlet and outlet

Parameter	Value
Inlet mass flow rate/(kg/s)	0.12
Inlet flow T/K	293
Operating pressure/Pa	101325
Inlet Gauge pressure/Pa	0
Oxygen mass fraction of inlet flow/%	23

Outlet T/K	293
Outlet Gauge Pressure/Pa	0

The equivalence ratio of the combustion ring is calculated based on the estimated cavity air flow rate of the diffuser design. The ratio of the inner and outer rings is 70/30, and the outer ring flow is calculated to be 0.036 kg/s. Fuel mass flow rate is 0.00158kg/s. The calculation conditions are shown in Table 2.

The effects of performance of the combustion chamber under different dimensions of air injection holes (diameter of 4.0 mm, 4.5 mm, and 5.0 mm) are considered.

#### IV. CALCULATION RESULTS AND ANALYSIS

##### A. Influence of cavity air injection holes in cavity air flow rate and equivalence ratio

Table 2: Cavity air flow rate and equivalence ratio under different dimensions of air injection holes

Diameter of air injection holes	4.0mm	4.5mm	5.0mm
Fuel flow rate	0.001582(kg/s)	0.001582(kg/s)	0.001582(kg/s)
Cavity air flow rate	0.02511(kg/s)	0.03079(kg/s)	0.03416(kg/s)
Equivalence ratio	1.3696	1.1170	1.0677

It can be seen from Table 2 that the diameter of different cavity air injection holes directly affects the ratio of fuel to air in the combustion chamber. As the diameter of the air injection holes increases, the cavity air flow increases and the equivalence ratio decreases. In this case, the equivalence ratios are 1.370, 1.17, and 1.068 respectively.

*B. Analysis of results at D1 in combustion chamber*

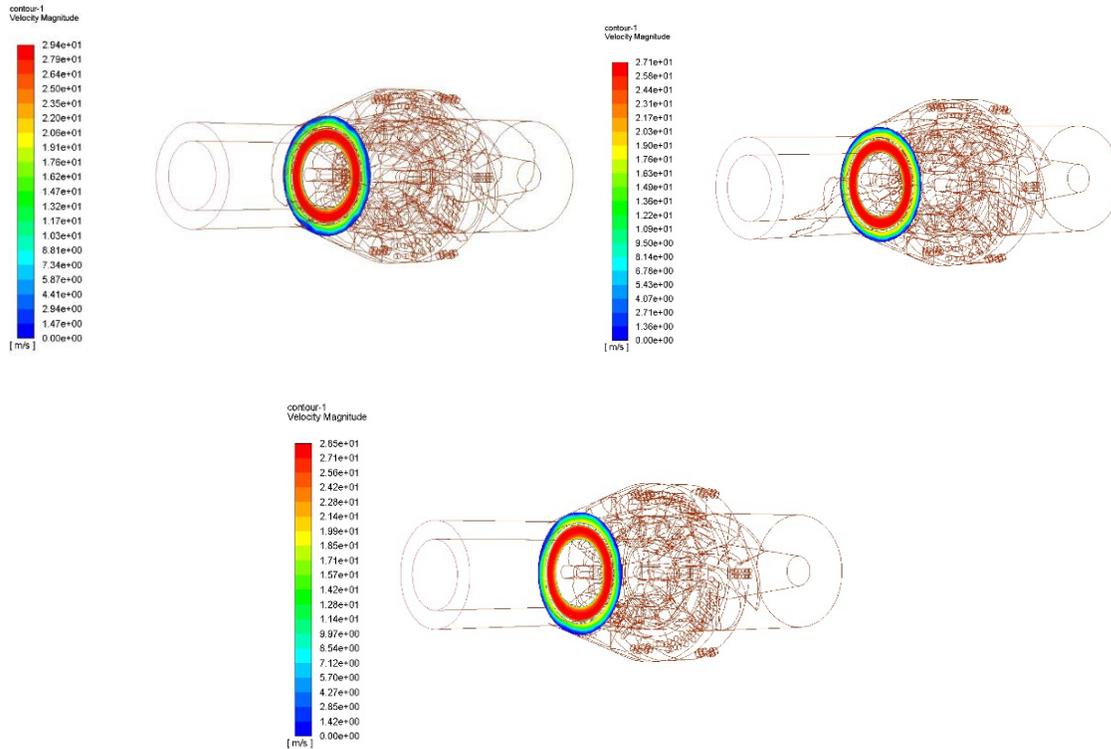


Figure 6: Tangential velocity contours at D1 when air injection holes have diameters 4.0mm, 4.5mm, and 5.0mm respectively

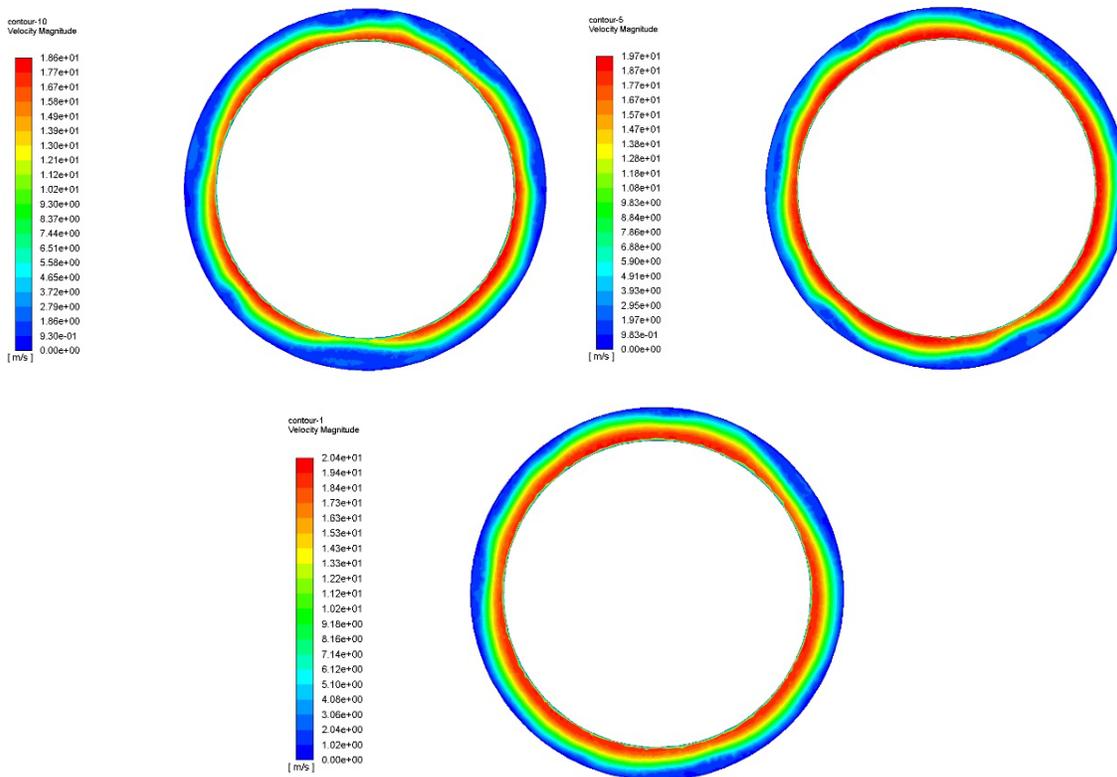


Figure 7: Tangential velocity contours at D1 cavity when air injection holes have diameters 4.0mm, 4.5mm, and 5.0mm respectively

It can be seen from Figure 6 and Figure 7 that the cross-section of the combustion chamber D1 is a concentric ring. Compared with the mainstream core flow, the velocity of cavity flow is lower due to the inclined inlet air flow rate. The velocity distribution of the cavity flow in the concentric ring is higher towards the inner ring. Since the diameter of cavity air injection panel affects the cavity flow rate, it also affects the air distribution into the combustion ring. Moreover, the maximum velocity in the cavity of the D1 section increases with the increase of the cavity flow rate.

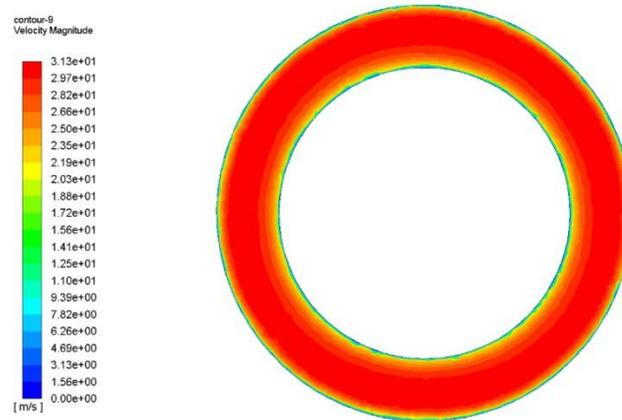


Figure 8: Tangential velocity contour at D1 core

The velocity distribution of the core flow exhibits an anti-U-shaped distribution. The velocity is lower at the two walls due to the viscosity and, rapidly increases along the radial direction as shown in Figure 8.

### C. Analysis of results at D1 in combustion chamber

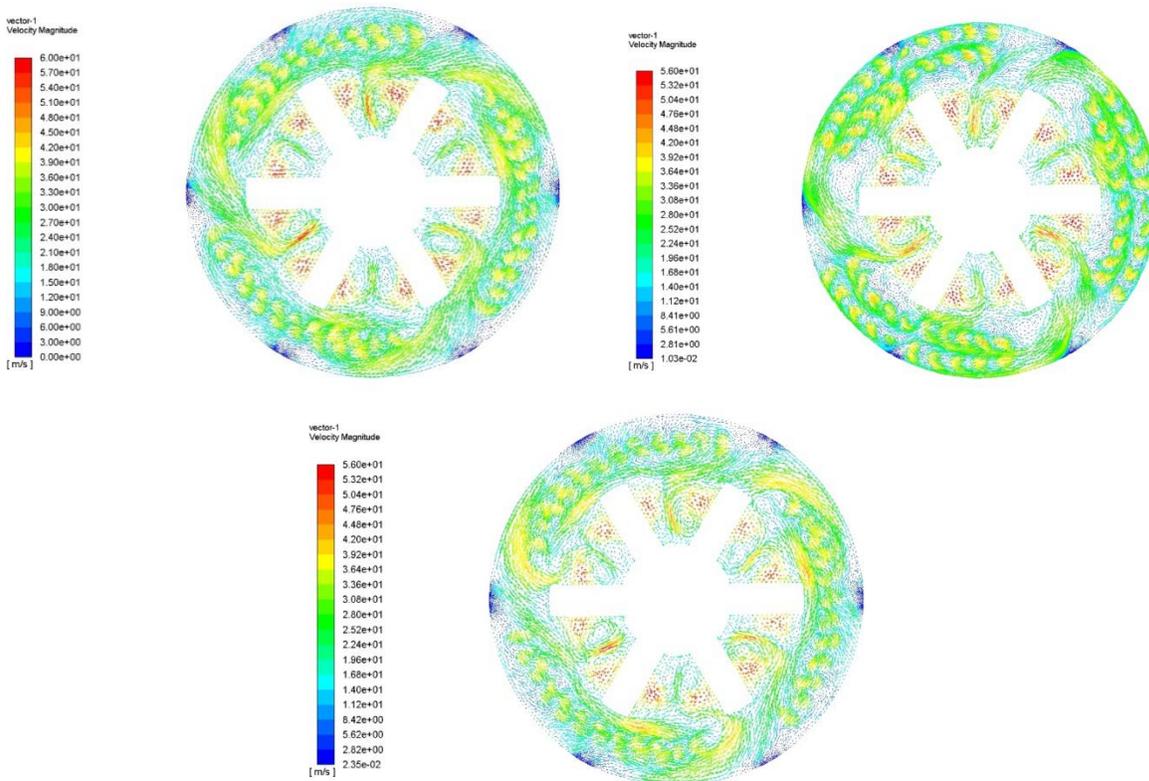


Figure 9: Vector velocity diagram of the cross-section velocity at C1 when air injection holes have diameters 4.0mm, 4.5mm, and 5.0mm respectively

It can be seen from Figure 9 that the velocity vector distribution of the air injection cavity holes of different diameters is similar at the C1 section in the combustion chamber, and the velocity at a position close to the fuel inlet is small. In the C1 section closer to the

outer ring wall, due to the fuel and the cavity air, a combustion mixed gas vortex is formed in the combustion chamber, in which the fuel is mixed with the air and burned. Whereas in the C1 section closer to the inner wall, the gas after combustion of the fuel mixture is mixed with the mainstream air to form an air vortex to lower the temperature of the gas. As seen from the figure below, as the airflow rate in cavity increases, the overall velocity of the C1 section decreases slightly.

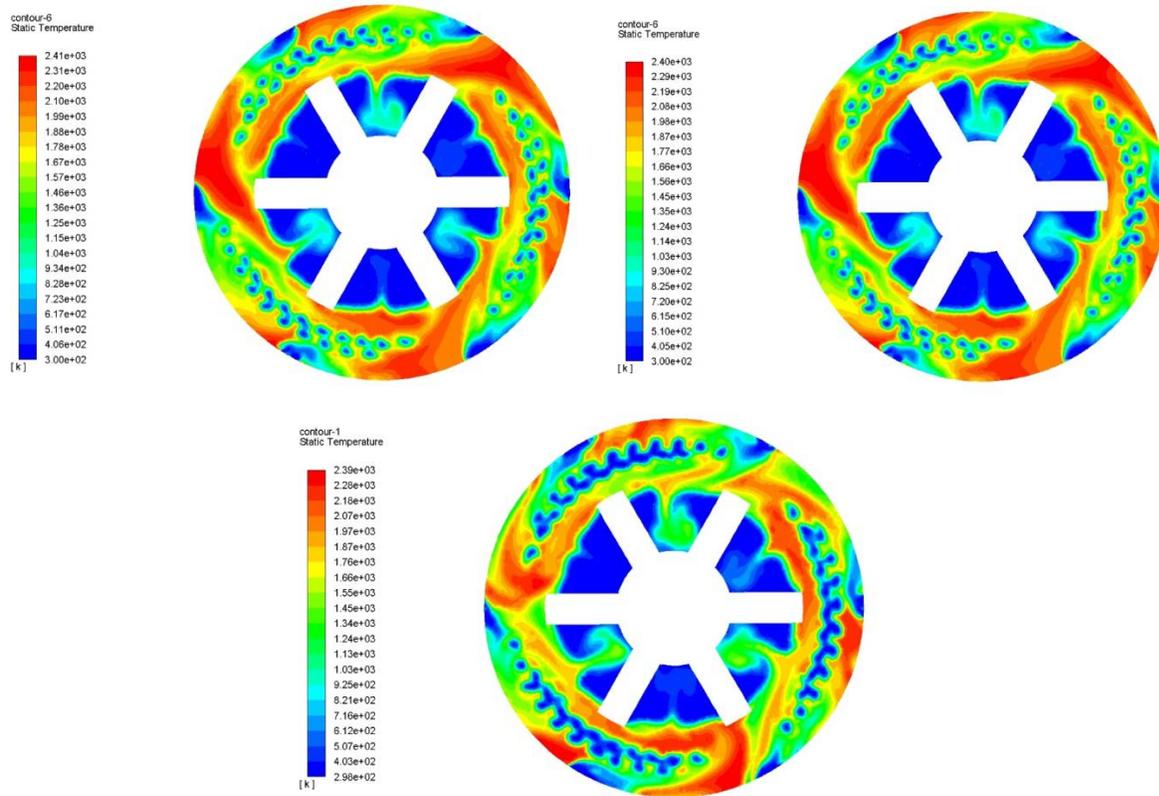


Figure 10: Temperature contours at C1 when air injection holes have diameters 4.0mm, 4.5mm, and 5.0mm respectively

Moreover, from figure 10, on the cross-section C1, the maximum combustion temperature is the highest when the equivalence ratio is the maximum. At the same time, it is found that for different diameters of air injection holes, the C1 section has different gas temperature distributions among the six-turbine blades, and the temperature between the three turbine blades is higher, the temperature is about 1200K to 1600K, and the other three turbine blades is lower, basically about 600K. Combined with the temperature distribution at the outlet of the combustion chamber, it can be found that the gas temperature distribution law between the six-turbine blades is similar to that of the C1 cross-section. The gas temperature between the three turbines is higher and is located in the radially middle of the outlet section, and the other three are close outside the outlet section.

