SOCIO-ECONOMIC IMPACTS OF SAND DREDGING IN EKOLE RIVER. YENAGOA LOCAL GOVERNMENT AREA, BAYELSA STATE, NIGERIA

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Abstract

Sand mining is an important economic activity and has been undertaken across the world over centuries. However, indiscriminate sand mining activities have detrimental socioeconomic and environmental effects. This study examined the extent of environmental degradation caused by sand dredging activities along Ekole River in Yenagoa Local Government Area of Bayelsa State, Nigeria Using Satellite Remote Sensing Imageries. The Satellite Imageries used include Landsat TM(1990), Landsat ETM(2000), and operational Land Imager (OLI, 2022) and high resolution Google Earth images were used to aid in classification. The socio-economic impacts of sand dredging was derived through the administration of questionnaires to people within the study area. Agricultural land, vegetation cover, and water bodies were extracted from the Imageries and the spatial growth and loss within the study period was established using the Land Change Modeler function on Idrisi Terrset software. The findings revealed that the study area witnessed a magnitude of change of the various land use and cover categories for the period between 1990 to 2022. Built-up areas has the highest annual rate of change of 71.40% followed by

agricultural lands which has the highest annual rate of built-up and other categories at 56.05%. Forest cover and vegetation cover witness decreasing trend by -16.81km representing a change (-24.67) of the total change with annual rate of change of -7.89%. An indication of increased anthropogenic activities across the study area. The results gotten from the compilation of the responses shows that the area has experienced an unprecedented rate of environmental changes due to the anthropogenic activities within their environment that led to urbanization and urban encroachment into agricultural lands, forest and vegetation cover which has subjected the area to some negative environmental and socio-economic impacts such as land degradation, reduction in biodiversity, reduction in water quality, pollution, congestion, increase laziness and poverty and escalation of crime in the area. From the foregoing, it is recommended that environmental friendly measures are expedient to monitor sand mining operations through restoration of lost vegetation on lands. Also, only licensed companies should be allowed to dredge as the will be covered under the tax net thereby generating revenue for the government.

Keywords: Sand Mining, Environmental Degradation and Remote Sensing

Introduction

United Nations Environmental Protection (UNEP) (2014), stipulates that "sand and gravel represent the highest volume of raw materials used on earth after water", but also sounded the alarm over the fact that "their use greatly exceed their natural renewal rates". The dredge may be part of water supply or flood relief project. In This case, it is used to construct reservoirs, deepen flood of prone river and for irrigation of channels. Yet, the most common reason for seeking deeper water is to improve navigation. This is the most common form of dredging activity and is undertaken in ports, harbours and chipping channels throughout the world. Civil engineering construction work is another activity that can create a demand for dredging. The

creation and backfilling of trenches for pipelines and tunnels and the forming of foundation for structures are all dredging activities which have their counterparts in dry (Chelala, 2010).

There is increasingly recognition of this resource value of waterway, especially in urban areas. With many river channels, drainage and lakes are been choked with all forms of rubbish, their clearance has presented new challenges to the dredging industries. In Nigeria, the change from traditional building design to today's modern design is as a result of increased wave of urbanization which result to shift from the use of mud to concrete and blocks. Surely, modern building design is an absolute departure from traditional building style. Hence, modern building designs make use of materials such as sand and gravel of different size usually found in large quantities at the bed and bank of rivers (Nurhasan and Sapura, 2018). Apart from building and construction, sand has been dredged for land reclamation, sand stockpiling, canalization, maintenance of inland waterways, river training, port and harbour maintenance, river crossing for oil and gas pipelines, offshore pipe landfills, shore protection, seabed profiling and preparation of access and slots for oil drilling Riggs in the swamps. (Kadi. *et al*., 2012.)

The initial dredging activities were carried out manually and in a manageable magnitude, sufficient to meet man's immediate need for survival. This type of mining was carried out by Artisans, and in Nigeria, this method can be traced back to 1900s. Because most of these artisans are from riverine communities since a skill in swimming is needed for such kind of mining method. However, commercial and mechanized riverbed dredging activities dates to the discovery of oil in Nigeria. Doubtless, Nigeria is endowed with oil and gas resources in Niger Delta and offshore region (Khan and Sugie, 2015).

In Ekole River the area of study, sand was manually extracted for income earnings. Due to high level of poverty in the area, young men were engaged in such activities as a means of sustenance. Until recently in the early 21st century that dredging companies began to establish along the Ekole River.

Presently there are about 12 dredging companies along the river of which includes, Azikiel construction Company Limited, Atup oil and gas limited, Globasonway

dredging company, JBD (Julius Bergger Dredging Nig. LTD)., AFFAN Dredging and Engineering company, Doncolt dredging oil and gas company, Lantar dredging and Engineering company, Niger Dux, Orgs dredging company , FAK Dredging and Engineering, company, GEE'S Dredging and Engineering company Awo Fineface JD Nig. LTD. Nigerian Westminster dredging and marine.

Ekole River has been overwhelmed by the activities of sand dredging over the years with the intent of satisfying the construction need of developers within and around Yenagoa metropolis. Sand mining has become a daily sight with dredgers and artisans miners removing sand from the river, and tipper trucks carrying them. It seems there are no strict rules to govern sand extraction because there is nonstop sand extraction. This has degenerated into plethora of dire ecological consequences such as distortion of livelihood chain of the communities, distortion of the ecosystem, destruction of the marine fauna and flora, destruction of access roads and infrastructures within the mining sites and incremental riverbed widening and deepening. This prompted the researcher to investigate the depth of the environmental effects of sand dredging within and around Ekole River.

The Study Area

The study area of this research work is Yenagoa Local Government Area in Bayelsa State. Yenagoa Local Government Area is geographically located within Latitude 4°48'00"N and 5°24'00"E, and Longitude 6°12'00"E and 6°39'30"E. It shares boundaries with Mbiama communities in Rivers State on the North and East, Kolokuma/Opokuma L.G.A. on the North/West, Ogbia L.G.A. on the South/East, and Southern Ijaw L.G.A. on the South/West. Yenagoa Local Government Area is located on the banks of Ekole creek and Epie Creek. The latter being one of the major river courses making up the Niger Delta River, with only one political/administrative ward namely: Epie-Atisa. There are six (6) major communities within the study area namely, Fambge, Swali, Akaba, Ogu, Ogbogoro, and Agbura.

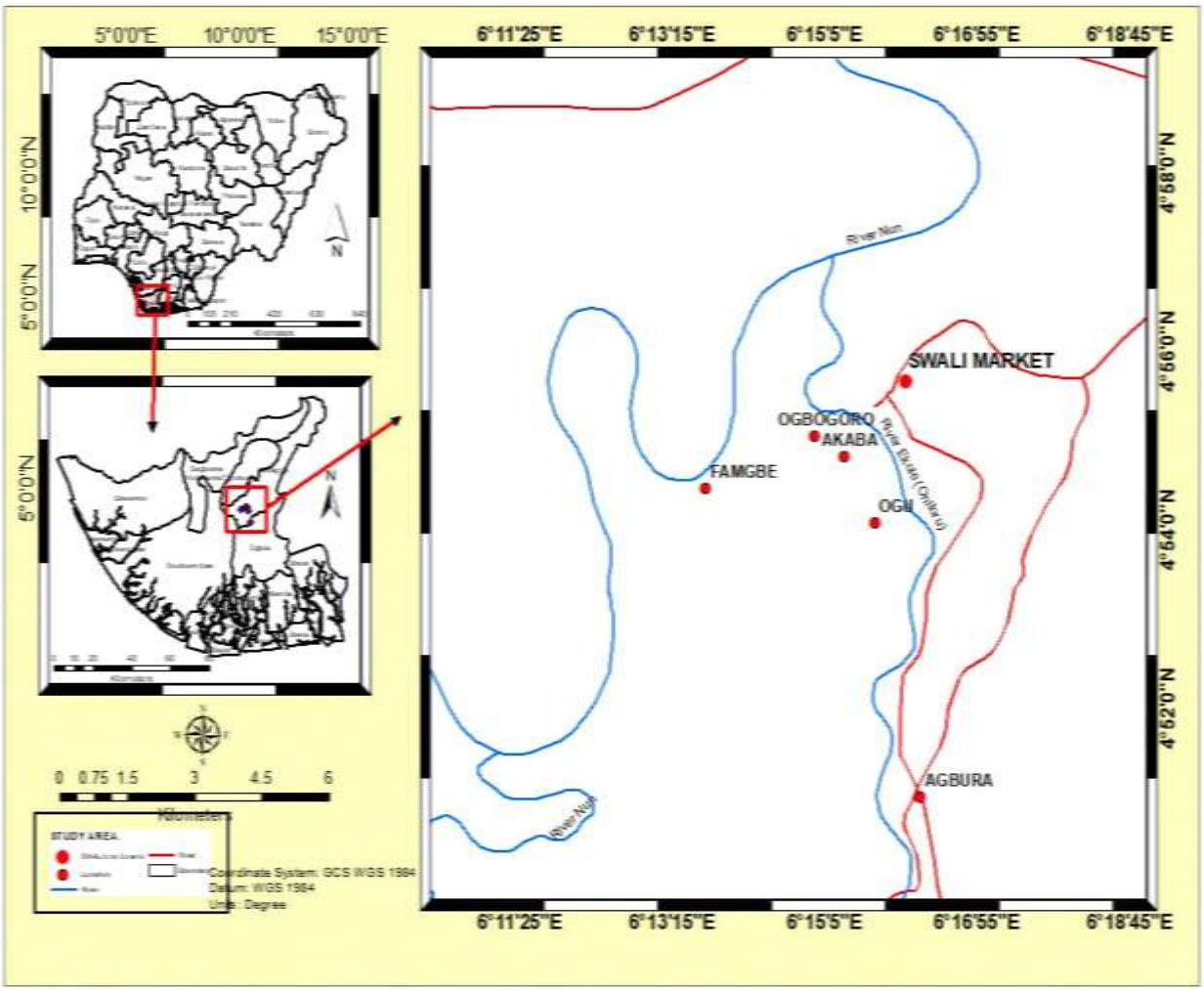

Figure 1: Map of Yenagoa Showing Location of the Study Area
Source: Geography Department, FUT MINNA

Materials and Methods

The data for this research was derived from primary and secondary sources. The primary data consist of first-hand information and comprises personal observation, taking of location of points using handheld Global Positioning System (GPS). The GPS was used for ground trothing during image classification. All data collected through these sources are direct information's collected by the researcher from the study area. Satellite Remote Sensing imageries. The Satellite imageries used included Landsat TM (1990); Landsat ETM (2000); and Operational Land Imager (OLI) (2022).

Table 1: Summary of Materials and Methods

OBJECTIVES	DATA SOURCE	METHOD OF DATA COLLECTION	METHOD OF DATA ANALYSIS	METHOD OF DATA PRESENTATION
1. To examine the extent of environmental degradation caused by dredging activities in the study area	Primary Data	Classified land use Imageries is used to acquire LULC change in the study area between 1990 to 2022, and to check the trends between built up areas and dredging sites over the coverage period.	• Data pre-position 1. Radiometric corrections 2. Image enhancement 3. Image classification	Maps and Graphics
2. To examine the socioeconomic impact of sand dredging on the livelihood of the study area.	Primary Data.	Field observation, questionnaire, and focus group discussions.	Statistical descriptive analysis.	Tables and charts.
3. To identify measures to mitigate the effects of river dredging on livelihood in the study area.	Primary Data.	Classified Imageries were used to check the effects between built-up areas and dredging sites over the	Clark Labs Idrisi Selva Land change modeler.	Tables and charts.

		coverage period.		