*D. Analysis of results at the outlet of combustion chamber*

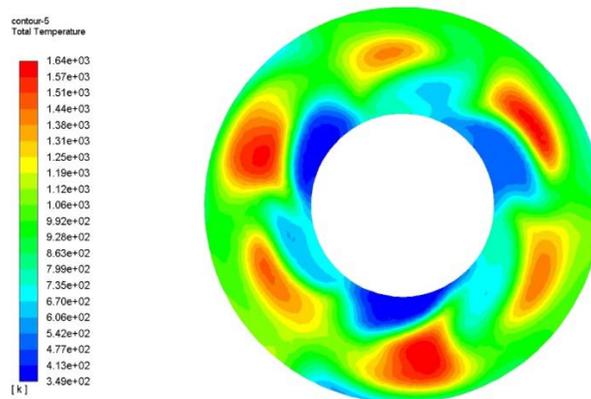


Figure 11: Temperature contours at outlet of combustion chamber when air injection holes have diameter of 4.0 mm

The temperature distribution at the outlet of the combustion chamber when cavity air injection holes have diameters of 4.0mm, 4.5mm and 5.0mm are presented by the graph in Figure 11.

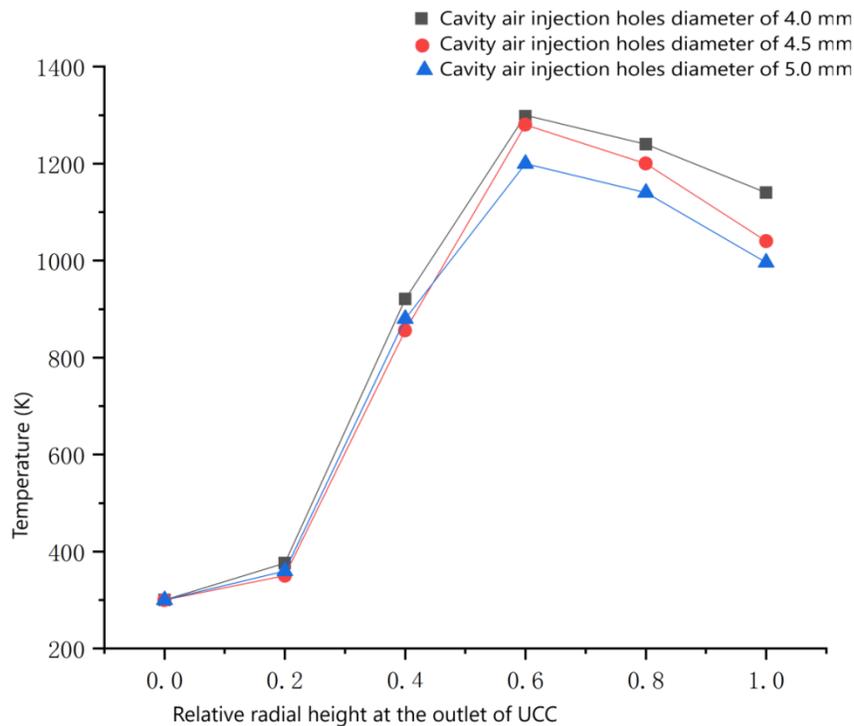


Figure 12: Average temperature at the outlet of the combustion chamber radially

It can be seen from Figures 11 and 12, that under different air injection holes conditions, the average temperature of the outlet at the time of combustion gradually decreases with the increase of the pore size. Moreover, the place where the temperature difference of the outlet section is the largest is at a relatively high radial height of the combustion chamber, that is, close to the outer wall of the combustor ring. In the inner wall, due to the small gas flow between the three blades between the turbine blades, the air flow mainly comes from the core flow, and the temperature is 300K. Therefore, the average radial temperature at the outlet is lower near the inner ring of combustion.

## V. CONCLUSION

This paper presents the influence of the cavity air injection panels on the flow and combustion performance in the UCC. A combustor model was used to replicate the circumferential mixing utilized in UCC configurations to study the effects of centrifugal forces on combustion stability and efficiency. It is found that changing the diameter of cavity air injection panel changes the equivalence ratio of fuel to air, and at the same time affects the cavity and core air flow rate. The vector field in the combustion cavity changes, thereby affecting the combustion within the combustion ring. Reducing the diameter of the panel increases the combustion temperature in the cavity, providing evidence to the higher temperature in the outlet of the combustion chamber. However, a minimal diameter of the air injection panels might lead to insufficient airflow in the cavity, while delaying the combustion and decreasing the combustion efficiency, which needs further research in future.

## ACKNOWLEDGMENT

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# Performance Comparison between Neo4j-based and OWL-based Query Classification Process

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**Abstract-** Web query classification is emphasized by various search engines nowadays due to the increase in the size of the web as millions of web pages are added to it every day. Web query classification is to classify a user query  $Q_i$  into a list of  $n$  categories  $c_{i1}, c_{i2}, c_{in}$ . Search result pages can be grouped according to the categories predicted by query classification method. Providing query classification can help the information providers to understand users' needs based on the categories searched by the users. To build the domain corpus, most of the query classification system use ontology, Wikipedia category source, graph database etc. In this system, graph database and ontology are built as domain corpus for query classification process by using Neo4j and Web Ontology Language (OWL). Web Query Classification Algorithm (WQCA) with five steps is implemented as a web service by using XML web service technology. Proposed system classifies each domain term of user query into their relevant categories according to this WQCA algorithm by using different domain corpus. Finally, this system compares the performance between Neo4j-based and OWL-based WQCA to show the effectiveness of using graph database in the query classification process.

**Index Terms-** Web Query Classification, Web Service, Neo4j Graph Database, OWL

## I. INTRODUCTION

Today, semantic logics are very important in query understanding to create successful web search engines. A user might not formalize the query when he seeks information although he knows what he wants. As a result, understanding the nature of the information that is needed behind the queries is important research problem. So, this system proposes the Query Classification Algorithm (QCA) for efficient Information Retrieval (IR) system.

Many other classification systems [1 - 4] have been proposed by using training dataset, user query logs, click URLs and user session data. The main advantage of using OWL or Neo4j graph database in query classification process is that the classification can be performed without requiring large data set. In this paper, Neo4j-based QCA is proposed and compared with OWL-based QCA.

The Neo4j-based QCA uses the graph database to classify the intended category of user query. Graph database is built by using Neo4j 3.1.3 which is an open source graph database supported by Neo Technology [9]. CYPHER query language is used to retrieve the matched terms and related category of domain words from the graph database. The node structure of graph database is shown in figure 3.

The OWL-based QCA uses the ontology dataset to classify the intended category of user query. Ontology file is constructed by using Protégé v 3.5 [10] and published as a dataset on the Apache Jena Fuseki server. Terms from ontology are extracted by SPARQL language using dotNetRDF which is a complete .NET library for parsing, managing, querying and writing RDF [11]. The class structure of ontology is as same as the node structure of graph database as shown in figure 5.

In this proposed system, QCA is implemented as a web service by using XML web service technology. To show the better performance of the Neo4j-based QCA, this system compares it with the OWL-based QCA.

The rest of the paper is organized as follows: related work is described in section 2. The proposed system is described in section 3. Web query classification algorithm is shown in section 4. Neo4j graph database and OWL construction are described in section 5 and 6. In section 7, implementation of proposed system is presented. Finally, evaluation of performance and conclusion are given in section 8 and 9.

## II. RELATED WORK

In 2012, S. M. Fathalla and Y. F. Hassan [1] presented hybrid method for user query reformation and classification depending on fuzzy semantic-based approach and K-Nearest Neighbour (KNN) classifier. The overall processes of the system are query pre-processing, fuzzy membership calculation, query classification and reformation. Classification is performed using KNN classifier not just by keyword-based semantic but using a sentence-level semantics. After classification, user's query is reformulated to be submitted to a search engine which gives better results than submitting the original query to the search engine. Experiments show significant enhancement on search results over traditional keyword-based search engines' results.

In 2015, A. Katariya [2] presented ontology based web query classification. Query classification is one technique in which query should classify to the number of predefined categories. Query classification use ontology as a model to classify the input search queries. Ontology stores a set of concepts and semantic rules to classify user queries.

In 2014, M. M. Thannaing and A. N. Hlaing [3] proposed query classification algorithm for automatic topical classification of web queries based on domain specific ontology. In their proposed system, ontology with 12 classes is constructed as a controlled vocabulary for query classification process. To implement the proposed ontology-based query classification for information retrieval system, J2EE is used. According to their experimental results, the proposed system can outperform than traditional keyword search system. The results of their experiments showed that the accuracy of informational retrieval system is improved by using the ontology-based query classification process.

In 2006, W. Yue, Z.Chen and X. Lu [4] proposed a novel information retrieval algorithm based on query expansion and classification. The algorithm is induced by the observation that very short queries with the traditional information retrieval methods often have low precision, although they can get high recall. Their approach attempted to catch more relevant documents by query expansion and text classification. The results of the experiments showed that the proposed algorithm is more precise and efficient than the traditional query expansion methods.

## III. PROPOSED SYSTEM

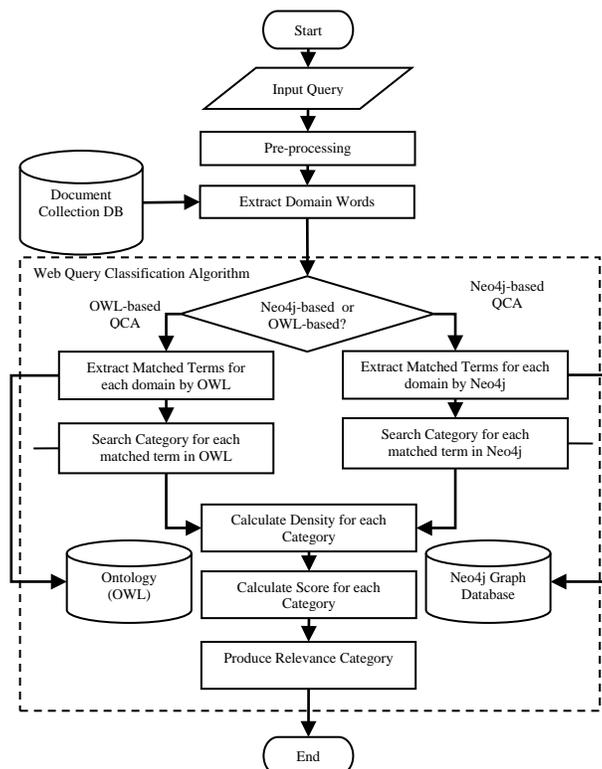


Figure 1: System Design

This system compares the performance between Neo4j-based and OWL-based query classification process. In this system, the user can choose the desired query classification process to classify the user query. In the OWL-based query classification, the user query is classified to intended category by using the domain ontology. But, the Neo4j-based classification process classifies the user query by using the Neo4j Graph Database to get the intended category for the user query. Both query classification process uses the same Web

Query Classification Algorithm (WQCA) based on different category data source: Neo4j graph database or ontology. System design is shown in figure 1.

#### IV. WEB QUERY CLASSIFICATION ALGORITHM

Web query classification is significant to search engines for the purpose of efficient retrieval of appropriate results in response to user queries. User queries are short in nature, contain noise and are ambiguous in terms of user intent. Web query classification is to classify a user query  $Q_i$  into a list of  $n$  categories  $c_{i1}, c_{i2}, \dots, c_{in}$  [5].

Web query classification includes three step processes. The first process is domain term extraction that is a categorization or classification task in which terms are categorized into a set of predefined domains [6]. The second process is learning step where a classification model is constructed. The third process is classification step where the model is used to predict class label for given data. If a certain category in an intermediate taxonomy is given, web query classification is directly mapped to a target category if and only if the following condition is satisfied: one or more terms in each node along the path in the target category appear along the path corresponding to matched intermediate category [2].

In the web query classification algorithm, the input is the domain terms of user query and the output is the relevance category that has the highest score. The web query classification algorithm (WQCA) is shown in figure 2.

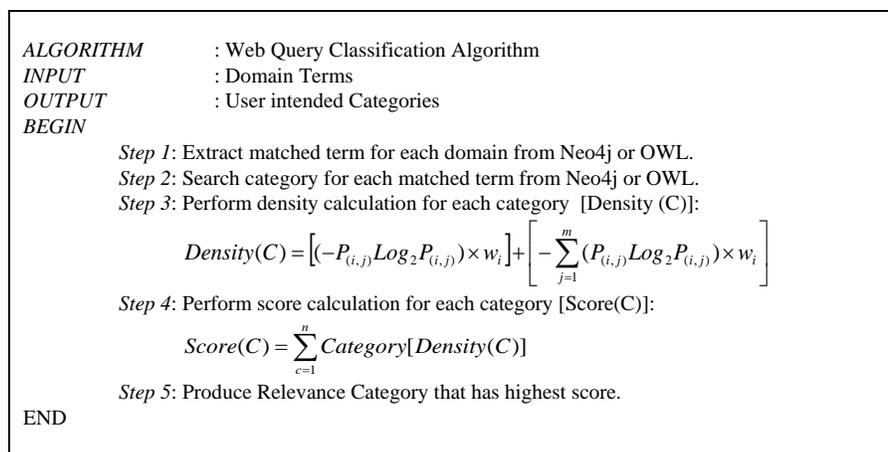


Figure 2: Web Query Classification Algorithm (WQCA)

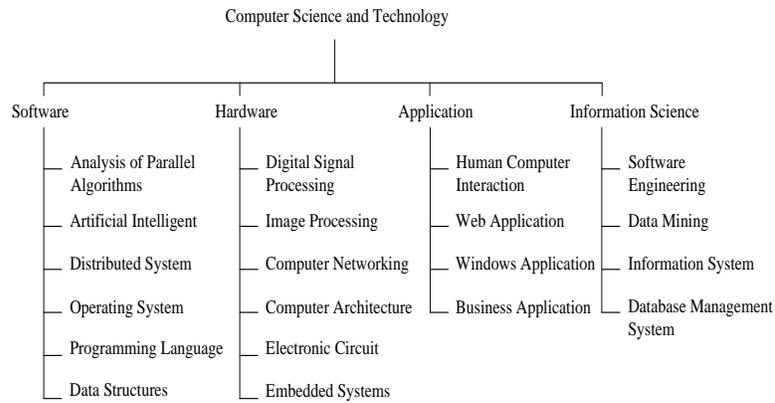
There are five steps in this algorithm. In the first step, this system extracts matched terms for each domain term using Neo4j graph database or ontology by specific query language. In the second step, related categories for each matched term are extracted from the Neo4j graph or ontology. In the third and fourth step, this system performs the density calculation for each category and performs the score calculation for each category. And finally, this system produces the Relevance Category that has the highest score.

#### V. NEO4J GRAPH DATABASE

Neo4j is a high performance NoSQL graph database which provides object oriented, flexible network structure. It is based on a Property graph data model which comprises of nodes and relationship along with their properties. It is reliable, ACID compliant, highly available and scalable. It offers REST interface and Java API quiet convenient to use. It can also be embedded into jar files. It uses CYPHER as its query language. Some of the fortune 500 companies that use Neo4j are Adobe, Accenture, Cisco, Lufthansa, Telenor and Mozilla [7].

A Neo4j database uses graph structures with nodes, edges and properties to represent and store information as shown in slide. Neo4j can be used in website link structures, hierarchical structures of categories and social networking. To classify the user query, concept terms in the area of computer science and technology are predefined in 22 sub categories using Neo4j database. These categories are grouped in four: Software, Hardware, Application and Information Science. The root category is Computer Science and Technology as our case study. The node structure of category graph is shown in figure 3. Each node in this graph is "Category" and the relationship between them is "INCLUDE".

CYPHER query language is a latest query language that has been recently added to the Neo4j. Examples of CYPHER query to retrieve all matched terms listed by given domain words is shown in following figure 4.



**Figure 3:** Category Structure in Neo4j

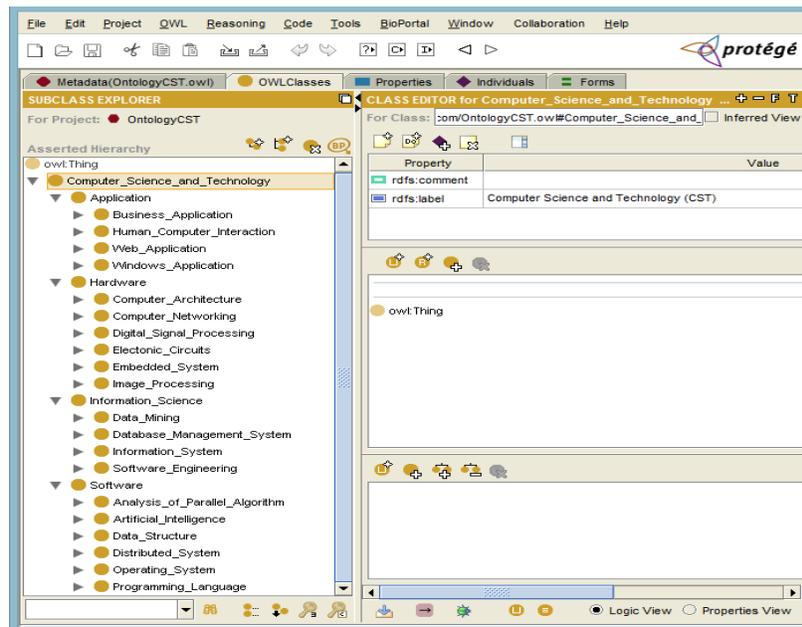
```

WITH ["artificial","intelligence","artificial intelligence"] AS domainTerms
UNWIND domainTerms AS domain
MATCH (c:Category)
WHERE LOWER(c.name) =~ ("(?i).*(?:[\\W-+]|^)" + domain + ".*")
RETURN domain as DomainTerm, collect(c.name) AS MatchTerms
    
```

**Figure 4:** Extraction of Matched Terms from Neo4j by CYPHER query

## VI. ONTOLOGY CONSTRUCTION

Ontology renders shared vocabulary and taxonomy which models a domain with the definition of objects and/or concepts and their properties and relations [3]. In this system, ontology is constructed for query classification process using Protégé v 3.5. In construction of ontology model the target categories of domain area are created as classes. All relationship between classes are type of `rdfs:subClassOf`. There are 22 subclasses are created as the categories as same as the node structure of Neo4j graph database. These categories are grouped in four classes: Application, Hardware, Software and Information Science. Computer Science and Technology is the root class of ontology. The overview class structure of OWL is shown in figure 5.



**Figure 5:** Class Structure in OWL

These categories consist of several subcategories or subclasses. For example, Web Application has subcategories namely Web Design, Website, Web Browsers, JavaScript (JS), Cascading Style Sheet (CSS), Hyper Text Markup Language (HTML) etc. Ontology is applied not only in the process of query classification to get the concepts of each domain word but also to match target category. Terms from ontology are extracted by SPARQL query language using dotNetRDF library as shown in figure 6.

```
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
SELECT ?className ?label
WHERE
{
    ?className rdfs:label ?label
    FILTER REGEX( ?label, '\\bartificial|\\bintelligence, 'i')
}
```

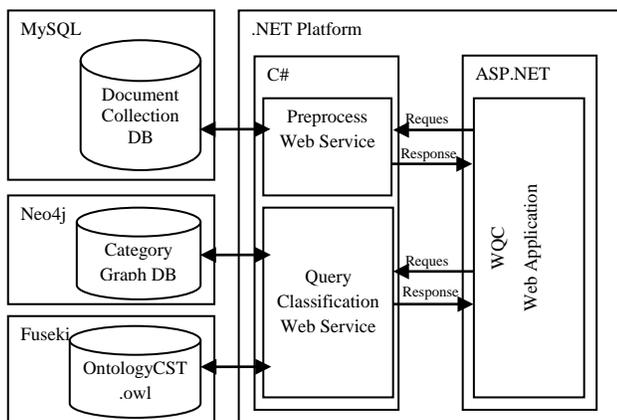
**Figure 6:** Extraction of Matched Terms from OWL by SPARQL query

Although SPARQL supports the REGEX expression with multiple parameters, the results of query cannot be grouped by specific parameter, in this case the matched terms for artificial and intelligence domain words are returned by query as a common result. Therefore query must be executed one time for each domain word to know which terms are related to which domain.

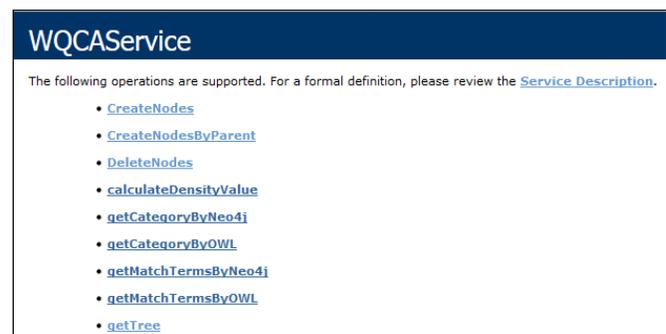
### VII. IMPLEMENTATION OF PROPOSED SYSTEM

Proposed system is implemented based on Service-Oriented Architecture (SOA) by using the XML based web service technology and ASP.NET. The logical architecture of proposed system is shown in figure 7.

Architecture of proposed system consists of one ontology dataset, two databases and three programming components. The functional module of proposed system is separately implemented as two web services by using C# programming language, because they relate to different database, in this case MySQL relational database and Neo4j graph database. Preprocess web service consists of functions for text preprocessing, extraction of domain terms and retrieving of information. Functions for QCA are implemented as a query classification web service. The functions of WQCAService are listed as shown in following figure 8. The functions for getting matched terms, getting category and calculating density value are the main functions of QCA web service. The user interface is designed and implemented as a web application in ASP.NET platform for testing these functions.



**Figure 7:** Proposed System Architecture



**Figure 8:** Function List of WQCA Web Service

### VIII. EVALUATION OF CLASSIFICATION PERFORMANCE

To evaluate the performance of query classification process based on different category data source, ReadyAPI v2.6.0 tool is used. ReadyAPI [8] contains several powerful instruments for complex and overall testing of API and Web Services such as LoadUI which supports to simulate a massive load on web server to see how it works under the given conditions. Various testing strategies can be used to test different aspects of server. With LoadUI, tests can be run in parallel, as well as distribute tests among several test computers. The load test results of query classification by using LoadUI are shown in figure 9.

Neo4j-based and OWL-based QCA Load tests have been performed by invoking the calculateDensityValue function of WQCAService with 20 simultaneous virtual users (VUs) within 5 minutes. As a result, we can see that the average response time for Neo4j-based QCA is lower than the OWL-based QCA and the variation of response times is not smooth in OWL-based QCA. The wave forms of response times in OWL-based and Neo4j-based QCA load tests are shown in figure 10 and 11 respectively.

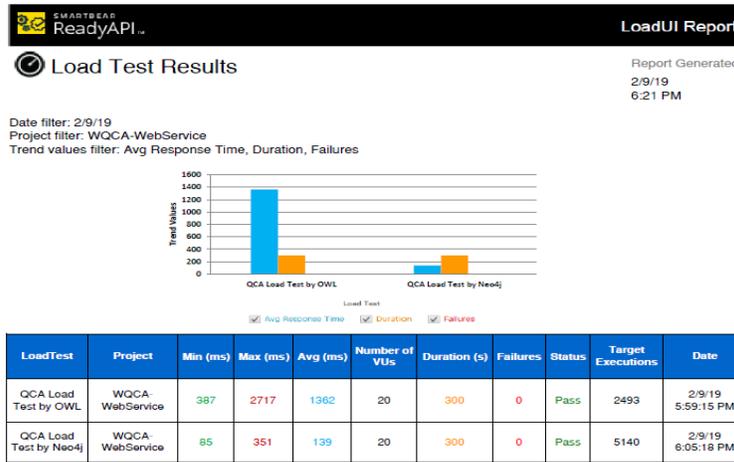


Figure 9: Load Test Result for QCA Execution Time

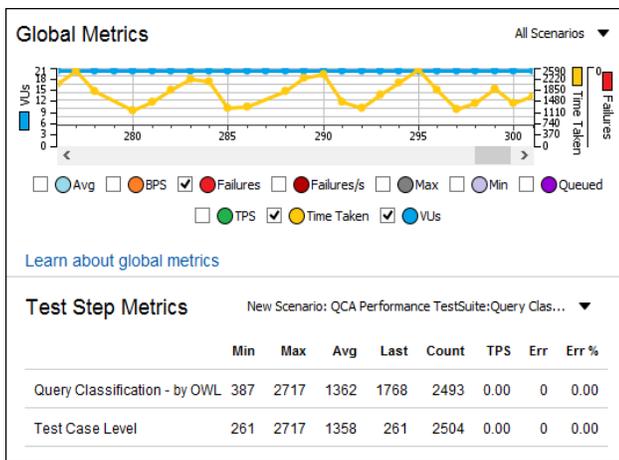


Figure 10: Load Test Result for OWL-based QCA

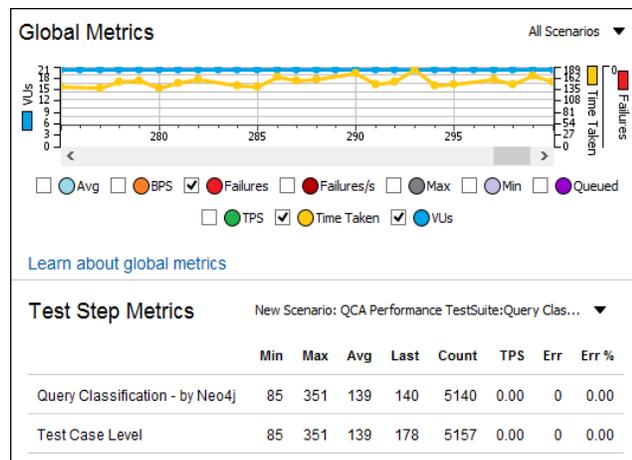


Figure 11: Load Test Result for Neo4j-based QCA

To evaluate the execution time of query classification process, total 220 queries (10 queries for each category) are tested from the ASP.NET web application. The execution times of Neo4j-based and OWL-based query classification are compared with bar chart group by intended categories of tested queries in figure 12.