Results and Discussion

Analysis of land use classification for the Study Area

Figure 2: 1990 Land use/Land cover distribution map

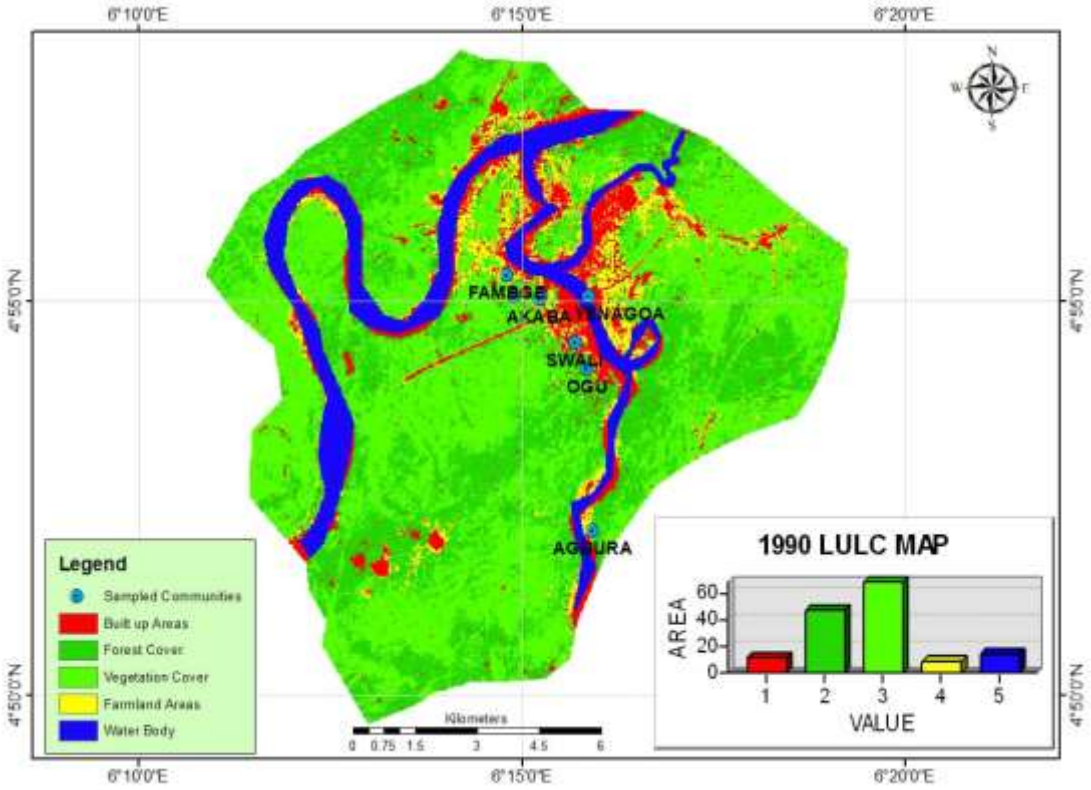

Figure 2 shows the classified land use imagery of the study location for the year 1990. The classification identified five categories of land use; built-ups, forest cover, farmland, vegetation and water bodies. The areal extent of these classes indicates that the dominant class is vegetation which covers 68.13 km^2 (45.50%), followed by forest cover 46.73 km^2 (31.21%), built up areas covers 11.44 km^2 (7.64%). water bodies with 14.54 km^2 representing (9.71%) of the total area and Farmland areas on the other hand covered 8.89 km^2 (5.94%), indicating the less dominant land use category in the study area. The total land area of the study area is 149.73 km^2**.**

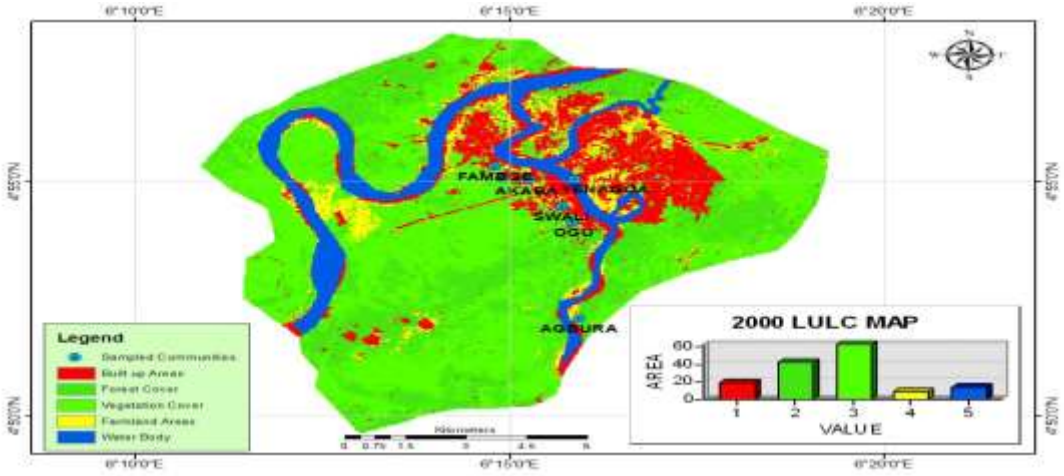

Figure 3: 2000 Land use/Land cover distribution map

Figure 3 shows the land use classification of the study area for 2000. It indicates a drastic increase in built up areas. There was an increase of 8.25 km^2 (5.51%) in 2000 than 11.44 km^2 (7.64%) in 2000. The built up expands towards the city center due to continuous influx of people as urbanization intensified.

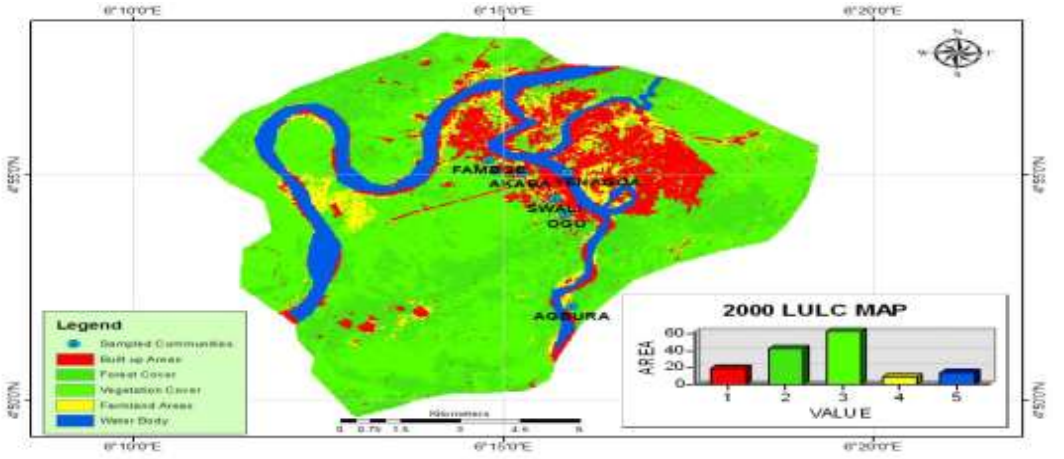

Figure 4: 2022 Land use/Land cover distribution map

Table 2: land use and land cover Distribution for the (1990 2000 and 2022)

LULC	1990		2000		2020	
Land Cover Category	Area (Sqkm)	Area covered (%)	Area (Sqkm)	Area covered (%)	Area (Sqkm)	Area covered (%)
Build up	11.44	7.64	19.69	13.15	36.96	24.70
Forest cover	46.73	31.21	43.03	28.75	20.93	13.99

Vegetation	68.13	45.50	62.98	42.08	51.33	34.29
Agricultural Lands	8.89	5.94	9.41	6.28	24.46	16.35
Water body	14.54	9.71	14.56	9.73	15.98	10.68
Total	149.73	100.00	149.67	100.00	149.67	100.00

Figure 4 shows that built up area increase from 8.25 km^2 (5.51%) to 36.96 km^2 (24.70 %) in 2022. The built up expands virtually across the study areas but more towards the city Centre, east and south eastern section of the study area as more people to move to the area. Vegetation cover an area of 51.33 km^2 (34.29%) in 2022. In addition, forest occupies 20.93 km^2 (13.99%) in 2022. This decrease may be attribute to increase deforestation as a result of making way for developmental activities such as road construction, mining and exploration activities and other construction activities which destroys the forest. Farmland increased form 9.41 km^2 (6.28%) in 2000 to 24.46 km^2 (16.35%) in 2022, this might be attributed to increase in farming activities within the area.

About 42% of the respondents agreed that their farmland and river are being affected while 19.3% indicated that their rivers are affected and 18.7% indicated that their River and land are affected by sand dredging in the community. 30.34% of the respondents experience water pollution, 19.42% experience land degradation, 20.74% experience river bank erosion, 11.29% experience air pollution and 11.04% experience loss of vegetation and 7.16% experience noise pollution.

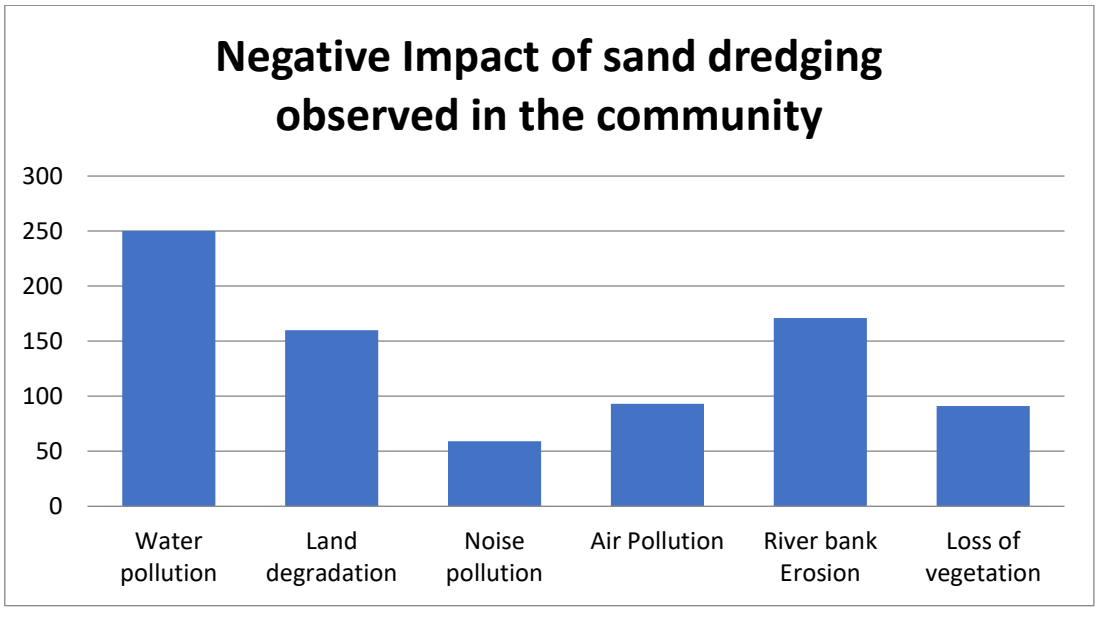

Figure 5: Negative impacts of sand dredging on the Environment

Table 3: Frequency of the Aquatic resources affected due to sand dredging

Options		Frequency	Percentage
Valid	Fishes died	17	5.7
	Fishes died and water unsuitable for drinking	39	13
	Fishes died and water unsuitable for drinking and Typhoid/Cholera fever	7	2.3
	Fishes died and Typhoid/Cholera fever	1	.3
	water unsuitable for drinking	183	61.0
	water unsuitable for drinking and Typhoid/Cholera fever	39	13.0
	Typhoid/Cholera fever	14	4.7
	Total	300	100.0

As indicated in Table 3, about 61% of the respondent agreed that their water is not suitable for drinking due to the effect of sand dredging, 13% indicated that their water is not suitable for drinking and also they experience typhoid/cholera fever while only 4.7% indicated that they experience typhoid/cholera due to sand dredging in the area. As indicated in Table 4, 45.3% of the respondent agreed that the effect is severe while 37.7% agreed that the effect is very severe and 10.7% agreed that the effect of sand dredging is barely severe while 3.3% agreed that the effect is not severe.

Table 4: Frequency of the severity of the socio-economic impact of sand dredging

	Frequency	Percentage
Very severe	113	37.7
Severe	136	45.3
Barely severe	32	10.7
Not severe	10	3.3
No adverse effect	9	3.0
Total	300	100

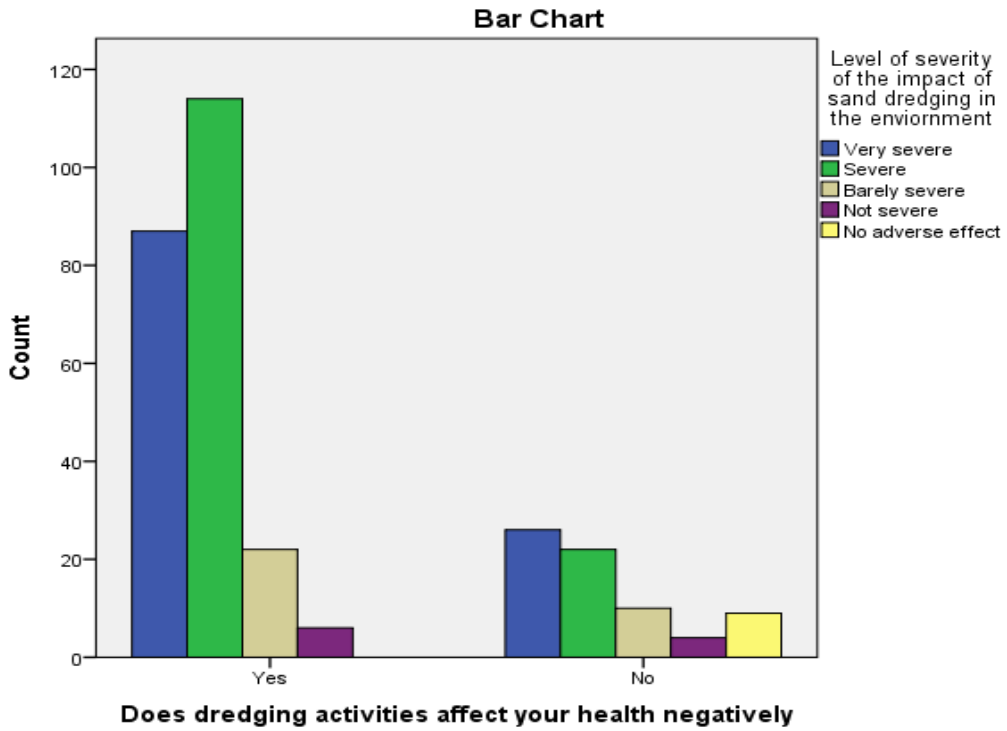

Figure 5: Effect of sand dredging on communities health

As shown in Figure 5 of the study, in Famgbe community, 96% of the respondent indicated that sand dredging has a negative effect on their health while 4% indicated that it does not have a negative effect on their health. In Ogu community, all the respondents indicated that sand dredging have a negative effect on their health. In Akaba community, 84% of the respondent indicated that sand dredging have a negative effect on their health while 16% indicated that it does not have a negative effect on their health. In Ogbogoro community, 96% of the respondent indicated that sand dredging have a negative effect on their health while 40% indicated that it does not have a negative effect on their health. In Agbura community, 58% of the respondent indicated that sand dredging have a negative effect on their health while 42% indicated that it does not have a negative effect on their health. In Swali community, 60% of the respondent indicated that sand dredging has a negative effect on their health while 40% indicated that it does not have a negative effect on their health.