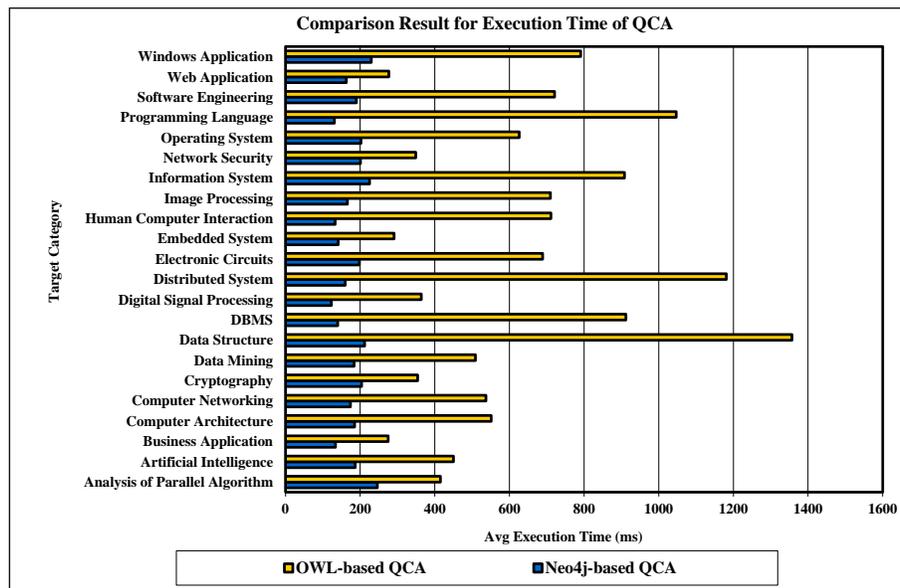


Figure 12: Comparison Result for QCA Execution Time

## IX. CONCLUSION

According to the experimental results, Neo4j-based query classification process is more stable than the OWL-based classification process. The load test results performed by ReadyAPI shows that Neo4j database server can provide the stabilization of query classification process. Moreover, Cypher query language used in Neo4j can provide the WQCA to perform the querying process in time-effective manner. The performance comparison between Neo4j-based and OWL-based QCA shows the effectiveness of using graph database in the query classification process. So, in this paper Neo4j graph database is proposed for query classification process.

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# The Development of Professional Identity among Lesotho University Lecturers

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**Abstract-** For university lecturers, professional identities are constructed within discipline-based cultures and the profession itself. With the view that professional identity is acquired through investigating a combination of self-efficacy, job satisfaction, motivation and occupational commitment, this study set out to describe job experiences which influenced the development of professional identity among university lecturers in Lesotho. Utilizing narrative inquiry among a sample of 15 academics, this study describes work experiences within discipline-based cultures which impact on the development of professional identities. The findings showed that academics had the ability to make their own professional choices and realize their own interests against the background of the institution's conditions, culture, demands and constraints. Thus professional identities at the university were based on sets of meanings that academics held for themselves that defined 'what it meant' to be who they were as individuals and role players.

**Index Terms-** Professional identity, narratives, interactionism, university lecturers, higher education, Lesotho.

## I. INTRODUCTION

Academic occupations are principally high-status, knowledge-based occupations displaying the hallmarks of a profession; they are characterized by abstract specialized knowledge, the right to exercise autonomous professional judgment as well as altruism (Hodson & Sullivan, 2008:258; Hooley, 2007:50). Since the core of academic work rests on research, teaching and community service, how academics see and experience their professional identity is indivisible from their identity as academics. It influences the way they teach, participate in professional learning activities and attach value to what they do. Nevertheless, it is a fact that many university lecturers enter higher education teaching with no prior professional training in pedagogy; rather they are recruited on the strength of their qualifications and many gain experience through trial-and-error (Komba, Anangisye & Katabaro, 2013:191). This realization led scholars, such as Bromme (1991), to view professional identity of university lecturers as subject or discipline-based.

Recently, however, other elements such the teaching and professional ethics became incorporated into professional identity (Beijaard, Verloop & Vermunt, 2000) leading to the perception that the professional identity of university lecturers is located somewhere between commitment to professional ethics/standards and an ability to progress within a profession (Komba et al., 2013). Thus, university lecturers' professional identity it is part of how they present themselves and wish to be perceived and recognized by others in the broader professional community (Bitzer & De Jager, 2016; Lieff, Baker, Mori, Egan-Lee, Chin, & Reeves, 2012). Furthermore, some authors argue that the professional identity development "might be different for university teachers since they have to combine the teaching role with other roles such as that of researcher or practitioner" (Van Lankveld, Schoonenboom, Volman, Croiset & Beishuizen, 2017: 326).

### The development of professional identity

A professional is a person who does skilled work to achieve a useful social goal (Lane, 2018). Conversely, professional identity is defined as one's professional self-concept based on attributes, beliefs, values, motives, and experiences (Ibarra, 1999). Professional identity also refers to "one's professional self-concept, based on attributes, beliefs, values, motives, and experiences" (Slay & Smith, 2011:86). Robson (1998:586) views it as "the perception of oneself as a professional and it is closely related to the knowledge and skills one has, the work one does and the work-related to the significant others or the reference group". Therefore professional identities derive from a profession; they influence self-definitions and shape how others think about the professional as an individual. For that reason, professional identity can be thought of as the constellation of attributes, beliefs and values that people use to define themselves in specialized, skill- and education-based occupations or vocations (Slay & Smith, 2011:87).

For academics, professional identities are constructed within discipline-based cultures (Clarke, Hyde & Drennan, 2013) and the profession itself (Pifer & Baker, 2014:118). Most contemporary approaches to professional identity recognize this and are in consensus that professional identities; (1) are developed within an established social context and (2) are shifting and dynamic rather

than stable and fixed (Neary, 2014; Vandeyar, 2010; Rodgers & Scott, 2008; Holstein & Gubrium, 2000). Wenger (1998:51) uses the concept of 'communities of practice' (CoP) to define professional practice as a process in which people experience the social world and their engagement in it as being meaningful. Practice then is about meaning as an experience of everyday life. Wenger (1998:149) further argues that participation within CoPs has three dimensions: (1) it improves mutual engagement; (2) it builds trust between members; and (3) it allows the discussion of issues pertaining to the practice. Others also contend that, it keeps the CoP together and builds a sense of accountability to a body of knowledge; and it helps members develop a shared repertoire, inclusive of routines, words, tools and stories within the practice (Ruuska & Vartiainen, 2003:172).

Accordingly, professional identities are both individual and social; and they play an integral role in academic staffs' wellbeing and productivity (Clarke et al., 2013; Lieff et al., 2012). Kelchtermans (1993, 2009) states that professional identity evolves overtime through 5 stages, namely: (1) self-image (how one describes oneself); (2) self-esteem (how good/bad one is defined by others); (3) job motivation (what makes one choose, remain committed or leave the job); (4) task perception (how one defined their job); and (5) future perspective (one's future career expectations). In line with Kelchtermans (2009) and Canrinus, Helms-Lorenz, Beijaard, Buitink and Hofman (2012), I believe an indication of university lecturers' professional identity is acquired through investigating their self-efficacy, job satisfaction, motivation and occupational commitment in their combination .

Research into the construction of professional identities highlights this. It cites family, cultural values, personal experiences and self-reflection on own identity as some of the factors which influence the construction of professional identities (Slay & Smith, 2011). For example, Barbara-i-Molinero, Cascon-Pereira, Hernandez-Lara (2017) found that social experiences, the educational context, perceived congruence with the profession, professional experience, personal development and self-engagement influenced professional development in higher education. Similarly, Bitzer and De Jager (2016) investigated chartered accountants' perceptions and preferences regarding their own professional identity and found that professional identity was not a stable construct; rather it was associated with personal choices and influenced by contextual factors. Komba et al (2013) also found that exposure to new challenges, interactions with colleagues and students, experience in teaching, self-discipline, personal effort and international exposure helped to improve professional identity. Besides professional roles and CoPs, academic professional identities are also said to be influenced by ascribed traits, socialization and values academics bring into their work (Wharton et al., 2000:68) as well as the attitudes (brought by diverse work experiences) they maintain towards their jobs (Celik, Man, Modrak, Dima, & Pachura, 2011:8). Nevertheless, it is important to note that, the construction of professional identity often seems problematic for university lecturers especially as their job requires them to juggle expectations, roles and employment conditions (Beijaard, Meijer & Verloop, 2004). Even so, since academics tend to experience tension from the institutional social context when attempting to develop professional identities (Vandeyar, 2010:917), this study will explore how professional identities develop in the context of the Lesotho higher education sector with the aim of showing that their professional self-images are a subject to the work environment, the institution and themselves as individuals.

### **Theorizing professional identity**

What is an identity? Gee (2000:1) defines it as "being recognized as a certain kind of person in a given context". In this sense, everybody has multiple identities connected to their performances in society. Similar to identity, professional identity is a definition that professionals use when they try to define themselves and communicate this to significant others within occupational contexts (Neary, 2014). The 'context' has an important role in identity development as it reflects how individuals see themselves and how they enact their roles within different settings. It is for this reason that Bullough (2005:146) states that identity development is not a passive activity, "it involves giving and withholding which simultaneously alters oneself and one's context, with the result that alternative identities may form". In short, an identity establishes a "link between the individual and the social structure" (Callero, 1992:485); it is the experience of oneself constructed in relation to the social world and it exists "only insofar as a person participates in social relationships" (Stone, 1962).

Professional identities are essentially 'social' and 'personal'; they comprise how individuals view themselves based on their qualifications, characteristics and values. Professional identity may also be seen as a response to socio-cultural values, work-place discourses, practices and norms as understood and contested within any social group (Murray, Czerniawski & Kidd, 2019). There are varying understandings of the development of professional identity. For example, Ibarra (1999) argues that it is due to work socialization and observation of peers; Larson (1977) contends that it is the result of shared expertise; while Hughes (2013) views it as a result of shared normative practice. It can be argued then that professional identity is a dynamic concept; it is developed and refined in interaction (and reflection of that interaction) with others (Schmidt, 2014). Similarly, this article approached identity from a structural approach to identity formation which views an identity as the result of the relationship between the individual and society. Thus, it views an identity as a set of meanings that define who one is as an occupant of a role, a member of a particular group or claims characteristics that identify him or her as a unique person (Burke & Stets, 2009:3).

Amongst the structural approaches to identity, Burke's (1980) cognitive approach to identity theory (CAIT) was adopted. Burke's (1980) CAIT focuses on the "internal dynamics that operate for any one identity" (Burke & Stets, 2009:48). It delineates five theoretical properties of identities from an interactionist view of the self; self-meanings, relational, reflexive, affecting behaviour and

motivating (MacKinnon, 1994:88). Firstly, identities are viewed as 'self-meanings' derived from significant others' reactions to individual's words, acts and appearances (MacKinnon, 1994:89). Burke (1980) refers to the meaning of identity as one's role identity which comes to be known through interaction. Thus meaning of identities does not stand in isolation; rather it can only be understood in the context of particular network of other role identities (Callero, 1992:485). Secondly, identities are seen as 'relational'. According to Burke (1980) this may happen in 3 ways: (1) identities may be related to roles; (2) identities may be related to other identities; and (3) identities may be learned by relating to others (Sluss & Ashforth, 2007; MacKinnon, 1994). Sluss and Ashforth (2007) add that relational identity integrates the individual, interpersonal and collective levels of the self. Thirdly, identities are 'reflexive'. This implies that individuals have the ability to reflect and consider who they are in relation to others. Thus the reflexive self develops in the interaction with others through a process that includes a person's self-efficacy, self-image, self-concept and self-esteem (Falk & Miller, 1997). Giddens (2016) adds that individuals do not just take for granted or inherit identities; instead, they actively shape, reflect on and monitor themselves. Thus identities become 'projects', something individuals actively construct. Fourthly, identities 'affect behaviour indirectly'.

Lastly, identities are 'motivating'. According to Oyserman, Lewis, Yan, Fisher, O'Donnell and Horowitz (2017:140) people are motivated to act and make sense of the world using their identities. This is because identities have value; thus people prefer to act and make sense of situations in identity-confirming ways. "The implication is that people are motivated to regulate their behavior, to work toward desired and away from undesired future identities, and to act in ways that fit who they are now and want to become" (Oyserman et al., 2017:140). Accordingly, Burke (1991:837) views identities as a set of meanings applied to the self as an actor in a social role or situation which defines what it means to be who one is.

In terms of professional identities, Burke's (1980) approach shows them as not only being reflexive and symbolic in nature but also as realised through interaction between actors and others (Burke & Reitzes, 1991:84). For example, Bitzer and De Jager (2016) investigated chartered accountants' perceptions and preferences regarding their own professional identity and found that professional identity was not a stable construct; rather it was associated with personal choices and influenced by contextual factors. Komba et al (2013) also investigated factors which led to changes in professional identity and found that exposure to new challenges, interaction with colleagues, interaction with students, experience in teaching, self-discipline, personal effort and international exposure helped to improve professional identity.

## Purpose and questions

"Professionally, who and what am I?" (Curle, 1969:9). According to Schmidt (2014) this is the one question that professionals have asked themselves most frequently during their careers as one's identity is often closely related to their profession. Surprisingly, professional identity is an area that has not been researched about in any great depth among professions, especially in higher education (Bitzer & De Jager, 2016; Beijgaard et al, 2004; Clarke et al., 2013). As such, more needs to be known about how academic staff come to possess the constructs and ideas that inform their professional identity (Clarke et al., 2013). Therefore, the purpose of this study is to describe job experiences within discipline-based cultures which influence the development of professional identity among university lecturers. In addressing this, three issues were inquired into, namely:

1. Which aspects of academic work enhance or diminish the development of professional identities?
2. How do contextual factors such as daily work interactions between academics, students and colleagues within and outside the university shape professional identities?
3. Which factors influence intention to sustain academic professional identities at the university?

## II. MATERIALS AND METHODS

Qualitative methods were used to describe job experiences which influenced the development professional identity among university lecturers. The National University of Lesotho (NUL), as a leading institution of higher learning in Lesotho, was used as a case study. The target population included all academic staff employed at NUL (regardless of type of employment contract or duration of employment). Purposive sampling was employed to identify 15 participants across NUL's seven (7) faculties (Social Science, Humanities, Law, Science & Technology, Education, Agriculture and Health Sciences) with different levels of academic rank, specialization, experience and qualifications to suit the objectives of the study. All participants provided written consent before participating in the study. Recruitment and study procedure were conducted in the participants' various departments. At the time of the study the interviews were conducted in lecturer's own offices to ensure visual and audio privacy. Using narrative inquiry research design, this study adopted an experience-centered narrative approach which assumes that narratives are sequential, meaningful and represent real human experiences (Squire, 2013:48).

In-depth interviews were used as research tools to collect the data. The interview guide sought views of participants with regard to aspects and context of academic work which enhanced or diminished professional identities and whether they intended sustaining academic professional identities at NUL. Data was collected in the form of personal narratives of experience (where participants told stories of long terms aspects of their career in academe) using a semi-structured in-depth interview guide organised to facilitate

narrative analysis. Interviews were conducted in English; audio-recordings of the interviews were transcribed with key identifying information removed from the transcripts. The data were then analyzed using thematic narrative analysis and this resulted in the identification of three main themes and their associated sub-themes. Firstly data were prepared and themes of analysis defined to ensure that the content analysed was based on the purpose of the research. This was followed by the development of categories and coding schemes and finally coding of all textual data. Finally inferences were made based on the codes (Datt, 2016).