As indicated in Figure 6 of the study, 37.83% agreed that sand dredging should be reduced and 17.83% indicated that proper treatment and disposal of industrial waste should be adopted as a mitigating measures and 15.22% indicated that supportive environmental friendly practices should be adopted as a mitigating measure for sand dredging in the environment.

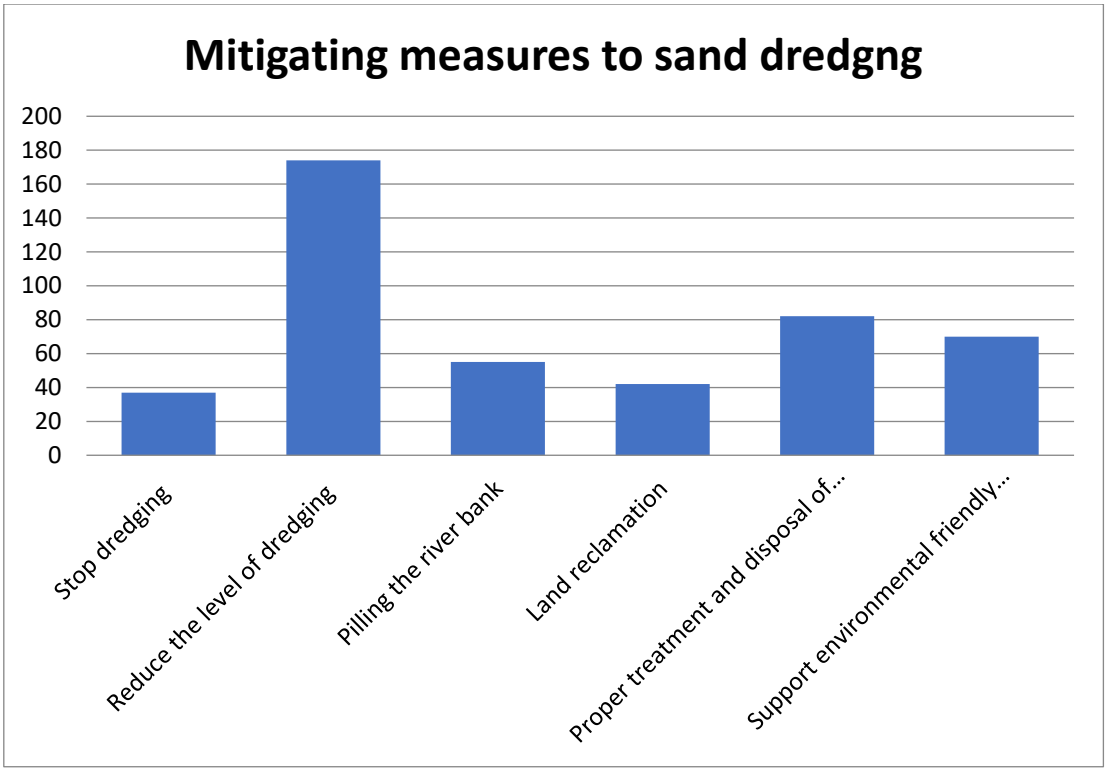

Figure 6: Mitigating measures to sand dredging

Conclusion

The research was carried out to investigate and expose the positive and negative effects of sand dredging on the environment of Ekole \River in Yenagoa Local Government Area of Bayelsa State. As revealed by the study, Ekole River is one of the important rivers in Bayelsa State, it is a coastal region characterized with long years of sand mining by either manually or mechanical dredging operations, artisanal fisheries and transportation. Also, the study discovered that the activities of sand dredging have increased the economic value of the study area by providing employment opportunities, livelihood and various related skills especially for young people and

land owners. However, over the years dredging the river has been a profit orient activity with detrimental consequences on the environment. Apparently, impacts are destruction of wetlands and mangrove swamps, persistent water turbidity, disappearance of certain phytoplankton and zooplankton including several species of macro benthos which ultimately affect fishery production and distribution.

In addition to sand mining, uncontrolled discharge of domestic and industrial wastes also has pollution implications as they alter concentrations of the water composition and its quality. River sand mining has removed large quantities of sands from the river thereby, lowering the water levels and channel degradation, exposing large –scale, removal of river sediments and erosion at the river bank. Ekole River water quality has been altered, endangering fisheries and other aquatic organism and even human health. Deposition of sand on land has also affected the topsoil, trees, vegetation, and various plants. Meanwhile, in order to achieve sustainable and environmentally suitable condition of sand dredging activities in Bayelsa state, it is opined that the policies and regulations governing this operation should be enforced more effectively.

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KNOWLEDGE AND DETERMINANTS OF HEPATITIS - B VIRUS AMONG PREGNANT WOMEN ATTENDING ANTENATAL CARE IN KATSINA STATE

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Abstract

The study focused on assessing the knowledge, prevalence and determinant of Hepatitis B virus among Pregenant women attending antenatal care in Katsina state, Nigeria. Three objectives and research question guided the study. Descriptive cross-sectional research was conducted on 404 individuals chosen by simple random sampling. Consenting participants were given structured questionnaires, which were then analysed using descriptive and inferential statistical techniques in SPSS V25. The majority of respondents are aware of the genesis of the Hepatitis B virus, as shown by

the four-item mean of 4.51 and the standard deviation of 0.81. Awareness of the signs and symptoms of the hepatitis B virus was 4.18, and the standard deviation was 0.88, demonstrating that there is a substantial correlation between education level and knowledge of HBV infection prevention strategies. This association highlights the need of formal and extensive public health education. Awareness of the route of transmission of the hepatitis B virus had mean scores of 4.41 and 0.83, respectively, and they all point to the dangerous behaviours of sharing barber's blades and receiving piercings. The study recommends that pregnant women avoid using unsterilized blades and other sharp objects. To prevent transmission, pregnant women should avoid consuming contaminated water or food prepared by individuals with Hepatitis B illnesses. In order to avoid mother-to-child transmission of Hepatitis B, proper treatment and care of the virus should be advocated.

Keyword: Knowledge, determinant, Hepatitis B.

Introduction

According to the World Health Organization (WHO), (2010) the Hepatitis B virus (HBV) is the second most dangerous carcinogen after cigarettes. Hepatitis B virus (HBV), a DNA virus that is a member of the Hepadnaviridae family, is the causative agent of this infection, which can be either acute or chronic. It is believed that 2 Billion individuals around the world have been afflicted, with 350 million people suffering from chronic infection. Ten percent of these people live in East Asia and Sub-Saharan Africa. Patients who are infected chronically have an increased risk of developing problems such as liver cirrhosis and hepatocellular cancer. The clinical symptoms of an acute HBV infection might be either prodromal or icteric, but recovery is possible in any case, after the incubation period, which varies according to the kind of virus, patients may present clinically with symptoms such as chills, headache, nausea, and vomiting, and jaundice may precede these symptoms. The liver swells and becomes sensitive, and there is accompanying pain in the upper right quadrant of the abdomen. Infections caused by the Hepatitis “A” virus (HAV) and practically all infections caused by the Hepatitis B virus (HBV), clinical and biochemical recovery to normalcy is the rule (Lu, *et al*., 2009). On the other hand, there are those who continue to be chronically infected, notably with HBV and HCV, and they run the risk of developing cirrhosis of the liver or hepatocellular cancer (Shawn, 2016). Hepatitis is an

inflammation of the liver, which may be identified by the presence of inflammatory cells in the tissue of the organ. This condition is almost often brought on by viral infections. Hepatitis can be caused by one of five hepatotropic viruses, which are as follows: A, B, C, D, and E types of Hepatitis, Hepatitis B and C are two of the most widespread viral illnesses found in humans (Kupin, 2017).

The Hepatitis B virus (HBV) is a major cause of worry on a global scale since it is the principal cause of chronic Hepatitis, cirrhosis, and, eventually, hepatocellular carcinoma (HCC) (Iida-Ueno, *et al*., 2017). East Asia and Sub-Saharan Africa have the greatest incidence of HBV infection, with between 5% and 10% of the general population infected. The Hepatitis B virus has been described as a significant issue or concern for the general public's health that is epidemically present throughout the world. Every year over one million individuals die as a result of complications related with viral Hepatitis, accounting for 2.7% of all deaths (Asrani, *et al*., 2019). Hepatitis caused by HBV infection is a potentially fatal liver infection that can cause both acute and chronic liver disease, leading to consequences such as cirrhosis and hepatocellular carcinoma and contributing to a high morbidity and mortality rate (WHO, 2017).

Objective of the Study

1. To examine the causes of Hepatitis B virus among pregnant women attending antenatal care in Katsina State
2. To evaluate the sign and symptoms of Hepatitis B virus among pregnant women attending antenatal care in Katsina State.
3. To evaluate the prevalence of Hepatitis B virus among Pregenant women attending antenatal care in Kastina State

Research Questions:

1. What are the causes of Hepatitis B virus among pregnant women attending ANC in Katsina State?
2. What are the sign and symptoms of Hepatitis B virus among pregnant women attending antenatal care in Katsina State?
3. What is the prevalence of Hepatitis B virus among Pregenant women attending antenatal care in Kastina State?

Hypothesis Testing

Ho_1: The level of the causes of Hepatitis B virus among pregnant women will not be significantly high

Ho_2: The sign and symptoms of Hepatitis B virus among pregnant women will not be statistically high

Literature Review

The failure of world leaders to adopt comprehensive policies on HBV immunization and to set treatment recommendations is a contributing factor that has indirectly led to the present prevalence of the illness, which is estimated to affect over two billion people. The inability to seek early treatment and preventive measures, which otherwise could have lessened the burden of the HBV progression, is directly related to a person's lack of knowledge regarding the mode of spread of the disease, its signs and symptoms, the treatment options available, and the complications associated with the disease. Other factors, such as religious views, cultural norms, and health-care perspectives, either impact or are influenced by a person's level of schooling. In addition, these variables have an effect on an individual's willingness to accept a certain mode of health service over another, which will ultimately have an effect on their HBV status (García, & Cerda, 2020).

According to Busayo, *et al*., (2021) proposed that a prevalence of 9.5% was discovered, which corresponds to approximately 20,083,000 Nigerians. That is a really significant proportion. The prevalence of infections varied greatly from region to region. The findings shed light on the magnitude of the possible liver disease problem in Nigeria as well as the areas in which efforts to prevent and treat the disease should be concentrated given the country's limited resources. For the purpose of determining the HBV prevalence, we carried out a meta-analysis using articles that were published between the years 2010 and 2019. There was a total of 47 investigations, and the participants were 21,702 in total. Our research revealed that Nigeria has a prevalence rate of 9.5%, which means the country meets the World Health Organization's requirements for high endemicity. It is important to note that we discovered significant disparities in the prevalence of infection across a variety of contexts and geopolitical zones. When compared with the South-East geo-political zone, the North-West geo-political zone had a higher rate of HBV infection (12.1%) than the South-East (5.9%). The rates of HBV infection in rural regions were similarly significantly higher (10.7%)

than the rates in urban areas (8.2%). The causes for this were not able to be determined by our research; nevertheless, it is probable that it may be owing to inequalities in access to health services, as well as due to variations between culturally varied populations (Busayo, *et al*., 2021). Supporting this study was the Health Belief Model (HBM) was chosen as the theoretical framework to help guide this study. It is one of the most commonly used frameworks in research of health behaviour since it was developed in the 1950s. The HBM has six primary concepts. They are used to predict why people decide, or do not decide, to control, prevent or screen for different illness conditions. The primary concepts are perceived susceptibility, benefits, severity, barriers and cues to action and self-efficacy.

Methodology

Research Design: The descriptive survey research design was used for this study. According to Creswell and Clark (2011) research design is a process for gathering, evaluating, interpreting and reporting information in research studies.

Population of the Study: The population of the study was Pregenant women who were attending antenatal care in Kastina State, in specific Daura

Sampling Technique: Sampling is the selection of a subset of individuals from within a population to yield knowledge about the whole populations, especially for the purpose of making prediction based on statistical inference (Black & William, 2004)**.** The research adopted a simple random sampling approach to select the sample for this study.

Instruments for Data Collection: A questionnaire is a collection of questions or statement that assesses attitudes, opinions, beliefs, biographical information or other forms of information (Cooper, 2011). It also ensures that respondents who are not easily approachable are reached conveniently. Besides, questionnaires can prove time for respondents to think about responses and are easy to administer and score (McGuirk, *et al.*, 2016). Thus, questionnaires were used as important tools for collection of primary data due to their many positive attributes.

Validity of the Instrument: According to Sharma and Gaur (2017) the most crucial aspects of precision when designing a questionnaire are validity and reliability. The research instrument was subjected to validation process by showing the researcher's supervisors and two other experts in the field of Measurement and Evaluation for careful in-depth scrutiny and necessary correction.

Method of Data Collection: An official letter of introduction will be obtained from the school which was later shown to the head of the PHC health facilities sample for the main study in order to obtained permission and counsel for the administration of the questionnaire. The respondent will be informed of the purpose of the exercise and significance of providing reliable and objective responses to the questionnaire items. The researcher will personally administer the questionnaire with the help of the research assistants who will be trained for the purpose.

Method of Data Analysis: Data analysis refers to examining the data that has been collected ad making deduction and inferences (Mugenda, *et al.*, 2012). The data gathered are properly cleaned and examined for errors to enhance data entry, missing values and ensure no violation of statistical assumptions such as normality, linearity etc. The categorical data will be analyzed using descriptive statistic while the null hypothesis will be tested using parametric test. The analysis will be facilitated with the help of computer software referred to as SPSS version 25.

RESULTS PRESENTATION

Age of the Respondents

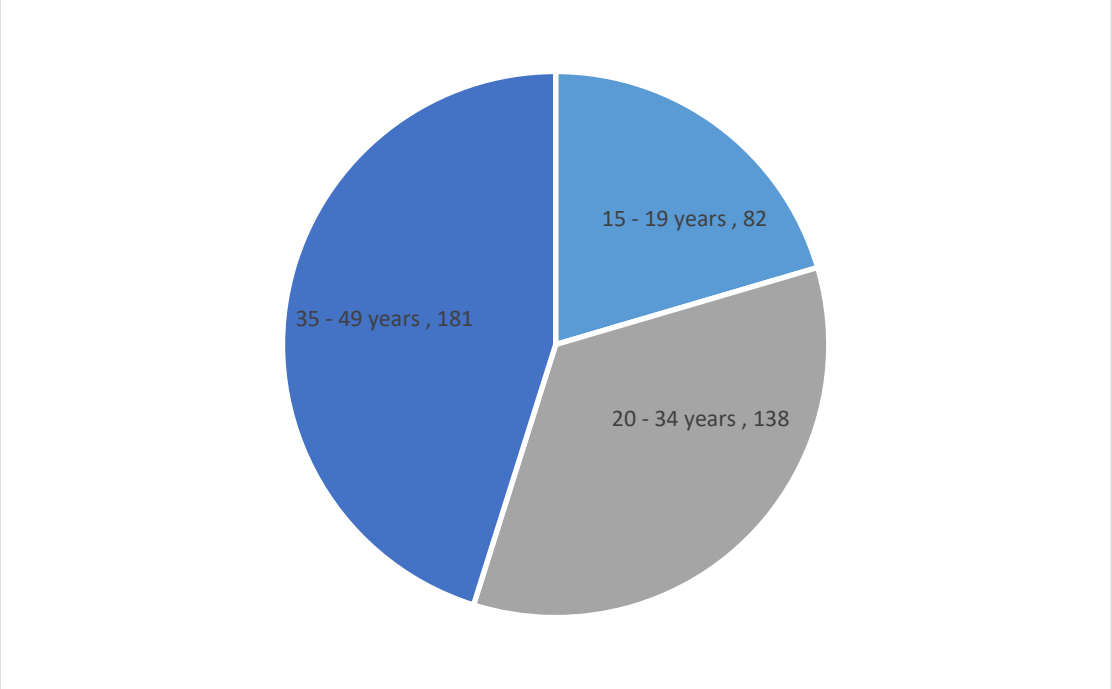

Figure 1: Respondents age bracket distribution

Statistics presented in Figure 1 shows the respondents age bracket distributions. It reveals that 82(20%) of the respondents are between 15-19 years old, 139(34%) are between 20-34 years old while 183(45%) are from 35 – 49 years. The inference is that majority of the respondents are aged 35 - 49 years.

Marital Status of the Respondents

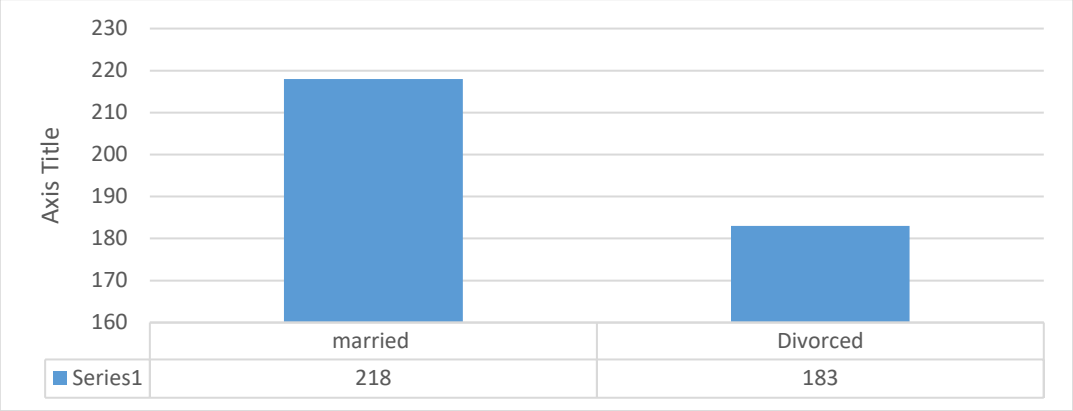

Figure 2: Respondents Martial Status distribution.

Figure 2 is showing data collected and analysed in relation to the marital status of the respondents, with 220(55%) of the respondents been married while 184(45%) are divorced. The conclusion is that majority of the respondents are Married.

Religion of the Respondent

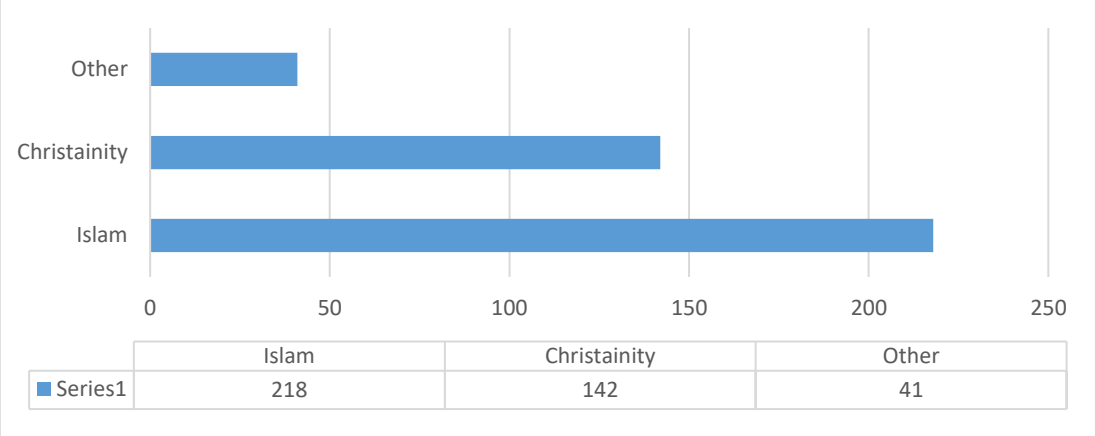

Figure 3: Religion of the Respondent

Figure 3 is showing data collected and analysed in relation to the marital status of the respondents, with 218(54%) of the respondents are Islam, while 144(36%) are Christians and 43(10%) are others. The conclusion is that majority of the respondents are Muslims

Tribe of the respondents

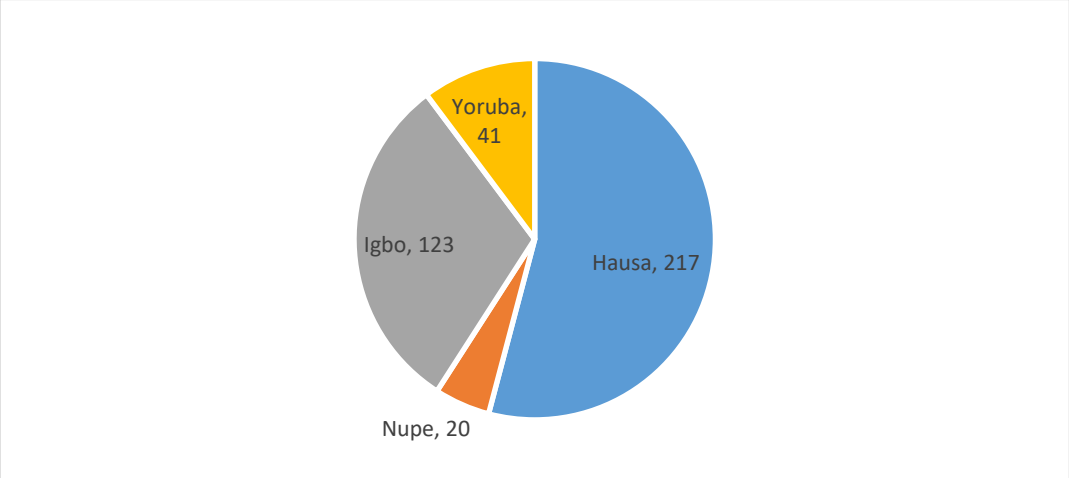

Figure 4: Tribe of the Respondent

Figure 4 is showing data collected and analysed in relation to the tribe of the respondent, Hausa had 218(54%), Nupe had 20(6%), Igbo had 125(30%), Yoruba had 41(10%). The conclusion is that majority of the respondents are Hausa.

Educational Qualification of the Respondents

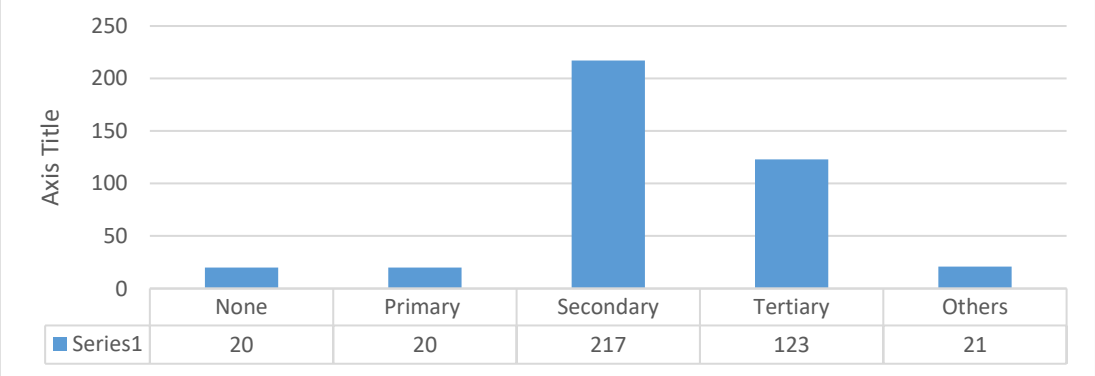

Figure 5: Distribution based on Highest Academic Qualifications

Presentation displayed in Figure 5 shows the respondents distribution based on highest academic qualifications. It implies that 20(5%) of the respondents have no qualification, while 20(5%) had obtained qualifications that is primary school, and secondary school had 219(55%), tertiary had 124(30%) and others had 21(5%). The inference is that majority of the respondents had secondary school qualification.

Occupation of the respondent

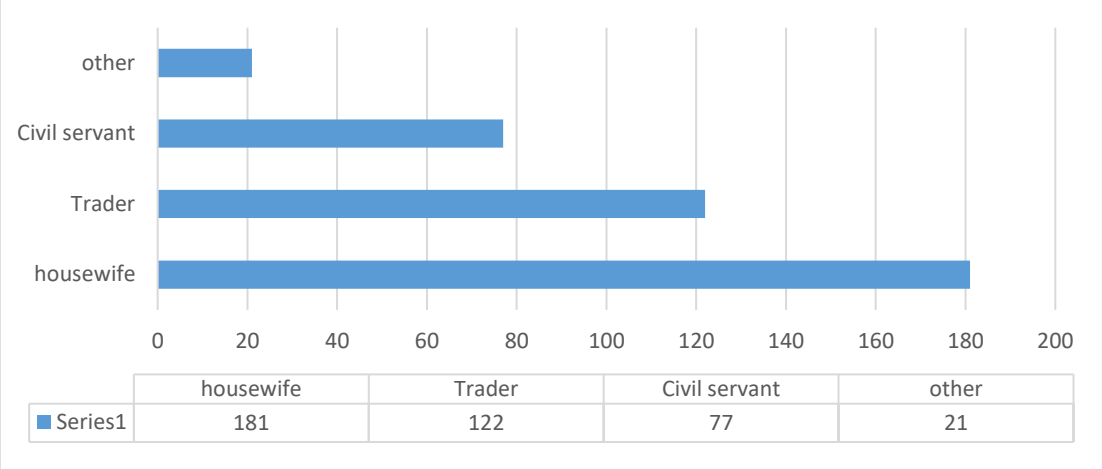

Figure 6: Respondents Occupations

The data collected and analyzed is in relation to the occupational status of the respondents. Figure 6 is showing that 77(19%) of the respondents are civil servant, 182(45%) are housewife, while 124(30%) are traders, finally others are 21(5%). It could be concluded that majority of the respondents are house wives.