### III. RESULTS

#### Participants' viewpoints

The study had a total of 15 participants (8 men and 7 women), with specializations in law, humanities, social sciences, agriculture, health sciences, pure sciences, technology/ engineering, and education. Their qualifications ranged from Masters to PhD and they were spread over the academic ranks of lecturer, senior lecturer, associate professor and full professor. The narratives provided below are excerpts from the interviews held with participants. They show that professional identities derive from various facets of academic work, unique histories, ethical backgrounds, and who identifies with their discipline-based cultures.

#### 'A matter of choice'

The findings revealed that professional identities derived from the autonomy experienced in academic work. For some, this was expressed through self-determined work behaviour where academics were able to 'design' how their work was to be executed. This feeling of being in charge of one's work was also observed in how academics took responsibility for their work, "I always bring my own equipment to work to teach students with it. The students need this from me and I can't get help, so I help myself in that way (Pamela, Law)". Participants also reported being able to determine the 'pace' of their work while others enjoyed the 'freedom and flexibility' inherent in academic work. However, it soon became apparent that autonomy in academic work was valued due to academics' dislike of close supervision or somebody 'telling them what to do': "I don't have an immediate boss who is after me all the time. I feel like a professional. I feel there is err...that confidence in me. I try to do things responsibly" (Mandy, Humanities).

It was also realized that the autonomy and flexibility in academic work influenced job commitment:

"I have been getting offers and I decline them. I got an offer from a bank but the setting there...; we are so many in the hall. Everybody in his cubicle facing that way...you're all around. There I don't think I would be free" (Rosa, Social Sciences).

However, the findings also revealed that perceived and experienced independence in academic work was actually socially constructed and not a permanent feature of academic work at the university; that is, it was determined by the group and was negotiated over-time. Initially, it emerged that the ability to negotiate autonomy at work depended on the type of employment contract one had as an academic. For example, part-time lecturers were found to be free of work obligations that were normative for tenured members of department, "Part-time lecturers just come to teach classes assigned to them...and mark the student-assessment work, that's all" (Mark, Social Sciences). Thus, while part-time academic staff felt more liberated and in control of their work, full-time academics had to sacrifice their personal time in order to keep up with the demands of their work, "I push myself to do my heavy work-load in time. Imagine, teaching, marking, student consultations, committees, meetings and minutes. All that I have to squeeze in somehow, so I really apply myself to finish" (Emily, Humanities). The need to 'push' to finish assigned tasks was found to be born from two realizations. Firstly, that the university operated in an environment of inadequate resources, yet work had to be carried out regardless. Secondly, that NUL management could logically not expect high quality performance or morally hold academics accountable for substandard work when it did not provide adequate job aids. However, it was clear that some academics genuinely cared for their work despite resource constraints at the university:

"I tell myself that I have to do the work which I like, no matter the limitations of infrastructure or financial support. I realized long ago that crying that 'hey I can't do my work because of 1, 2, and 3' is a waste of time. It must be done... dark or blue and nobody can complain to me about the quality as long as it's done" (Isaac, Education).

The findings also revealed that some academics had initially struggled to gain recognition and status within the group upon arrival as new recruits. Rather, it came overtime when they had gotten used to the politics of the group. Nonetheless, these initial feelings of perceived powerlessness and low status within the group left academics feeling like second-class citizens which enhanced feelings of frustration due to perceived unequal treatment:

"When I first came here I was given another Course apart from what I specialize in. So I found myself doing what other people did not want to do. Kind of forced to lecture...because other people wanted to do their PhDs. When I got used to the system, I said 'No, I must do those things that I am trained for and specialized in'. So I started dropping that Course and doing more of my specialization" (Amanda, Health Sciences).

Besides this, academics also had to adhere to university rules and regulations when carrying out their duties regardless of whether it interfered with other planned activities or not, "I dislike the time-table... so almost every day I teach early in the morning and late in the afternoon. That makes me unhappy because I have other things to do" (Beatrice, Health Sciences).

### **'It's a good headache'**

Sense of accomplishment academics found in their work was found to influence not only the positive attitudes they had for their jobs, but it also helped them to construct a professional self based on experiences of achieving goals under strenuous work situations, "I remember one day I had so many things to do regarding teaching and supervision of students. When I went home that day I felt that I had accomplished something. I had a headache that day, but I felt that...it was a good headache" (Catherine, Law). Even so, it was not just work-related accomplishments that influenced the professional identity of participants. For some, it was seeing their students grow and progress academically and finally graduate while for others, it was students excelling professionally which gave a sense of accomplishment:

"When I meet my former students and they tell me 'we are beginning to appreciate what you taught us when we were in school'. You begin to understand that 'ok I am making a certain contribution to the nation'" (Maxwell, Social Sciences).

It also emerged from the findings that professional identity hinged on identification with teaching, research and community service roles. Amongst participants who identified with their professions, it was realized that the 'connection' to practice they felt working at the university enhanced their professional identity, "I have a deep passion for pharmacy and for the practice of the industry. So I feel that connection between my job here and the practice" (Amanda, Health Sciences). Participants who identified with their profession also noted a strong need to pass on and/or instill the professional principles into protégés:

"I must say I am a very passionate nutritionist. Nutrition is my passion and it is something that I want to instill in the students that we teach. When I see that students are not catching what I am saying, it's like I could get into them and make them understand as I would like them to" (Beatrice, Health Sciences).

For participants who identified with their roles as researchers, their professional identity was enhanced by being innovative, coming up 'with new things' and publishing in refereed journals. It also emerged from the findings that participants recognized that enacting their research roles was also key in getting recognition in the form of academic titles and ascending to the upper echelons of academia:

"If you want to be somebody you must work hard. I'm sure it's nice to be called doctor or professor, so I feel like 'hey man, just keep pushing. A little mounts up to a lot in time'. So I try hard to engage in the publishing game from time to time. Right now I have bagged some articles. Now when Calls for Promotions come, I just tell myself 'next year I qualify'. I can't wait"(Thomas, Agriculture).

However, it emerged that inasmuch as promotion criteria required academic staff to publish, was clearly spelled out for them, it was not a straightforward exercise. Academics still to adhere to university rules for promotion regardless of whether they qualified for promotions or not. This frustrated academics and led them to consider resigning from their work at the university:

"Recently I applied for promotion. I was meeting the requirements but they said I don't qualify due to the fact that I don't have six years to qualify for the promotion. Those are the things or reasons that would have influenced me to quit" (Felicity, Education).

It was also realized that participants who identified with their research roles as academics were aware that structural constraints in the form of lack of resources was a constant threat to the construction of this identity at the university, "You need to have a lot of materials...without them one would be handicapped" (John, Science & Technology). This was found to be a source of frustration among academics as stated by Martin (Science & Technology):

"The expectation to do research, without providing us with the necessary materials and things to do our work as lecturers...to talk about quality, to talk about this and that... it's really very annoying. But prior to that, one has to put things in order. If the department or the faculty does not have the necessary budget to grant the department particularly the practical aspect and so on and the facilities, then we may not deliver... you know things that are expected from us. So the expectations and the realities do not match".

It also emerged from the findings that some participants identified with opportunities to develop and grow that the university offered its academic staff, "My job keeps me on my toes because as a lecturer you can't relax and say what I studied in 1980 still works now (John, Science & Technology). It also emerged that staying relevant could be achieved by either keeping up with recent subject-based developments, through study leaves, or through attending conferences. Interestingly participants seemed to be aware that it was only if they stayed in academia that they could remain relevant academically, "If I leave the university I will not have time to learn about issues that are emanating from the subject itself" (Felicity, Education). Participants also felt like their jobs afforded them academic growth which not only benefited them as individually but also enhanced students' learning experiences. Nevertheless, there were some participants who were unhappy with resources allocated to growth and development at the university:

“They should give us enough research allowance so that we can publish. They must also increase conference grants so we can go to conferences and you see when you go to conferences, you’re not going for yourself alone you go on behalf of the university and on behalf of Lesotho. I went to a conference in Hong Kong and that was the first time many people heard about Lesotho. Yes, it opens up this country to the academic world to find out, and I got some Chinese friends who seem eager to visit Lesotho” (Catherine, Law).

Thus staying relevant seems to highlight the fact that academics need to remain competitive and relevant as professionals in the workplace. Thus professional identity seems to be influenced by the need to test knowledge, to advance careers and to become more effective in work roles.

### **‘Draining but rewarding’**

Participants were of the view that working at the university was draining yet rewarding. Interactions between academic staff and their students were found to be key in these perceptions. For some participants, there was an acknowledgement that interactions with students were interesting, rewarding and enjoyable. There was also a recognition that academic work contributed to the social exposure that academics valued, which left them feeling appreciated and esteemed. Conversely, academic work was said to be draining, with some participants complaining that class sizes at the university were too big, leaving them feeling emotionally, physically and mentally exhausted:

“The classes are so big that sometimes we even compromise what we are giving students. For instance, now we hardly...sometimes we don’t give these students the required number of tests. Under normal circumstances we have to give them the minimum of three pieces of work so as to be able to calculate their coursework. But sometimes you find that you are forced to confine yourself just to two; why? Because the numbers are so big. You teach a number of courses with large numbers and it becomes very, very difficult” (Maxwell, Social Sciences).

Some participants expressed concern over students’ lack of interest in their studies; they complained that students at the university had a culture of showing up for class and expecting lecturers to spoon-feed them “You teach so many and so few actually participate to see whether they hear you or not. Sometimes it’s like you are talking to air” (Chris, Agriculture). Other participants reported that students’ academic results did not reflect the hard work that they as lecturers put in teaching:

“Marking is so draining; especially to mark students who give you back what you taught them. Really, it’s tiring. You know sometimes they give you the same examples you gave them in class? It’s so incredible how they just take their studies so lightly like that” (Chris, Agriculture).

Besides attitudes toward general learning, students’ were also said to be truant and even when in attendance they were non-participative in class which affected academics’ professional self-images negatively. Participants also reported being surprised when they administered tests that they had many more students registered for courses who were not attending classes regularly. “You can find out that probably in the class maybe of 147 maybe 40 or 50 students are not in. That I discovered when giving them test scripts, so that is a big challenge” (Maxwell, Social Sciences). It also emerged that sometimes students who carried forward failed courses experienced double-booking which negatively affected their class attendance, “Sometimes when you go to class, you find that there are no students because apparently your class clashes with another class” (Emily, Humanities). Other issues mentioned by participants referred to plagiarism amongst students and recurrent student riots at the university caused mainly by delays in the administration of bursaries and student stipends. Even so, most participants were happy with relationships with colleagues; workplace alliances and relationships were found to afford participants a chance to learn about other disciplines:

“Interacting with other people... we are so many here and of different disciplines. I practically got a friend in every faculty and I tend to learn a lot from them. I mean now I can tell you a lot about women in law because I like to interact with ladies in the faculty of Law” (Amanda, Health Sciences).

Although professional self-images benefited from the cordial relations between academics and their colleagues, it emerged that some academics had experienced the opposite; some had not been oriented into their various roles and responsibilities as academics which left them feeling isolated and overwhelmed by their work while others encountered problems of assimilation into the system.

## **IV. DISCUSSION**

The literature states that university lecturers’ professional identity develops through a combination of self-efficacy, job satisfaction, motivation and occupational commitment (Canrinus et al., 2012; Kelchtermans, 2009). The study’s theoretical framework (structural symbolic interactionism) holds a similar view. It states that every identity has self-meanings that affect behaviour and motivate individuals, it is also relational and reflexive (MacKinnon, 1994). Similarly, the study revealed that professional identities at NUL derived from the nature of academic work itself; it allowed the exercise of self-efficacy through job autonomy, control and flexibility. However, it was realized that the perceived independence in academic work was actually temporary and hinged on adherence to institutionalized norms and tenure. The findings also revealed that power relations within discipline based cultures influenced the professional identity of academics. Further, the findings showed that university lecturers at NUL identified more with their teaching

when compared to research and/or community service. This perception was found to enhance positive attitudes towards work. It also emerged from the findings that opportunities (although they were limited by lack of resources) to develop and grow that the university as well as the perception that academic work afforded lecturers academic growth enhanced occupational commitment.

Overall, the study showed that professional identity developed from how university lecturers perceived themselves based on their interpretations of their continuing interaction with their context (Kelchtermans, 2009). Thus the study showed that academic professional identities are influenced by interactions with others within discipline-based cultures (Clarke et al., 2013), the profession itself (Pifer & Baker, 2014:118) and the attitudes academics maintain towards their jobs (whether good/bad), resulting from diverse features of their work and experiences (Celik et al, 2011:8). Similar to Van Lankveld et al (2017), interactions with students were described as strengthening for academic professional identities. Similarly, the study found that participants' professional identity was enhanced by enjoyment of teaching and collaborations with colleagues. It was also enhanced by professional autonomy, innovativeness, and being acknowledged and appreciated by others. Conversely, similar to Van Lankveld et al (2017), academics at the university complained about the context of their work (general working conditions and students' learning culture) which were found to even influence their intention to quit academe.

The study draws attention to the view that professional academic identities are "co-constructions with an individual's traits, beliefs and commitments" (Taylor, 2008:29) derived from the work they do (Barbara-i-Molinero et al., 2017). That is, academic professional identities derive from academics' entire thoughts, feelings, self-evaluations and imaginations of who they are; thus they are meanings that they hold about themselves, based on their observations, inferences, wishes, desires and how others act toward them (Stets & Burke, 2003:5). Consequently, it was evident in the findings that Burke's (1980) cognitive approach could be used to theorize the development of professional identities as it showed that they are not only reflexive and symbolic in nature, but they are also realized through interaction between actors and others (Burke & Reitzes, 1991:84). Thus professional identities among academics at the university were found to be based on sets of meanings that academics hold for themselves that define 'what it means' to be who they are as individuals and as role players (Burke, 2004:5).

## V. CONCLUSION

Thus professional identity is a multi-layered concept, often interpreted in terms of individual's self-perceptions as part of their professional practice (Canrinus, 2011). Against this background this study sought to describe job experiences within discipline-based cultures which influence the professional identity of university lecturers and show which aspects of their work enhanced or diminished the development of professional identities. The study showed that the context and interactions with others within it were crucial to this construction of professional selves. Similar to Barbara-i-Molinero et al (2017), the study found that social experiences, the educational context, perceived congruence with the profession, professional experience, opportunities for personal development and self-engagement influenced professional development at NUL. The study also established that academic staff at NUL identified more with their teaching roles (Komba et al., 2013) and this together with the alignment of individual expectations, professional values and working conditions determined the development of professional self-concepts. This confirmed Van Lankveld et al's (2017) statement that perceptions of the work environment as collegial and supportive enhanced professional identities. This study therefore concludes that academic staffs' professional identities are key in the way they assign meanings to themselves; hence they help academics claim purpose and meaning from their work (Slay & Smith, 2011:87). Therefore Burke's (1991:837) view that identities as sets of meanings applied to the self as an actor in a social role or a situation which defines what it means to be who one is has been confirmed.