Residence of the Respondents

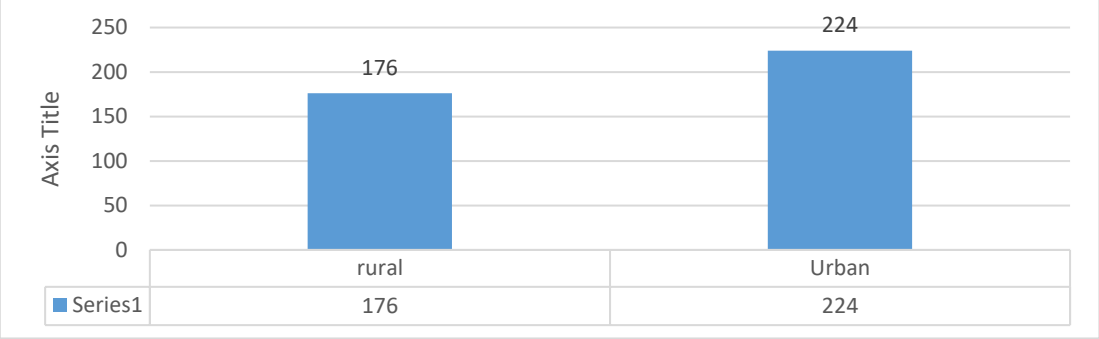

Figure 7: Residence of the Respondents

The figure 7 above shows the type of family of the respondents, it indicates that rural residents were 176(44%) and urban residents was 224(56%). In conclusion it depicts that majority of the respondents were living in urban area in the study area.

Experienced Hepatitis B Virus Before

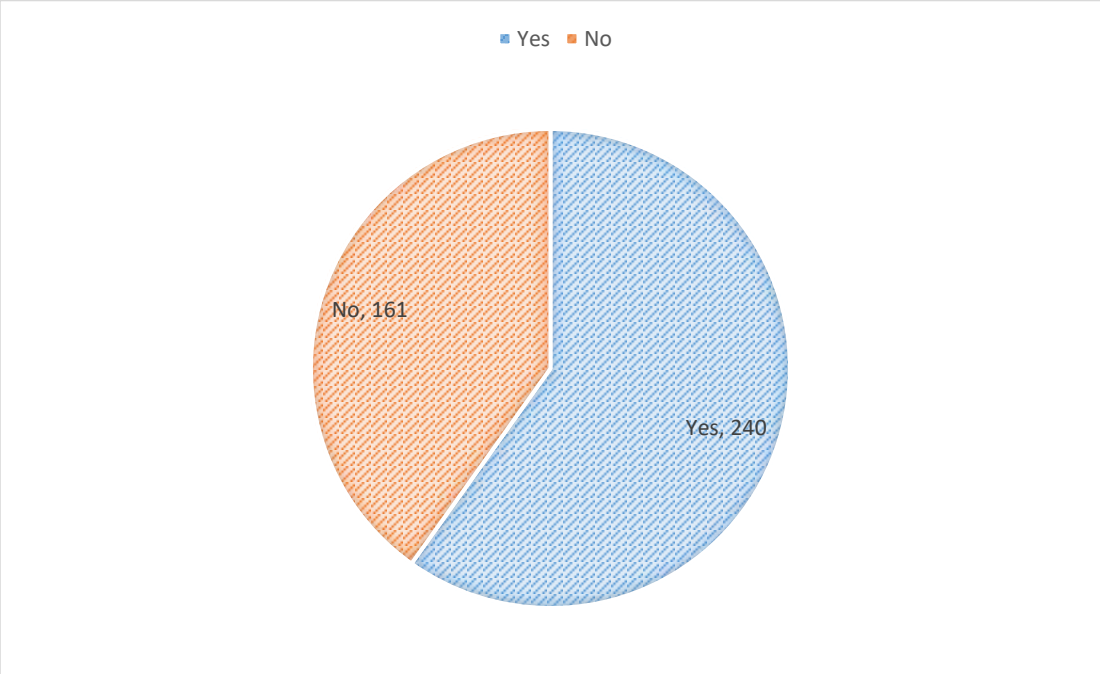

Figure 8: Experienced Hepatitis Before by the respondent

The figure 8 above shows the history of Hepatitis B virus of the respondent. It depicts that Yes had 242(60%) and No had 162(40%). In conclusion majority of the respondents have yes with regards to experienced Hepatitis B virus.

Description of Research Variables

The descriptive statistics of the major variables comprises of the mean and standard deviations are calculated and presented.

Table 1: Means and standard deviations of Research Variables

S/No	*Dependent variables*	*items*	*Mean*	*Standard Deviation*
1	Causes of Hepatitis B virus	*4*	4.52	0.81
2	Knowledge on sign and symptoms of Hepatitis B virus	*6*	4.18	0.88

Research Question 1: What are the causes of Hepatitis B virus among pregnant women attending ANC in Katsina state?

Table 2: *Responses on* the causes of Hepatitis B virus among pregnant women attending ANC in Katsina state?

S/n	Causes of Hepatitis B virus	Mean	S.D	Decision
1	I believe that Hepatitis B is caused by a virus	4.71	0.95	**Agreed**
2	Liver Failure is cause by HBV	4.50	0.80	**Agreed**
3	Hepatitis B can cause liver cancer and Liver cirrhosis	4.34	0.92	**Agreed**
4	The cause of both HBV and HIV is the same	4.55	0.59	**Agreed**
	Grand Mean	**4.52**	**0.81**	**Agreed**

Source: Field Work, 2022

The results of data analysis presented in Table 2 revealed that the grand mean of 4.52 (SD=0.81) is greater than the cut-off mean point of 3.00, revealing that the items have been accepted by the respondent as causes of Hepatitis B virus among pregnant women attending ANC in Katsina state. Item-by-item analysis reveals that causes of Hepatitis B virus among pregnant women items each had a mean score higher than the accepted mean score of 3.00, In conclusion, this depicts that the respondents cause of Hepatitis B virus among pregnant women attending ANC in Katsina state.

Research Question 2: What are the sign and symptoms of Hepatitis B virus among pregnant women attending antenatal care in Katsina State?

Table 3: *Responses on* sign and symptoms of Hepatitis B virus among pregnant women attending antenatal care in Katsina State?

S/n	Knowledge on sign and symptoms of Hepatitis B virus	Mean	S.D	Decision
5	The early symptoms of Hepatitis B are the same as cold and flu (fever, running nose, cough)	4.41	0.73	**Agreed**
6	Jaundice is one of the common symptoms of Hepatitis B?	4.10	0.71	**Agreed**
7	Nausea, vomiting, and loss of appetite are some of the common symptoms of Hepatitis	4.14	0.79	**Agreed**

8	There are no symptoms of Hepatitis B in some of the patients	4.25	1.01	**Agreed**
9	Most of the pregnant mothers do not have any sign and symptoms in the early stage of the disease	4.10	1.15	**Agreed**
10	I believe that a person can be infected with Hepatitis B and not have any symptoms of disease	4.12	0.93	**Agreed**
	Grand Mean	**4.18**	**0.88**	**Agreed**

Source: Field Work, 2021

The results of data analysis presented in Table 3 revealed that the grand mean of 4.18 (SD=0.88) is greater than the cut-off mean point of 3.00, revealing that the items have been accepted by the respondent as to sign and symptoms of Hepatitis B virus among pregnant women attending antenatal care in Katsina state. Item-by-item analysis reveals that all items have been agreed upon by the respondents. In conclusion, this depicts that the respondents have agreed on the sign and symptoms of Hepatitis B virus among pregnant women attending antenatal care in Katsina state.

Hypothesis Testing

HO 1: The level of the causes of Hepatitis B virus among pregnant women will not be significantly high

Table 4: One-sample t-test analysis on causes of Hepatitis B virus among pregnant women

Variable	N	Sample Mean	Sample SD	Reference t-value	t-value	Sign	Remark
Causes of Hepatitis B Virus	404	18.10	2.51	-1472.85	-183.8*	<.001	S

The results of data analysis presented in Table 9 revealed a statistically significantly high causes of Hepatitis B virus among pregnant women (M=18.10, SD=2.51) = t(403) = -183.8, P<.001, leading to the non-support of the first null hypothesis. This then implies that the causes of Hepatitis B virus among pregnant women are significantly high indeed.

HO 2: The sign and symptoms of Hepatitis B virus among pregnant women will not be statistically high

Table 5: One-sample t-test analysis on sign and symptoms of Hepatitis B virus among pregnant women

Variable	N	Sample Mean	Sample SD	Reference t-value	t-value	Sign	Remark
Sign and symptoms of Hepatitis B virus	404	25.11	3.06	-1158.76	-176.88*	<.001	S

Similarly, analyzed data displayed in Table 10 reveals a statistically significant high sign and symptoms of Hepatitis B virus among pregnant women (M=25.11, SD=3.06), t(403) = -176.88, P<.001, leading to the non-support and thus the rejection of the second hypothesis. This then means that sign and symptoms of Hepatitis B virus among pregnant women was significantly high.

Conclusion

To encourage future research and subsequent high-quality translation to health settings, I propose the development of national guidelines to assure nationwide consistency in data collection and thereby enhance the quality of reporting. For instance, the routine recording of age, along with other pertinent population and individual variables, will facilitate greater understanding of the true HBV infection situation and lead to tangible improvements for patients and their communities. I also advocate for a substantial investment in capacity building to improve HBV diagnosis, as well as sustained surveillance to track progress towards eradication. A systematic commitment to early diagnosis and clinical management is a crucial element of the path to HBV eradication by 2030.

Recommendations

The researcher is hereby recommending that pregnant women should avoid the use of unsterilized blades and sharp object. Pregnant women should avoid contaminated water/food prepared by persons suffering from Hepatitis B infections to prevent transmission.

The researcher is hereby recommending that health workers at all levels of care need basic knowledge and skills to be able to identify Hepatitis B, its mode of transmission, causes, risk factors, and strategies for prevention of the infection in pregnant women. Public health advocacy and education on HBV infection should be intensified in public places such as the market so that the traders as well as their clients can be well educated about the preventive practices against this infection in pregnant women.

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ENVIRONMENTAL AND HEALTH IMPLICATIONS OF ARTISANAL MINING ACTIVITIES IN MINNA METROPOLIS NIGER STATE, NIGERIA

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ABSTRACT

Despite Artisanal mining is a source of livelihood of individuals that involves in mining it is accompany with environmental and health challenges that have negative threat to individual and communities which mining takes place. The aim of the study is to access environmental and health implications of Artisanal mining activities taking place in Minna Metropolis Niger State, Nigeria. The objective is to examine the level of water pollution in the study aree and to identify the major health challenge caused by Artisanal mining thereby assessing the extent of Environmental degradation that occurred as a result of Artisanal mining in the study area. Both qualitative and quantitative approach was used in gathering of the data, water sample was taken from the study area. Both qualitative and quantitative approach was used in gathering of the data,

water sample was taken from the Gold mining areas respectively. Physio-chemical and bacteriological test was conducted. The physiochemical parameters are Turbidity, BOD, Electrical Conductivity, TDs, Total Hardness, P^H and Alkalinity. The result revealed that P^H, BOD, E.C, and TDs are acceptable according to WHO standard in three locations while alkalinity and total hardness are above the minimum standard for domestic uses. The result for the bacteriological parameter indicated that TCC, TFCC and TBC have exceed the WHO permissible limit and rendered the water unsafe for domestic uses. The major health threat to the Artisanal miners is dust air borne disease and ranked (48.8%), drinking water nearby stream (31.1%) and noise pollution has the least with (20.2%). However, landsat image classification was used to analysis the level of environmental degradation and shows that land degradation was ranked highest with (34%), landscape distraction (22.2%), Deforestation (11%), soil erosion and loose of soil quality (17.7%) and degradation of water quality (14.8%) respectively. Generally, this result shows that the activities of miners have negative impact on the water which makes it unsafe for domestic use. Air borne diseases are responsible for the respiratory diseases of the miners and also lead to environmental degradation and lost of biodiversity within the study area. In conclusion, Artisanal and Small Scale Mining (ASM) is higher dangerous work associated multiple occupational and environmental hazards with little or no consideration given to the safety and health of the miners. The research work recommends that united Nation, WHO, ILO, World Bank, Government, Multinational and Employers should adopt a conventional environmental safety and health condition for Artisanal and Small Scale Miners.

Keywords: ASM, BOD, TDS, EC, TCC, TFCC, TEC, WHO, ILO.

INTRODUCTION

Mining refers to the process of extraction of mineral deposits from the surface of the earth or from beneath the surface. Mining can only take place where minerals are

present and economically viable. Natural resources (metallic, non-metallic minerals and fossil fuels) are importance in the development of any country. The general importance of the mining sector has been documented to include foreign exchange, employment and economic development Obaje *et al.*, (2015). Artisanal mining are operations which are easily controlled technologically and financially by under-equipped populations with limited means and exploited as individuals, families, associations or cooperatives Seydou, (2002). An estimated 20 million people around the world rely on artisanal gold mining AGM for livelihood, working in more than 80 countries. They produce some 10% of the world's mined gold (WHO, 2013).

Artisanal Mining is a means of livelihood adopted primarily in rural areas Veiga, (2013). Minerals are extracted in Artisanal and Small-Scale Mining by people working with simple tools and equipment. This is sometimes called informal sector, which is outside the legal and regulatory framework Azubike, (2011).The activities of artisanal mining operators pose great threat to the environment and this has heightened interest from the public and many researchers Asiedu, (2013). Apart from environmental problems, health issues are not left out because of artisanal and small scale gold mining operations. The use of gravity concentration methods such as panning and sluicing during processing the chemical composition of soil, surface and groundwater found in any environment is greatly influenced by the lithology in the area as well as dominant anthropogenic activities in the area. Studies have shown that human activities such as mining, waste dumpsites, application of fertilizer and agro-chemicals are major sources of environmental contamination. Amadi *et al*., (2015).

World Health Organization (WHO) and the Zamfara State Ministry of Health (ZSMOH) confirmed that hundreds of children under ages of five were at risk of death or serious acute and chronic health effects due to extremely high levels of lead and mercury WHO, (2011). The medium through which the people were affected include drinking water, food, and inhalation of contaminated dust, oral ingestion of particles especially by children and through breast feeding.

The benefits of artisanal gold mining AGM include job creation and opportunities for local companies, infrastructure and social/community development and financial income Tiffany, (2012).

Several studies have shown problems of environmental implications of artisanal mining activities and are not limited to a particular geographical area or mining site, such problems cover various areas and the results has shown that their is heavy contamination of the streams/rivers with the debris as tailings are discarded directly into the rivers without any form of treatment Kessey (2013). Not only those it alter the aesthetic feature but also the physio-chemical and biological parameters of the river/stream making it unfit for domestic purposes. Some key rivers and streams, particularly Birim, Densu, Pra, Ankobra have been polluted to the extent that, they are almost losing their self-cleansing ability. These rivers that serve communities along the watersheds are turned into reservoirs for dangerous chemicals disposal and also turned muddy because of heavy siltation Fatawu and Allan, (2014).

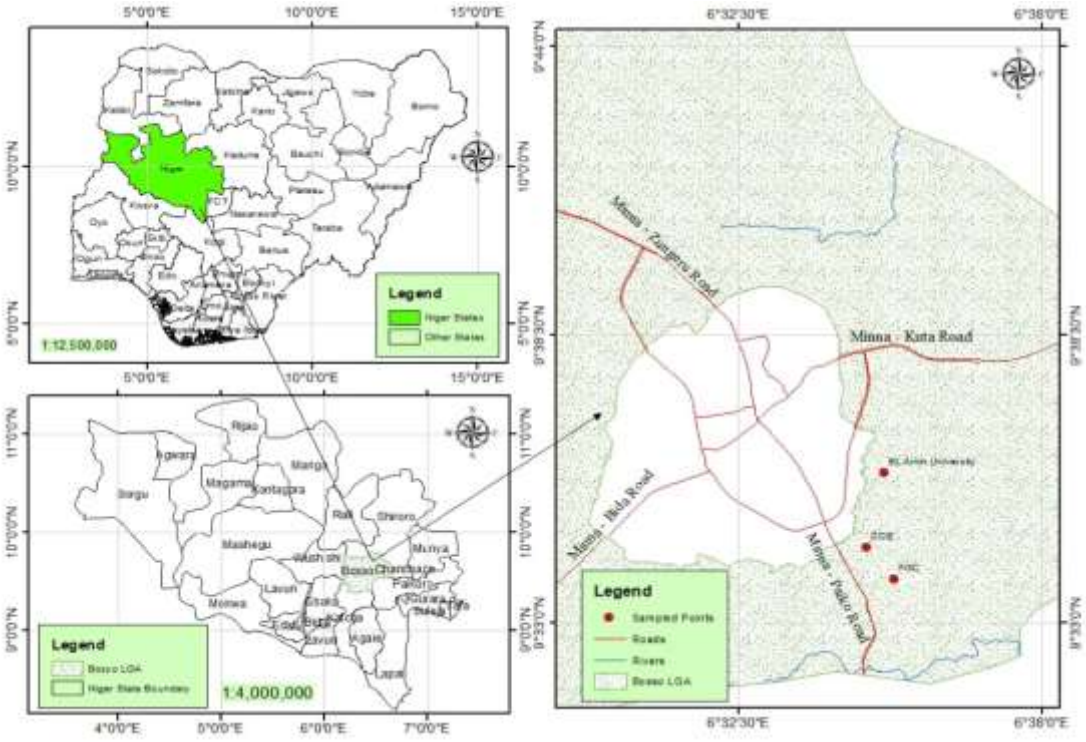
Destructions of river banks and river course diversion have led to serious inundations with the slightest downpour Fatawu and Allan, (2014). Again, illegal mining is ensued by land degradation with negative consequences on soil. Many pits are dug haphazardly with pit sizes between 400 and 4000sqft with a depth ranging from 6 to 30ft Kessey and Arko, (2013). Unfortunately, these remain uncovered even long after mining operations have ceased Kpan *et al.*, (2014). Pits become filled with rain water and becoming breeding grounds for mosquitoes, emanating nauseating stench on the environment and also becoming death trap Awaomim, (2013).

For instance, the toxic metal content of milk and dairy products is due to several factors – in particular – environmental conditions. As a result of soil and water pollution by heavy metals that exposes man and grazing animals to health risks, it becomes necessary to determine and monitor the levels of toxic metals in milk, because they can significantly influence the human health Zheng *et al.*, (2017). However, this research will examine on the implication of artisanal mining on environment and health in the study area.

MATERIALS AND METHODS

Bosso Local Government Area lies between longitude 6^0o 33^1E - longitude 6^0 37^1E and latitude 9 33‖ N - latitude 9o 38‖ N, on a geological base of undifferentiated base complex of mainly gneiss and magnetite situated at the base of prominent hills in an

undulating plan. Bosso Local Government Area is situated on Niger valley. It is located in the south eastern part of Niger State with elevation in height between 100 feet (300 meters). The area geographically shares boundaries with Wushishi Local Government to the west, Chanchaga Local Government Area to the east, Shiroro Local Government Area to the north and Katcha Local Government Area to the south Bosso Encyclopedia, (2019).



Source: Geography Department, Federal University of Technology, Minna (2022)

Sampling frame/size

Both Quantitative and Qualitative approach was employed to collect data in study areas. Water samples was collected from three 3 sampled points in the study areas(El-Amin, Chanchaga and COE, Minna sample points) and each samples was subjected to physico-chemical and bacteriological test. Purposive sample was used to determine the targeted group within the study area which include; environmentalist, health personnel, community elders and miners. Total number of 105 questionnaires was

issued to the targeted groups.ie 35 questionnaires was issued in each of the study area. Ten 10 questionnaires each for environmentalist, health personnel, community elders and 5 each for the miners. Landsat Imagery was used to assess the extent of environmental degradation as a result of artisanal mining in the study area. Qualitative approach was employed to collect and analyzes the level of environmental degradation in study areas using Landsat Imagery. Water sample was subjected to physico-chemical and bacteriological test. The water sample result and the major health challenges of the artisanal miners were analyzed using descriptive statistics such as frequency distribution and percentages while Landsat Imagery was used to assess the extent of environmental degradation as a result of artisanal mining in the study area.

RESULTS AND DISCUSSION

Examine the Level of Water Pollution in the Study Area

Table 4.1: The physio-chemical Analysis of selected water sample points in the study area

PAREMETERS	EL-AMIN CHANCHAGA	COE MINNA	UNITS	
Tubidity	1.4	1.0	4.5	NT
B O D	2.0	1.8	3.1	mg/ml
Electrical Conductivity	86	104	150	mg/ml
TDS	46	51	74	mg/ml
Total Hardness	106	84	112	mg/ml
PH	7.6	7.5	7.8	____
Alkalinity	41	34	39	mg/ml
Temperature	25.7	26.0	25.9	^{0}C

The physio-chemical analysis includes turbidity, BOD, electric conductivity, TDS, total hardness, pH, alkalinity and temperature. Turbidity of the water sampled analysed shows variation which is the result of intense washing of the gold mining activities in the selected sampled areas as indicated in Figure 4.1 of the study.

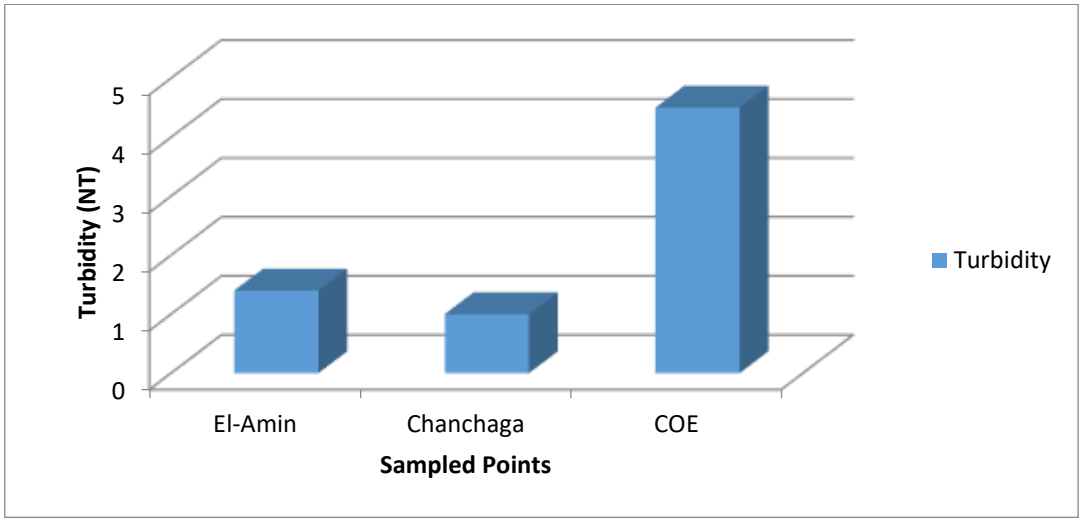


Figure 4.1: Turbidity of the Sampled Points in the Study Area

As revealed in Figure 4.1 of the study, COE has the highest turbidity value with 4.5NT, El-Amin ranked second with 1.4NT and Chanchaga ranked the least with 1.0NT. This revealed that COE sampled point has the major gold mining activities due to higher level of turbidity which in turn can affect the quality of domestic water in the study area.

Biological Oxygen Demand (BOD) of the sampled points includes 2.0, 1.8 and 3.1 as indicated in Figure 4.2 of the study.

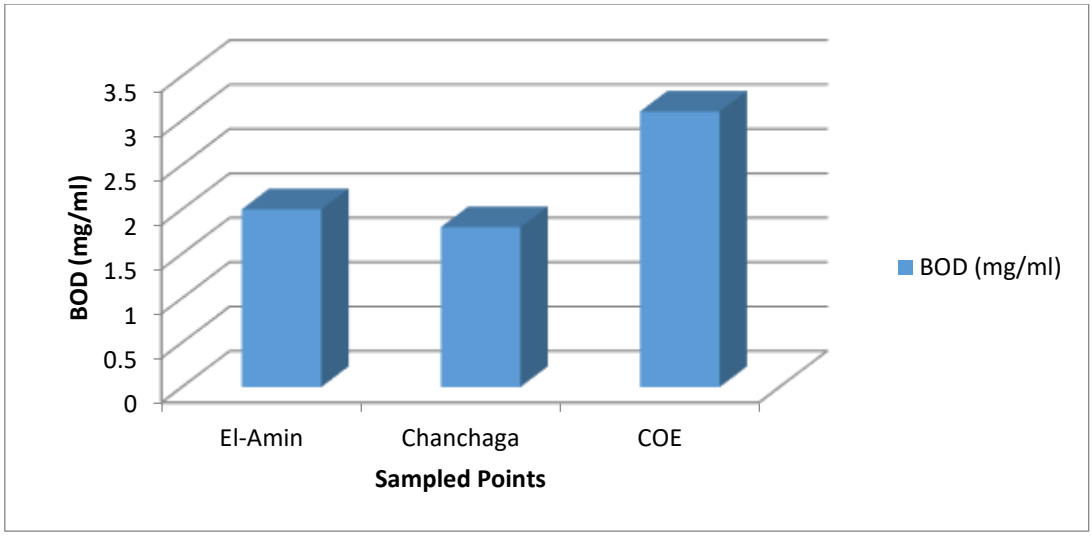


Figure 4.2: BOD of the Sampled Points in the Study Area

As revealed in Figure 4.2 of the study, COE has the highest BOD value with 3.1mg/ml, El-Amin ranked second with 2mg/ml and Chanchaga ranked the least with 1.8mg/ml. This revealed that COE sampled point has the major gold mining activities due to higher level of BOD which in turn can affect the quality of domestic water in the study area. The available range of the BOD in the study which is between 1.8 and 3.1mg/ml indicate that the water samples are moderately clean with regards to BOD parameter. The electric conductivity of the water sampled analysed include 8.6, 104 and 150µs/cm^3 as indicated in Figure 4.3 of the study.