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# Mediation analysis of fuel cost on maintenance cost and production- bench drilling phase of diamond wire sawing technique of Stone Extraction

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## Abstract:

Maintenance cost is the expenses incurred for either or both of proactive and reactive maintenance. There is a moderate and statistically significant correlation between maintenance cost and production. Fuel cost is the expenses incurred as diesel and lubricants' consumption. When production is regressed on maintenance cost, the regression model is statistically significant and maintenance cost has a statistically significant and moderate influence on production. This paper aims to find the mediation effect of fuel cost on the relationship between production and maintenance cost. Pearson correlation suggests that fuel cost has statistically significant and strong correlations with both of these variables. When production is regressed on maintenance cost and fuel cost for the mediation analysis of fuel cost, the regression model suggests that fuel cost has statistically significant and strong influence on production but in this model maintenance cost has statistically insignificant and negligible influence on production. This shows that fuel cost has mediation effect on the relationship between maintenance cost and production.

## Index terms:

*Fuel cost, maintenance cost, mediation analysis, bench drilling, diamond wire sawing*

## I. INTRODUCTION

Bench drilling is the first phase of diamond wire sawing technique of dimension stone extraction. Different costs incurred in this phase can be divided into five major components i.e. fuel cost, labour cost, maintenance cost, depreciation cost and insurance costs. Both diesel consumption and lubricants consumption are function of operating time. There are two types of maintenance, proactive maintenance and reactive maintenance [1]. Proactive maintenance may be a pre-planned, scheduled activity while the reactive maintenance may not a pre-planned activity but to make the machine operational after sudden breakdown due to any unforeseen reason. An unforeseen damage to the machine or some part/ accessories of it may also cause spillage or wastage of fuel.

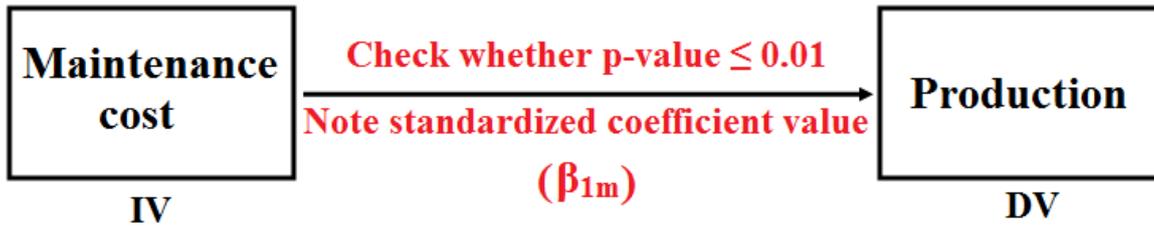
Various researchers have analyzed different operational parameters [2, 3, 4, 5, 6, 7, 8] but least research has been done on the relationship between cost components and production [9] and especially the influence of different cost components on each other. This paper aims to find whether there is any mediating effect of fuel cost on the relationship between maintenance cost and production for the bench drilling phase of diamond wire sawing technique of dimension stone extraction.

## II. MATERIAL AND METHOD

Hypothesis testing approach is used in this research. This research focuses only on fuel cost and maintenance cost as major cost components incurred during bench drilling phase of stone extraction through diamond wire sawing. Fuel cost includes the expenses incurred due to diesel consumption to operate compressor. Operators prefer to estimate diesel consumption on hourly basis to analyze the performance of the machine. Fuel cost also includes the expenses due to the consumption of lubricants associated with the compressor operations e.g. engine oil and hydraulic oil etc. Generally lubricants' change is a function of time e.g. engine oil needs to change after 150 operational hours of compressor and hydraulic oil needs to change after 2,000 to 2,500 operational hours (manufacturers' proposed). Maintenance cost includes the expenses incurred for both proactive and reactive maintenance of compressor and the drilling machines. Monthly data of production and both fuel cost and maintenance cost for a span of four and a half years has been taken from Black granite quarry of M/s Indus Mining (Private) Limited. The raw data was checked for presence of any outlier entries.

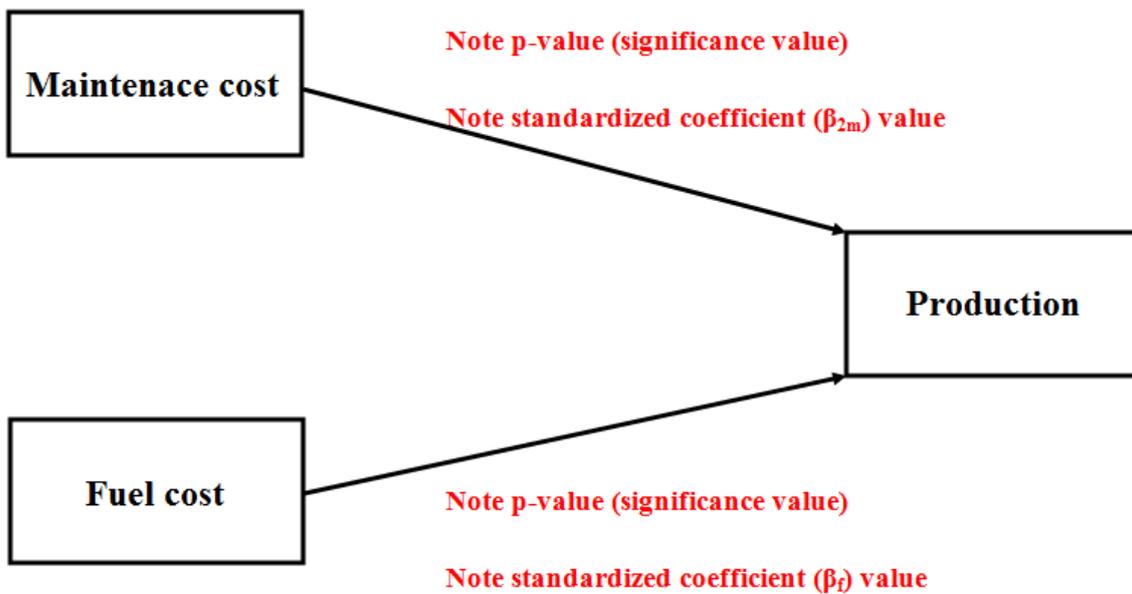
Production has a strong and positive correlation with both maintenance cost and fuel cost incurred during bench drilling phase of dimension stone mining [9]. This research is based on the assumption that fuel cost mediates the relationship between maintenance cost and production. One prerequisite condition for the mediation analysis is that all of these three variables,

production, maintenance cost and fuel cost must have a moderate to strong and statistically significant correlation ( $p\text{-value} \leq 0.01$ ). For the purpose of hypothesis testing, the significance level ( $p\text{-value}$ ) is set as 0.01. Null and alternate hypothesis are developed to find the presence of any mediation effect of fuel cost on the relation between maintenance cost and production. Two regression models were developed to test hypothesis. First regression model includes production as dependant variable and only maintenance cost as independent variable as shown in figure 1.



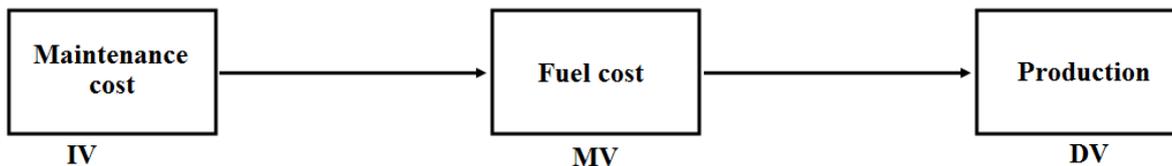
**Figure 1:** Regression model (mediator variable excluded). (IV: Independent variable, DV: Dependent variable)

There was no inclusion of fuel cost (possible mediator) in this model. Standardized Beta value of maintenance cost ( $\beta_{1m}$ ) and its significance was noted. Second regression model includes production as dependant variable and maintenance cost and fuel cost (possible mediator) as independent variables as shown in figure 2.



**Figure 2:** Regression model (mediator variable included).

Standardized Beta value of maintenance cost and its significance was also noted. The  $p\text{-value}$  and standardized beta coefficient value of maintenance cost in both models were compared. If the standardized beta coefficient value of maintenance cost in second model ( $\beta_{2m}$ ) reduces and becomes insignificant, there will be a mediation effect of fuel cost on relationship between maintenance cost and production as shown in figure 3.



**Figure 3:** Mediation model used in this research (IV: Independent variable, MV: Mediator variable, DV: Dependant variable).

Null hypothesis is proposed as follows:

*Null hypothesis:*

“For the bench drilling phase of diamond wire sawing technique of dimension stone mining, fuel cost does not mediate the relationship between maintenance cost (independent variable) and production (dependant variable)”. **Condition 1:**  $\beta_{2m} \geq \beta_{1m}$ . **Condition 2 (optional):**  $p\text{-value of maintenance cost in 2<sup>nd</sup> model} > 0.01$ .

*Alternate hypothesis:*

“For the bench drilling phase of diamond wire sawing technique of dimension stone mining, fuel cost mediates the relationship between maintenance cost (independent variable) and production (dependant variable).” **Condition 1:**  $\beta_{2m} < \beta_{1m}$ . **Condition 2 (optional):**  $p\text{-value of maintenance cost in 2<sup>nd</sup> model} \leq 0.01$ .

In order to accept any of the above two hypotheses, either or preferably both conditions should fulfill.

III. ANALYSIS

First of all three variables of mediation model were tested for Pearson-correlation. Table 1 shows the magnitude and significance level of Pearson correlation. From table 1, it can be deduced that all correlations are statistically significant ( $p$ -value  $\leq 0.01$ ). Production has a strong correlation with fuel cost ( $r = 0.664$ ) and moderate correlation with maintenance cost ( $r = 0.365$ ). Similarly, there is a strong and significant correlation between maintenance cost and fuel cost ( $r = 0.538$ ). Hence the pre-requisite condition of statistically significant and moderate/ strong correlation between three variable of the tested model fulfills.

**Table 1:** Pearson correlations between production, maintenance cost and fuel cost (N=54).

		Production	Fuel cost	Maintenance cost
Production	Pearson Correlation (r)	1		
	Sig. (2-tailed)			
Maintenance cost	Pearson Correlation (r)	0.365**	1	
	Sig. (2-tailed)	.000		
Fuel cost	Pearson Correlation (r)	0.365**	0.538**	1
	Sig. (2-tailed)	.007	.000	

\*\* . Correlation is significant at the 0.01 level (2-tailed).

Regression analysis will be done with maintenance cost as independent variable and production as dependant variable. Table 2 shows that the ANOVA test (and hence the regression model) is statistically significant.  $R^2$  value of 0.133 reflects that the model accounts for only a little more than 12% of the variation in the data.

**Table 2:** ANOVA test results (IV: Maintenance cost; DV: Production).

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	525245.414	1	525245.414	7.977	.007 <sup>a</sup>
Residual	3424117.420	52	65848.412		
Total	3949362.833	53			
a. Predictors: (Constant), Maintenance cost					
b. Dependent Variable: Production					
$R^2 = 0.133$					

Table 3 shows the regression analysis results where production (dependant variable is regressed on Maintenance cost (independent variable).

**Table 3:** Regression analysis results (IV: Maintenance cost; DV: Production).

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta ( $\beta_i$ )		
1	(Constant)	475.805	86.201		5.520	.000
	Maintenance cost	.005	.002	0.365	2.824	.007
<b>Dependent Variable: Production</b>					$R^2 = 0.133$	

The  $p$ -value for maintenance cost is 0.007 which is less than 0.01. This suggests that the influence of maintenance cost on production is statistically significant. Hence the relationship of maintenance cost (independent variable) and production (dependant variable) can be tested for mediation. The beta value (standardized coefficient) is 0.365 which suggests that if there is only maintenance cost in the regression model, for 1 standard deviation in maintenance cost, there will be 0.365 standard deviations in production.

In order to check the mediation effect of fuel cost, the production is regressed on both variables of fuel cost (expected mediator) and maintenance cost (dependant variable). Table 4 shows the ANOVA analysis results. The  $p$ -value of this regression model is less than 0.01 which shows that this model is also statistically significant.  $R^2$  value for this model increases to 0.442 which suggests that this regression model accounts for 44.2% variation in the data.

**Table 4:** ANOVA test results (IV: Maintenance cost, Fuel cost; DV: Production).

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	1743684.078	2	871842.039	20.159	.000 <sup>a</sup>
Residual	2205678.756	51	43248.603		
Total	3949362.833	53			
a. Predictors: (Constant), Fuel cost, Maintenance cost					
b. Dependent Variable: Production					
R <sup>2</sup> = 0.442					

Table 5 shows regression analysis results of this model where production (dependant variable) is regressed on both maintenance cost and fuel cost (independent variables).

**Table 5:** Regression analysis results (IV: Maintenance cost, Fuel cost; DV: Production).

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta ( $\beta_1$ )		
1	(Constant)	228.182	84.005		2.716	0.009
	Fuel cost	.001	.000	0.010	0.083	0.934
	Maintenance cost	.000	.002	0.659	5.308	0.000
<b>Dependent Variable:</b> Production				R <sup>2</sup> = 0.442		

From table 5, it is observed that the influence of fuel cost on production is statistically significant (p-value<0.01) and strong (standardized beta coefficient value = 0.659). On the other side, the previously statistically significant influence of maintenance cost on production has now become statistically insignificant (p-value= 0.934>0.01) and the influence has also decreased ((standardized beta coefficient value = 0.010). Following conditions of mediation fulfill:

- After the introduction of mediator in the regression model, the influence of mediator (fuel cost) on dependant variable (production) is strong and statistically significant.
- The influence of independent variable (maintenance cost) on dependant variable (production) becomes statistically insignificant and weak.

Hence, the results reject null hypothesis and accepts the alternate hypothesis which states that:

*“For the bench drilling phase of diamond wire sawing technique of dimension stone mining, fuel cost mediates the relationship between maintenance cost (independent variable) and production (dependant variable) (i.e. p-value≤0.01)”*.