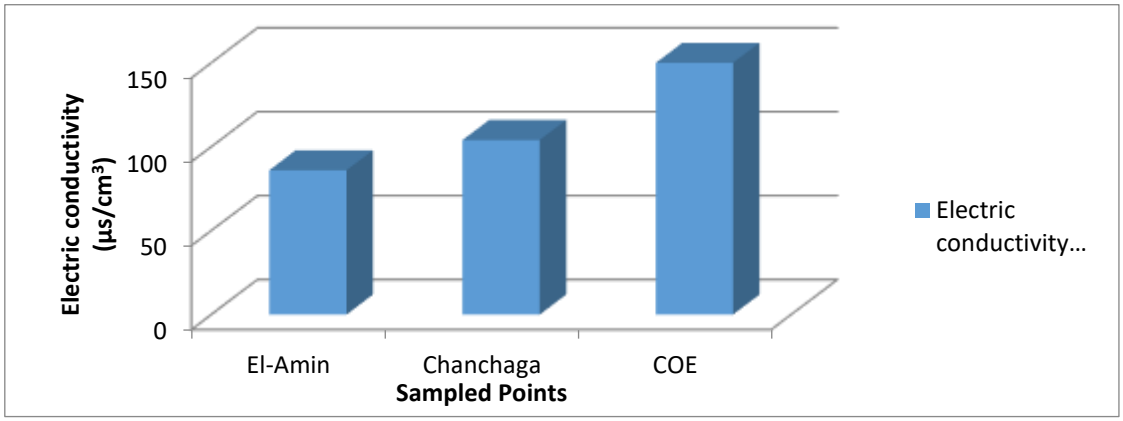


Figure 4.3: Electric Conductivity of Water Samples in the Study Area

Total Disolved Solid (TDS) of the water sampled analysed includes 46, 51 and 74mg/ml as shown in Figure 4.4 of the study.

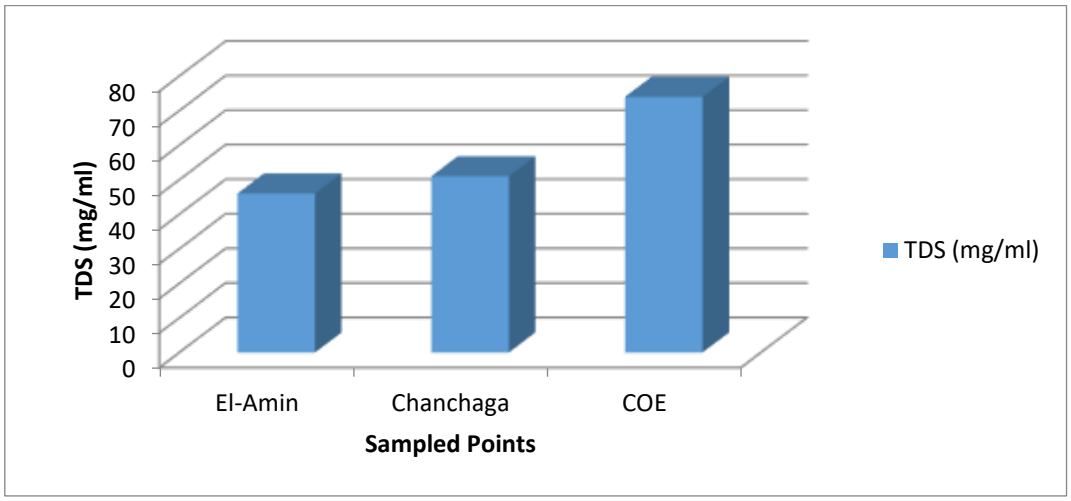


Figure 4.4: TDS of the Sampled Points in the Study Area

As revealed in Figure 4.4 of the study, COE has the highest TDS value with 74mg/ml, El-Amin ranked second with 51mg/ml and Chanchaga ranked the least with 46mg/ml. This revealed that COE sampled point has the major gold mining activities due to higher level of TDS which in turn can affect the quality of domestic water in the study area since its represent the total concentration of dissolved substances in water. The higher the TDS, the more gold mining minerals are dissolved in the sampled water.
As revealed in in Figure 4.5 of the study, the pH level were within the range of 7.5 to 7.8 for the selected sampled points across the study area. As revealed in Figure 4.5 of the study, COE has the highest pH value with 7.8, El-Amin ranked second with 7.6 and Chanchaga ranked the least with 7.5. This revealed that COE sampled point has the major gold mining activities due to higher level of pH which in turn can affect the quality of domestic water in the study area if it continue to exceed 8.5 in the study area.

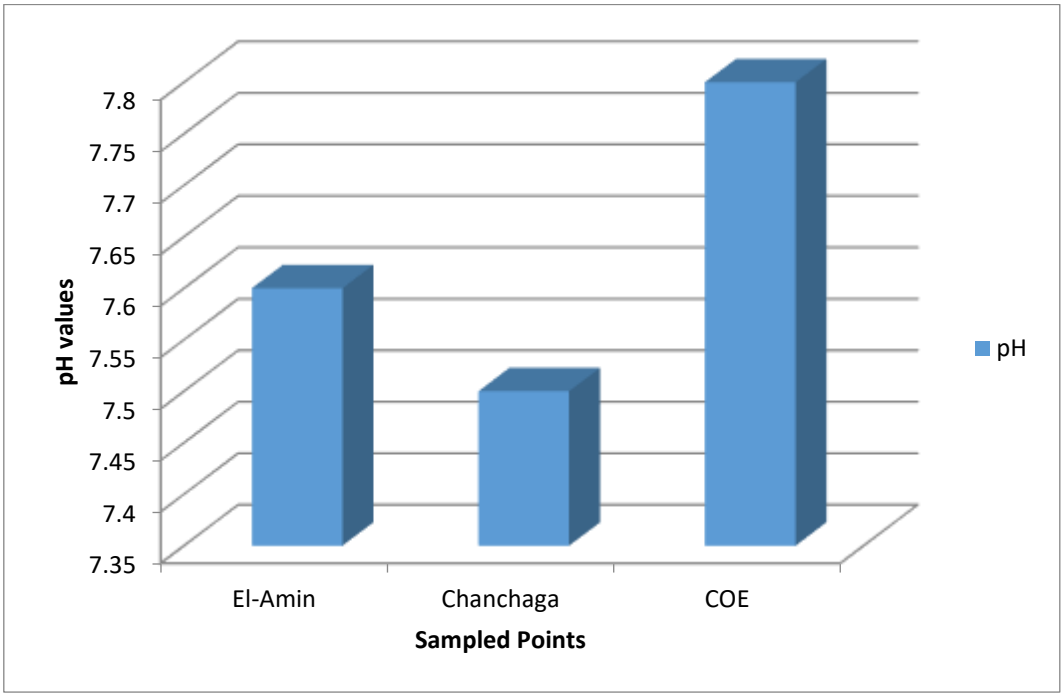


Figure 4.5: pH of the Sampled Points in the Study Area

The alkalinity of the sampled water were within the range of 34 to 41 as depicted in Figure 4.6 of the study. El-Amin ranked the highest with 41mg/l, COE ranked second with 39mg/l and Chanchaga ranked the least with 34mg/l.

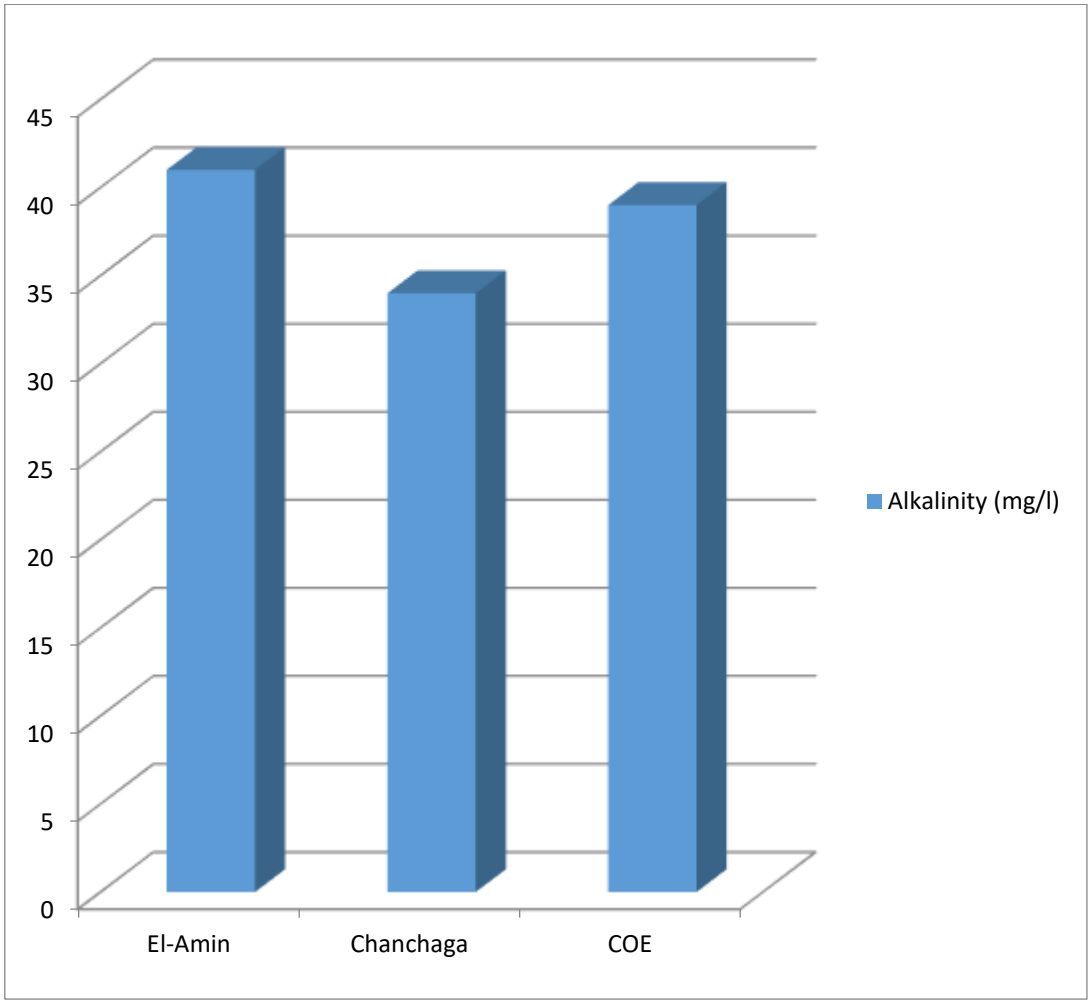


Figure 4.6: Alkalinity of the Sampled Water in the Study Area

The presence of high alkalinity in these water sampled revealed the activities of gold mining in the study area. This implies that alkalinity will continue to increase since gold mining activities in on the increase.

Table 4.2 : Microbial Analysis of the Selected Water Sample Points

Sample Points	TBC (cfu/ml)	TCC (cfu/ml)	TFCC (cfu/ml)
Chanchaga	106 X 10^3	16 X 10^3	3 X 10^3
El-Amin	94 X 10^3	11 X 10^3	10 X 10^3
C.O.E	98 X 10^3	9 X 10^3	7 X 10^3

As revealed in Table 4.1 of the study, microbial analysis covered include Total Bacteria Comit (TBC), Total Coliform Comit (TCC) and Total Feacal Coliform Comit (TFCC). In TBC, Chanchaga ranked the highest with 106 X 10^3 and El-Amin ranked the least with 94 X 10^3. In TCC, Chanchaga ranked the highest with 16 X 10^3 while C.O.E ranked the least with 9 X 10^3. In TFCC, El-Amin ranked the highest with 10 X 10^3 while Chanchaga ranked the least with 3 X 10^3. This revealed that the selected sampled points water were all contaminated and not fit for domestic usage since it can easily affect human health in the study area.

The result shows some bacteria in the samples collected include Bacillus, Eschinchia, Coli, Staphylococcus, Subtilis, Aureus, Salmonella typhi and Klebsilla.

4.2 Identify the Major Perceived Health Challenges Caused by Artisanal Mining in the Study Area

Table 4.3: Perceived Causes of Health Challenges in the Study Area

Options	Frequency	Percentages (%)
Airborne dust	99	48.8
Drinking of water from near-by river	63	31
Noise pollution	41	20.2
Total	**203**	**100**

Source: Field Survey, 2023

As revealed in Table 4.3 of the study, there exists airborne dust, drinking of water from near-by rivers and noise pollution as the causes of health challenges in the study area. As shown in Table 4.3 of the study, airborne dust ranked the highest with 48.8% of sampled population, drinking of water from near-by river ranked second with 31% of sampled population and noise pollution ranked the least with 20.2% of sampled population. This revealed that the major cause of health challenges was airborne dust and this result to majority of health challenges in the study area.