#### IV. CONCLUSION

This research deduces that maintenance cost first affects fuel cost which eventually affects production. The reason for affect of maintenance cost on fuel cost may be the reactive maintenance when lubricants (especially hydraulic oil) pipes get damaged thereby causing spillage and drainage of lubricants from the pipe lines. Lubricants line may damage due to strike of a stone or hot weather. Once the lubricant drains, there will be a need to refill the lubricants’ storage vassal again for smooth working of pumps etc. Similarly frequent leakages from O-rings of lubricants’ pipe may also be the reason of excessive lubricants’ consumption affecting the overall fuel costs. One other notable reason may be the complete overhauling of hydraulic pump and/ or hydraulic assembly which results in complete, unscheduled change of hydraulic oil in the storage tank.

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# The Impacts of Globalization on the Military Instrument of Nigerian Foreign Policy (2012-2018).

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**Abstract:** *Many of us still think of the world vis-à-vis parts: different countries and peoples. However, the different parts of the world are now intermeshed across spatial and temporal trajectories into a synchronic order; a whole which has many commonalities and connections that cut across political borders, national identities and cultural differences. Little wonder the world is now called a “global village” because of the interconnectedness of economic, technological, religious, communications and transportation, military and political activities among people of the distinct states and societies on earth. Therefore, it is the purpose of this paper to investigate the impacts of globalization on the military aspect of Nigeria’s foreign policy tool. The study’s design is descriptive and it undertakes a content analysis of secondary data sources. Likewise, the study adopts the Behavioralist theory. The paper argues that the success achieved by implementing a carefully planned policy, hence, depends on the skillful utilization of tactical instruments, tools and globalization has great impacts on the shaping and usage of these tools for the formulation of well-grounded foreign policies in a rapidly changing world of complex interconnectedness.*

**Keywords:** *Globalization, foreign policy, foreign policy instruments.*

## INTRODUCTION

Rourke (2009) was precise in noting that when Rudyard Kipling predicted in 1889 that “East is East and West is West and never the twain shall meet”, he would not have foreseen the degree to which globalization would prove him wrong. Just like Kipling, many of us still think of the world vis-à-vis parts: different countries and peoples. However, the different parts of the world are now intermeshed across spatial and temporal trajectories into a synchronic order; a whole which has many commonalities and connections that cut across political borders, national identities and cultural differences. Little wonder the world is now called a “global village” because of the interconnectedness of economic, technological, religious, communications and transportation, military and political activities among people of the distinct states and societies on earth.

Globalization which spawned a new international system is not a novelty. It must be noted that the Westphalia Treaty of 1648 presented an era of sovereign nation-states interactions. The purpose and logic of the interactions among states have increased and are gaining grounds; every state, no matter how small, endowed or powerful must relate with other states. These transborder links of interdependence have cracked the capability of states to pursue security, economic and political goals via the traditional uses of power and in the course of these rapports, state set foreign policies, principles objectives vis-à-vis national interest, that guide their interaction with their external environment. The success achieved by implementing a carefully planned policy, hence, depends on the skillful utilization of tactical instruments, tools and globalization has great impacts on the shaping and usage of these tools for the formulation of well-grounded foreign policies in a rapidly changing world of complex interconnectedness.

## STATEMENT OF THE PROBLEM

Since the last two decades, globalization has taken center stage to become one of the greatest themes in foreign policy. Nations are constantly impacted by the increasingly evolving nature of global events. Global events transcend borders to the point that an issue happening in nations thousands of miles away may have direct impacts on the security, peace, development, lifestyle or health of other nations within or outside the continental location of the issue. These affect States' international relations and reduces their capability to pursue strict military or economic policies without recourse to the wellbeing of others – state and non-state actors. Generally, scholars of globalization differ on what areas of social life is most impacted by globalization. Over the years, a lot of emphases have been placed on the economy, communications technology and the spread of cultures with the relegated importance of globalization's impact on politics. More so, there exists in globalization literature arguments on the declining relevance of territorial boundaries. They is the belief that globalization blurs the distinctions between the domestic and the foreign or what scholars like Hill (2003) call the 'inside' and 'outside.' This notwithstanding, the question then is: when this distinction is blur, how can we determine what is *foreign* in foreign policy?

## OBJECTIVES OF THE STUDY

Imperatively, this essay is geared at explicating on the impacts of globalization on the military aspect of Nigeria's foreign policy tool. More specifically, it serves:

- i. To identify the meanings of foreign policy and globalization;
- ii. To determine the multidimensional nature of globalization;
- iii. To identify the distinct foreign policy tools as used by states; and
- iv. To discover the effects and consequences of globalization for the nation-state system.

## CONCEPTUAL AND THEORETICAL ANALYSIS

It is difficult to reduce foreign policy to a single definition as there are myriad of them. For instance, Frankel (1969) saw foreign policy as consisting a decisive action which involves to some appreciable extent relations between states. However, some states are seen not to have taken any action in response to a situation e.g. the US and Russia's refusal to intervene in Syria (2011) and Iraq (2003) respectively. This inaction is an action in itself (as one cannot be politically neutral) (Duke, Agbaji, Charles, Akhabue & Elemi, 2018). To Light (1999) foreign policy is the official relations that take place between the units of the international system. Light focusing only on those official relations makes the definition laden as there are a plethora of relations between states which are unofficial. More so, Holsti (1992) defined foreign policy as the action of a state toward the external environment and recognition,

usually domestic under which these actions are formulated. Holsti looking at the domestic level is oblivious of the fact that a nation's politics and economy and its interactions cannot be construed without preference to the world system (external) of which it is a part. To that extent, therefore, we can describe foreign policy as comprising all (official and unofficial) relations and/or objectives, principles, values vis-à-vis national interest which guide and direct states' intercourse with other units/actors of the international system.

More so, globalization is a slippery and elusive concept. Despite intensifying interest in the phenomenon since the 1980s, it is still used to refer variously to a process, a policy, a marketing strategy or even an ideology (Heywood, 2007), it is thus difficult to reduce globalization to a single theme or definition as there are myriad available. For instance, McGrew cited in Randall and Theobald (1998) saw globalization as the multiplicity of linkages and interconnections that transcends the nation-states which make up the modern world system. According to Ohmae (1989), globalization is a borderless world, i.e. it not only refers to the tendency of traditional political borders, based on national boundaries to become permeable, it also implies that division between people previously separated by time and space have become less significant and are sometimes entirely irrelevant.

According to Robertson (1992:8), globalization refers to the "compression of the world and the intensification of consciousness of the world as a whole." This definition raises three (3) issues: (1) globalization is a (long term) process, thus, today's mass communications satellites and tourism represent an acceleration and deepening; (2) it should not be read as creating a uniform response as people, conscious or unconscious of it, may respond differently; (3) what is been compressed is space, thus, leading towards homogenization or supraterritoriality (Brown, 1995; Scholte, 2005).

Globalization is multidimensional. In particular we need to recognize its economic, cultural and political dimensions. Economic globalization is a shift from a world of distinct national economies to an integrated global economy in which production (and exchange) is internationalized and trade, financial capital, technology and information etc, flow freely and instantly between nations (Heywood, 2009, Obadan, 2004, Randall & Theobald, 1998). Cultural globalization is a process whereby people, information, language, clothes, food, religions, diseases, movies etc, from one culture spread globally. Migration patterns, global tourism which brings jobs offer, foreign exchange and shape mental images of people and places fall under this (Heywood, 2007, Kaarbo & Ray, 2011, Legraine, 2003). Political globalization is evident in the growing number and significance of international organizations such as the European Union (EU), the United Nations (UN), World Trade Organization (WTO), North Atlantic Treaty Organization (NATO), and the Organization of Petroleum Exporting Countries (OPEC), among others, and non-states transnational actors which compose a new system of global governance (Legrain, 2003, Archer, 1992, Heywood, 2007). For instance the UN has taken more roles, peacemaking and humanitarian intervention without the consent of states and provides forum for debate (Kaarbo & Ray, 2011).

Added to the foregoing analysis, Castells cited in Keukeleire and Schunz (2008) explained a fourth dimension they call 'the fourth main catalyst of globalization: technological development.' According to them, "... globalization has been enabled by the rapid evolution of communication, information and transport technology, which allow together for a decrease in importance of distances and, thus, the compression of space and time" (Keukeleire & Schunz, 2008:7). To that extent, therefore, globalization can be described as meaning that our lives are increasingly shaped by events that occur and decisions that are made at a great distance from us, thus, the declining relevance of territorial boundaries.

It can be deciphered from the foregoing that its multidimensional nature, nevertheless, globalization not only has severe effects but also has great consequences. So, it can be said to be like a coin possessing opposite sides: one side creates numerous

opportunities for some; and the other presents grave threats to the sustenance of others. In fact, we cannot but agree with McGrew (2005) that the area of social life which is most affected by the effects of globalization is politics. In fact, Keukeleire and Schunz (2008:7) explained this position in this way: “Not only are all levels of policy-making – from the local to the global – in one way or the other affected, but the predominantly territorial organization of politics itself is being put to the test.” So, political matters are affected by globalization, irrespective of which dimension, and nations are increasingly pressured to make decisions and severe, maintain or form alliances based on the world’s swift and ‘progressive’ changes. Added to this is the fact that the declining relevance of territorial boundaries blurs the distinctions between the domestic and the foreign or what scholars like Hill (2003) call the ‘inside’ and ‘outside.’ When this distinction is blur, how can we determine what is *foreign* in foreign policy? Consequently, globalization challenges how foreign policies are made. Though different arguments exist regarding the validity of the claims of the slow but progressive erosion of the nation-state borders system, nations and their policy makers consistently seek solutions – sometimes alone, other times through collaboration with other state or non-state actors – to novel challenges, thus, increasing the value of the idea of foreign policy.

The instrument with which nations pursue their foreign policies (a subject we will discuss later on in the study) are also largely affected by globalization. The closer the world get the more redundant the traditional focus on solely military and/or material capabilities to steer the instruments required to conduct foreign policy. So, states’ power structure in the international system is not entirely determined by the existing strength of the nations’ military or economy but by the networks or alliances they create and maintain. What is important and emphasized here, as Webber & Smith (2002) wrote, is influence and communications and structural power while coercion becomes less prominent and only sought for when all other options are exhausted by nations acting within a governing structure. As such, the tool to be used here is widely determined by the governing body of the mutually established structure. To sum it all up, Keukeleire and Schunz (2008:9) observed that:

*If globalization restructures the world as we know it, dealing with these transformative processes – through (foreign) policy – amounts in essence to “globalizing structures” ... i.e. adapting the political frameworks in which actors interact to the realities of a de-territorializing world.*

We must mention here that foreign policies are pursued through different means. These instruments for conducting foreign policy generally refer to the mechanisms used by States in conducting their relationships with other States (Akinboye, 1998). These tools comprise: Diplomacy; Propaganda; Economic measures; Cultural dimensions; and Military persuasions.

## **Diplomacy**

It is by far, (usually) the first, most peaceful and most important tool by which States mutually attempt to adjust their respective national interests. Crudely put, it is the conduct of inter-state relations by means of negotiations (Akinboye, 1998). G. Kennan saw it as the business of communicating between governments (Okoro, 2006). A more comprehensive definition is that diplomacy is the official state-to-state conduct of communications by means of negotiations usually by States’ officials: presidents, ambassadors, high commissioners, and so on, who use tact, intelligence, conciliation, arbitration, and commonsense to reach agreements, compromises, and settlements peacefully rather than by war (Holsti, 1992). It is commonly bilateral but the growing importance of international and regional conferences and organizations have shown its multilateral aspects (Palmer & Perkins, 2007; Akinboye, 2008; Akinboye & Ottoh, 2014). In most cases the purpose of diplomacy between States is to change or sustain each

other's objectives and policies to reach an agreement over some contentious issue, e.g. the Nigeria-Cameroon Bakassi Peninsula dispute (Okoro, 2002).

The machinery of diplomacy in a modern State consists of two major parts. First, there is the home establishment; the governmental department, referred to in Nigeria as the Ministry of Foreign Affairs, and in the United States of America as the Department of States, under the Chief Executive, entrusted with the basic responsibility for the conduct of foreign affairs. Second, there is the diplomatic mission abroad, the embassies and legations, and their respective staff. Protected by international law from civil and criminal laws of the host States, through three sets of rules concerning protocol, immunities, and non-interference (Holsti, 1992), the diplomatic mission gathers information that affects relations between the two States, handles complaints and requests that might threaten the existing routine, administers foreign policy objectives, symbolically represents the home country (through social contacts at ceremonies), expands commercial interests, protects nationals, and so on (Okoro, 2002; 2006; Holsti, 1992).

### **Propaganda**

Propaganda generally refers to "any systematic attempt to affect the minds, emotions, and actions of given groups for a specific purpose" (Frankel, 1969 in Okoro, 2006). It can also be seen as the deliberate attempt by governments to influence the attitudes and behaviors of foreign populations, or of specific ethnic, class, religious, economic or language groups within these populations, with the hope that the foreign group will influence their government's actions (Holsti, 1992). It involves the extensive use of the mass media (Akinboye, 1998).

Propaganda differs from diplomacy, as Holsti (1992) aptly captured, because first, propaganda is addressed to the people in other States rather than to their government, and it is selfish, governed exclusively by the national advantage of the propagandist. Hence, since propaganda is used by States to create favorable attitudes abroad and decrease other States' ability to oppose their policies, it is, thus, believed to serve negative purposes (see Holsti, 1992).

Politically motivated propaganda program involves four essential components: a communicator or propagandist with a view to changing attitudes and opinions of others; the symbol – written, spoken, or behavioral – used by the communicator; the media of communication; and the audience or the target. Therefore, the first task in developing a propaganda is to identify the target; catch the target's attention; after these, the propagandist may use a variety of techniques in delivering the message(s) – name calling, fear, testimonial, bandwagon, frustration scapegoat, and so on (Holsti, 1992; Okoro, 2006).

### **Economic Measure**

The conduct of modern policy requires much more than just traditional contact between States and their officials. Therefore, owing to the complexities of commercial transactions and the structure of economic relations between societies, governments, in seeking to change or sustain the behavior of others, have a broad range of economic instrumentalities, which can lead to, as Holsti (1992) wrote, "the manipulation of economic opportunities and transactions to create vulnerabilities which can then be organized for all sort of political purposes."

These economic instruments include: tariffs; quotas; boycotts; embargoes; international trades; loans, credits and currency manipulations, freezing assets; blockades; blacklisting; expropriation; economic sanctions; granting or withdrawal of foreign aids and investments, and so on (Akinboye, 1998; Akinboye & Ottoh, 2014; Okoro, 2002; 2006). Foreign aids an expression of benevolence,

goodwill, and generosity by the donor nation to the recipient nation. Aids go to few States, especially those that are most strategically relevant to the donor state for the realization of its foreign policy objectives as well as for ensuring the cooperation of the poor state(s). For example, the US Marshall Plan – a \$16.5 billion program – was aimed at reconstructing the war-torn Western European and Japanese nations and economies, and to reduce the spread of Soviet-propagated Communism in Western Europe and Japan. In a relatively open world economy, corporations, governments and individuals often maintain assets abroad, in the form of investments, bank accounts and real estates. If sufficiently large, such assets can become hostages (Holsti, 1992). For example, in 1979, the US froze assets of Iran, amounting to almost \$12 billion, in retaliation for the invasion of the United States' embassy in Tehran. The US and Europe froze the assets of top Russian businessmen who made-up key sectors of the Russian economy because of the Russian invasion of Crimea in 2014. Embargo involves the prohibition of exports from entering the country concerned, thus, starving it of vitally needed scarce resources, lower its citizens' living standard, and create domestic crises for the State. For instance, the Arab oil embargo on the United States was an effort to weaken America's pro-Israeli foreign policy.

## **Culture**

Culture can be seen as the total way of life of a particular group of people. More elaborately, according to Taylor (1924) cited in Okoro (2002) it is the “complex whole which includes knowledge, beliefs, arts, morals, laws, customs, and any other capabilities and habits acquired by man as a member of society.” Consequently, it can be discern that every society has its own distinctive values and life styles from those of others. These have been, thus, used as a major political weapon.

Sports has become the most prominent aspect of the cultural dimension of some countries foreign policy. Nigeria for instance, has invested much in sports to facilitate and reinforce international understanding and friendship among the various countries of the world. Nigeria's involvement in the World Cup, Olympic Games, Commonwealth Games, World Athletic University Games, and the African Nation's Cup, inter alia, have contributed as influencing factors in Nigeria's foreign relations (Okoro, 2006). For instance, in 1976 and 1978, Nigeria led other members of the OAU and Commonwealth to boycott the Montreal Olympic Games and the Edmonton Commonwealth Games, respectively to protest New Zealand's sporting links with Apartheid South Africa which contravened United Nation's embargo on such links (Akinboye, 1998). Another is the area of festival. The Calabar Carnival is a major tourist attraction which helps boosts Nigeria's foreign relations with the outside world. Also, the creation of the (second) World International Festival of Arts and Culture (FESTAC) organized in Lagos in 1977 was poised at bringing Blacks the world over together to establish close links and solidarity to fight for Black liberation from racism and oppression. It also attracted Afro-American politicians and businessmen to Nigeria (Okoro, 2006).

## **Military Persuasion**

It involves the use of force, terror, and military coercion in conducting foreign policy objectives of States. That is, to achieve and/or defend interests and promote social values abroad, governments may – instead of sending diplomatic notes or making military threats – invade a foreign territory with its troops, influence voluntary organizations, attempt coups d'état, and so on (Akinboye, 1998; Holsti, 1992).

It has been observed that force as an instrument of foreign policy has a face value distinct from its intrinsic value. The face value is that every State has got a force, while the intrinsic value is how effectively such force could coerce other States (Okoro, 2002). Thus, when States' relation center on the survival interests of States defined strictly vis-à-vis national defense, an all-out national effort to protect their citizens is required in the face of immediate danger to the security of the State (Okoro, 2006). For <http://dx.doi.org/10.29322/IJSRP.9.04.2019.p88102>

instance, the United States invaded Iraq in 2003, unilaterally and militarily because it perceived Hussein's Iraqi government as a threat to Iraqi citizens, the US, and the world, as an end of the regime's proliferation of weapons of mass destruction (WMDs), abuse of human rights, and ties with global terrorism (links with Al-Qaeda).

Owing to its violent nature which often results in wars, it is often adopted as the last resort when diplomacy and other subtler or peaceful mechanisms fail. For instance, in 1991, the UN Allied Forces led by the US went to war with Iraq when series of negotiations failed to resolve the gulf crisis between Iraq and Kuwait. Similarly, Nigeria in 1983, went to war with Chad when the issue at stake defied resolution through negotiation (Akinboye, 1998). Nigerian rulers overtime, sometimes seen as "pacifist", have resorted to the use of military force as an instrument of pursuing Nigeria's national interests rather infrequently. Military forces have effectively been used in peace keeping operations under the auspices of the United Nations, the African Union, and the Economic Community of West African States (ECOWAS). For example, Nigeria partook in the peacekeeping in the Belgian Congo in the 1960s, in Liberia during its civil war, in Sierra Leone, and so on.

### **Theoretical Analysis**

The study adopts the Behavioralist theory of International Relations. This theory, a post-World War II creation, is a fall-out of the revolution or the earliest criticism against positivism – Idealism and Realism – initiated by the works of David Easton, Robert Dahl, Karl Popper, David Butler, Albert Somit and Joseph Tanenhaus, Sidney Ulmer, and Richard C. Snyder and his associates in the 1950s, aimed at developing a "systematic treatment of decision-making phenomena in the study of foreign policy and international politics" (Anifowose, 1998; Okoro, 2006; 2012).

This approach focuses on the individual beings, rather than the large political unit or collectivities, as the unit of analysis. The analysis of State behavior centers on these individuals (foreign policy makers) who act in behalf of the State (Okoro, 2006). Ulmer (1961) cited in Anifowose (1998) corroborating this adds that, "Political behavior approach is distinguished by its attempt to describe government as a process made up of actions and interactions of men and groups of men." More elaborately, Anifowose (1998) purported that behavioralism:

*...is concerned with the activities of governments, political parties, interest groups, and voters. Institutions are rejected as the unit of analysis because government, after all, is not made up of merely of documents, containing laws and rules or of structures of a particular form but is fundamentally based upon patterns of actions and activities of men... Thus, the unit of analysis of behavioralism should be the observed behavior and relationships of men (p. 30).*

The approach, therefore, discusses decision-makers as individuals who arrive at their decisions by confronting their values with their image of the environment, i.e. it utilizes both internal and external factors as they influence decisions made and fine-tuned via the eyes of the individual decision-maker; their worldviews or idiosyncratic factors which shape behavior. In line with is, the discourses in political behavior are devoted to the provision of a sound understanding of the relationship between political actions and political process and/or knowledge, and this makes the subject to now cover issues such as political attitude, participation and culture, all of which show the values, orientations and experiences, explain protests, social movement, resistance, apathy, extremism, wars, voting, and so on.

The behavioral approach serves as a scientific and holistic method of analysis. It argues in favor of conceptualization, quantification, formal hypothesis, testing and the systematic investigation, empirical generalization, and systematic theorization of behaviors in international relations. Thagard and Van Fraasen in Okoro (2012) believe that behavioralism aims not to discover truth, but to produce intellectual structures that provide adequate predictions of what is observed and useful frameworks for answering questions and solving problems in a given domain (and in this case, the domain is foreign policy). In this vein, it provides one-minded, creativity, integration and problem solving as opposed to the theoretical specification, discrimination and warfare between the competing positivist theories (Idealism and Realism) (see Okoro, 2012). These scientific techniques are aptly discernible in the pure sciences – Biology, Physics, Chemistry, and so on.

More still, behavioralism emphasizes intersubjectivity in the accumulation of knowledge (Okoro, 2006). What this means is that, for instance, knowledge acquired and utilized in foreign policy is gotten from ideas from other scholars who have conducted researches on foreign policy and relations of states and from other fields of study, especially those in the Social Sciences like Sociology, Psychology, Economics, and so on. Consequently, intersubjectivity is the basic feature of science; whenever any knowledge or generalization is proposed, other scholars must look into such so as to verify its validity, and to know if it is truthful or to prove its reliability.

The relevance of this theory to the study can be seen in the fact that Nigeria, being an economic and demographic giant in Africa, can pursue a robust foreign policy in Africa through whatever means it feels best secures its national interest but basically through a complex set of rapport between nations and non-state actors like international non-governmental organizations (INGOs) and multinational corporations (MNCs). Thus, Nigeria pursues foreign policies that serve its purpose and the purpose of the international organization it may choose to contribute personnel to. It is, therefore, worth reiterating that states' power structure in the international system is not entirely determined by the existing strength of the nations' military or economy but by the networks or alliances they create and maintain. The ability of its armed forces to navigate through the waterways, fly through the air, and march through land gives the nation a very impressive edge to advance its foreign policy military instrument.

## **IMPACT OF GLOBALIZATION OF FOREIGN POLICY TOOLS**

Giddens (1990) noted that globalizing actions and ties reach across space to shape social life. This causes some effects and Brown (1995) in this regard noted that globalization does not abolish difference or power but it does impact change or affect the context of (domestic and global) politics; how states relate, make and design tools to pursue their foreign policies and so on. In this view, since globalization has positive and negative sides, its impacts the foreign policy tools of nations positively and negatively too. Our focus will be on the impact of globalization on the military tool of Nigeria's foreign policy.

### **Impact of Globalization on Military Instrument of Nigeria's Foreign Policy (2014-2018)**

Just as gunpowder helped destroyed the foundations of the feudal order, mass media of communication, rapid transportation, an interdependent economy, weapon technology and mass politics have helped diminish the impermeability of the state (Holsti, 1992). Hence, the international nature of the world has resulted in distinct forms of relations. These relations in most cases, centre on the survival interests of states defined strictly vis-à-vis national defense thus requiring an all-out national effort to protect their citizens in the face of immediate danger to the security of the states (Okoro, 2006). For instance, the regionalization of Boko Haram attacks has posed severe threats to the human security, socioeconomic, political and environmental development of nation-states in the Lake Chad region. The porous borders of the nations in this region has become a matter of serious concern vis-à-vis the flow of persons

illegally, transborder crimes, terrorism, and the easy shipment of small arms and light weapons – the ills of globalization – which usually end up reaching the hands of terrorists. The Nigerian government, through its armed forces, joined in the collaborative effort to curb the spread of terrorism in the Lake Chad region. This collaborative effort is called the Multinational Joint Task Force (MNJTF) between Nigeria, Chad and Niger. More so, Zamfir (2015) opined that the Paris Summit of May 2014, which brought together the Heads of State of Benin, Chad, Cameroon, France, Niger and Nigeria and representatives of the United States of America (USA), Britain and the European Union (EU), decided to enhance regional cooperation in the fight against Boko Haram by means of coordinated patrols and border surveillance, pooling intelligence and exchanging relevant information. This action by the Nigerian government can be justified using Emilio Mignon's statement that the defense of human right dignity (and security) knows no boundaries (Kaarbo & Ray, 2011). All these complement the Nigerian military's active engagement of Boko Haram insurgents, with the sole objective to annihilate the perceived threat to national security, in Sambisa Forest, a location claimed to be the headquarters of all Boko Haram operations in Nigeria, and which once usurped more than 130 villages and control about 20 Local Government Areas in Northeast Nigeria especially in Borno, Adamawa and Yobe states (a territory the size of Belgium), declared the areas an Islamic caliphate and flew al-Qaeda's flag within those communities (Duke, Agbaji & Etim, 2016).

Also transnational organizations e.g., media houses like Cable Network News (CNN) and the British Broadcasting Corporation (BBC), civil society movements and human right groups, private military firms and so on, influence governments' decision making by providing information owing to their deep knowledge of regional and local issues, cultures and relationships. In view of the hostilities arising from the Northern Mali Conflict between several Islamic rebel groups and the Malian government other states found it needful to intervene through or under the auspices of international regimes like UN and AU among others, to prevent such war from spreading. For example, as reports of vicious attacks on civilians, separatists and Islamists, the ousting of the Malian President, Amadou Toumani, by Amadou Sanogo as well as the destruction of ancient monuments in Timbuktu circulated on the media, social networks and blogs (globalization in information technology) about the Malian uprising of 2012, the UN and AU saw the conflict as a humanitarian crisis demanding international response. So, the Economic Community of West Africa States (ECOWAS) organized and sent a military mission called the Africa-led International Support Mission to Mali (AFISMA) to support the government of Mali against the rebel groups. On January 17 2013 Nigeria deployed air and ground forces to Mali. It is estimated that the Nigerian government deployed about 1200 military personnel for the AFISMA initiative to assist the Malian government (*Al Jazeera English*, 2013). Likewise, the UN established the United Nations Multidimensional Integrated Stabilization Mission in Mali (MINUSMA) which the Nigerian government also contributed personnel.

Furthermore, globalization has created 'radical fundamentalism.' For instance, Boko Haram terrorists have been trained by Al Qaeda of the Islamic Maghreb (AQIM) in Algeria, Mauritania and the Sahel region (Geneva Center for Security Policy, 2017), they adapted the Wahhabist and Salafi-jihadi ideas (Thurston, 2016) – ideological orientations developed in central Arabia, and are financed by international benefactors (links to Al Qaeda and the Islamic State) via International Banks (McCoy, 2014). In fact, one may argue that one reason Nigeria is suffering from religious extremist today is the US-Iraq invasion which multiplied the radical Islamic threat to the US and the world (e.g. currently IS) by mobilizing radical Islamic behaviours and transfer of revolutionary ideas around the world.

## CONCLUSION

This essay has attempted an explication of the phenomena at issue, globalization and foreign policy (tools) which have been defined by scholars all influenced by their personal experiences and environments, hence the inability to arrive at a universally

accepted definition. However, attempts were made to define the terms for the purpose of this work. Likewise, the multifaceted nature of globalization was treated: economic; cultural; and political aspects. These, it must be noted are theoretically distinct but in practice are all woven to aid apt analysis of globalization. The tools which are used to pursue foreign policy were discussed where attempts were made to analyze the military tools, in this vein, the main thesis of this work was treated i.e. identifying the impact of globalization on this tool. Globalization is seen to have impacted the military tools through the sporadic spread of terrorist ideals and rapid transportation to allow states intervene in other states activities. In this vein, states' sovereignty is breached, thus, requiring an all-out national defense effort. Through giant media houses and transnational corporations (TNCs) like CNN, information is given which also shape states' military tools e.g. the Northern Mali crisis, the Libyan crisis, AU and the West's response. Likewise, globalization has created radical fundamentalism. It is this paper's position that globalization has had profound impacts on foreign policy tools and owing to the dynamism of the world and it will continue to impact the world too.

However, it must be noted that the amount of globalization that enters a state is, as Legrain (2003) explained, government controlled. In this vein, national governments must ensure that their borders are effectively manned to reduce the indiscriminate movement of people, drugs, and small and light weapons from country to country since those weapons only end up in the wrong hands and insecurity will of course be the concomitant backwash.

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