As revealed in Figure 4.7 of the study, the health challenges were classified into two namely biomechanical health challenges and psychological health challenges. Respondents with biomechanical health challenges ranked the highest with 126 sampled populations across El-Amin, Chanchaga and COE while psychological health

challenges ranked the least with 77 sampled populations. This revealed that majority of the sampled population suffered from biomechanical health challenges.

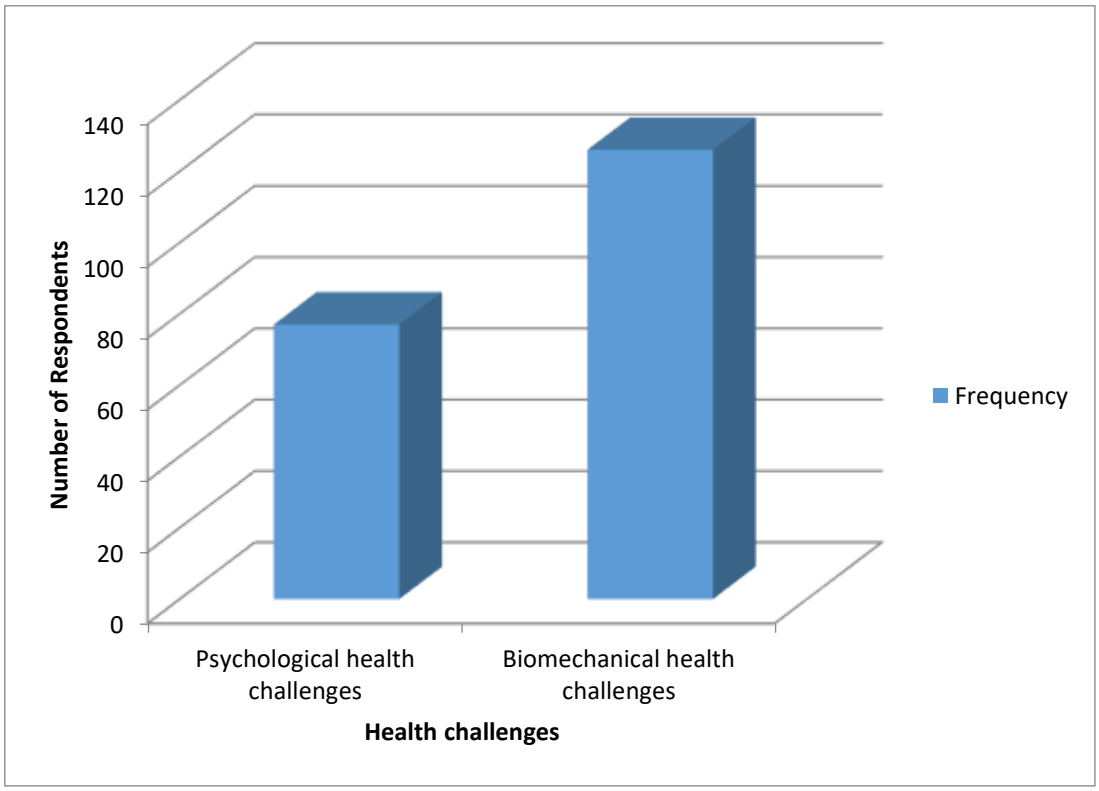


Figure 4.7: Health Challenges in the Study Area

Biomechanical health challenges (with consequences as musculoskeletal disorders, fatigue, trauma, etc.) may result from the fact that diggers work with inappropriate equipment for long periods of time in uncomfortable postures in the gold mines of the study area. Furthermore, diggers are pushed to make extra hours of work searching for survival means due to poverty and the local perception of 'virility' according to which "men don't get tired". Enduring prolonged hours of work is a leading criterion for being selected as a digger irrespective of the associated biomechanical risks.

Psychological health risks: In order to intervene on the health effects of psychological hazards (such as the stress leading to drug and alcohol abuse, fatigue, etc.), actions to respond to socio- economic constraints of the mine workers must be taken in addition to the organizational and awareness-raising measures mentioned above.

Table 4.4: Environmental Degradation Due to Artisanal Mining in the Study Area

Options	Frequency	Percentage (%)
Land degradation	69	34
Landscape destruction	45	22.2
Deforestation	23	11.3
Soil erosion and loss of soil quality	36	17.7
Degradation of water quality	30	14.8
Total	**203**	**100**

Sources: Field survey 2023

Environmental degradation due to artisanal mining in the study area are land degradation, landscape destruction, deforestation, soil erosion and loss of soil quality and degradation of water quality as revealed in Table 4.4 of the study. Land degradation ranked the highest with 34% sampled population, landscape destruction ranked second with 22.2% sampled population, soil erosion and loss of soil quality ranked third with 17.7% sampled population and deforestation ranked the least with 11.3% sampled population. This shows that the major environmental degradation was land degradation in the study area.

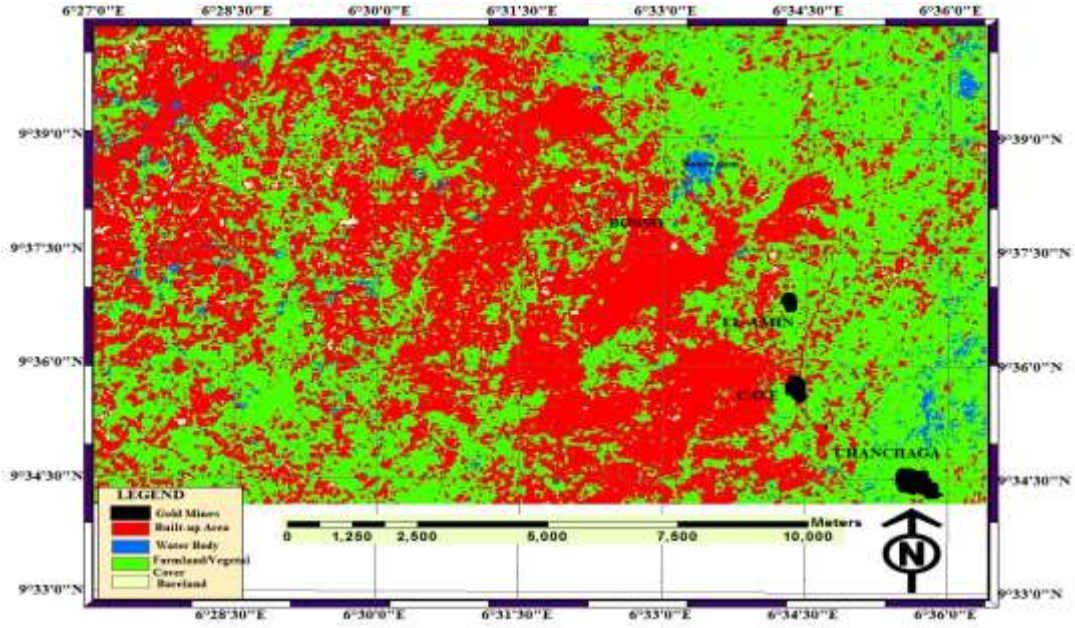


Figure 4.8: Map showing the extent of environmental degradation gold mining sites

The extent of gold mining activities which in turn leads to environmental degradation in the study. Gold mining sites in Chanchaga ranked the biggest with 0.74km^2, while that of El-Amin ranked the least with 0.51km^2.

Conclusion

In conclusion, Artisanal and Small-Scale Mining (ASM) is highly dangerous work associated with multiple occupational and environmental hazards. In most mines of the study area, little consideration is given to health and safety. Governmental oversight is rare, especially in areas where ASM is illegal. Severe injuries such as falls from heights crush injuries from cave-ins, and lacerations and amputations from unguarded tools are common in the study area. Because there is little separation between working and living areas in ASM, miners, their families, and residents in mining communities are at risk of exposure to hazards associated with mining for 24 h each day, every day, throughout the year, often under very primitive conditions.

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NIGERIA'S FEMALE ENTREPRENEURS WITHIN FEMALE ENTREPRENEURSHIP'S MACROCOSM

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ABSTRACT

The paper examines the popularity of the female entrepreneurs and their importance in creating vitally required jobs right on demand in breaking the vicious cycle of poverty. It additionally identifies the challenges confronted by these lady entrepreneurs, by means of reviewing a number of literatures and gives some recommendation on overcoming these obstacles. Women these days have emerged as a key participant in financial improvement of the nations. Today, women have an important place in the economic development of the country. But social change is not over yet. Women entrepreneurs encounter problems not only in the process of establishing a business, but also in the process of sustaining a business. All over the world, they have become important players in promoting social and economic development. In the last few decades, women have made significant progress in the workforce. This change is a result of equality and equal pay policies; fair work; changing social norms for women in the workplace; and organizations seeking qualified women in management positions to create a positive image. In the last few decades, women have made significant progress in the workforce. This change is a result of equality and equal pay policies; fair work; changing social norms for women in the workplace; and organizations seeking qualified women in management positions to create a positive image. Many women are learning more and the idea that women should stay at home, take care of the children, cook, go to the market, look after the children and family is not in fashion. The number of women in business is increasing day by day. Women entrepreneurs

face many challenges in the process of reaching their goals. Initially they face social problems, then they face financial problems. Commercial and intellectual barriers make it difficult for them to start a business. Problems arising from their own fears and their behavior in business decisions are another important factor in the uncertainty of female entrepreneurs. However, they have proven that they can't just run a small business, they can be successful at running a bigger business. After all.

Keywords: Entrepreneurial Success, Female Entrepreneurship, Female Entrepreneurs, Challenges, MSME,

INTRODUCTION

Half of the world population are women consequently they are known as the better half of the society. They were confined to the four walls of houses performing household activities in traditional societies, but n modern societies they have come out of the four walls to participate in all sorts of business activities. Women have been performing exceedingly well in different spheres of activities like academics, politics, administration, social work and so on according to the global evidences. They have now successfully started plunging into industry also and running their enterprises.

Recently female entrepreneurs have been moving rapidly into manufacturing, construction and other industrial filed from their known traditional fashion, food and other services sector businesses. Almost in all countries, Women owned business are lightly increasing. Entrepreneurial potential of women that was hitherto hidden has gradually been changing with the growing sensitivity to the role and economic status in the society in the service of man and humanity. Running a business successfully women have the potentials, skill, knowledge and adaptability to defy all odds to succeed.

Across the globe, the rate at which females are starting their businesses is in a geometric increase. In the United States, for example, female folks own 9.1 million firms, or 38 percentage of all U.S. companies. From 1987 to 1999, the variety of woman-owned companies in the United States elevated by over 103 percent; employment with the aid of lady groups rose 320 percent; and, even greater astounding, income grew by over 436 percent. Female-owned corporations in the

United States generate greater than $3.6 trillion in annual sales, and lady entrepreneurs appoint greater human beings than the whole Fortune 500.

Although the United States might also be the most stated instance of the upward shove of female entrepreneurs within the industrialized world, woman-owned organizations are on the upward jostle everywhere. In Germany, female entrepreneurs have created a 1/3 of the new organizations considering the fact that reunification in 1990, supplying 1 million new jobs and contributing U.S. $15 billion to the German gross countrywide product. Female entrepreneurs in different transition economies, like Russia, Hungary, Romania, and Poland, are making a comparable impact. In Latin America, in accordance to the World Bank, absolutely 1/2 of all economic boom in the remaining decade all through the location is attributable to the creativity and tough work of female entrepreneurs. In South Asia, female entrepreneurs now outnumber men counterparts as commercial enterprise owners. And in Southeast Asia lady owned corporations have been at the forefront of that region's financial turnaround when you consider that the "Asian flu" arrived in 1997.

Research shows that trends in female entrepreneurs in emerging economies are similar compared to developed countries. GEM (2013.Approximately 40 percent of Nigerian female folks are entrepreneurs. The sub-Saharan region has the highest rate of female entrepreneurs worldwide (Mohammed et al., 2017).

A recent BBC survey found that around 40% of Nigerian women are entrepreneurs; this is a higher percentage than anywhere else in the world (BBC). With the rise of women entrepreneurs in Nigeria, research on these businesses has become timely, important and relevant.

The growth of women's businesses is clearly good for business. The rise of female entrepreneurs also benefits society and women themselves. Those who want to see women improve around the world have discovered that caring and supporting female's entrepreneurship is of immense value to the society. The benefits of women starting and running their own businesses are significant because: it increases self-confidence, quality of life and life expectancy, and reductions in infant mortality,

In emerging economies, research reveals comparable tendencies amongst the female entrepreneurs when compared to the developed countries. GEM (2013) in its document indicates that about 41% of ladies mounted new organizations as against to 29% amongst the men in Nigeria and Zambia.

It has been estimated that 40% of Nigerian ladies are entrepreneurs. The best possible percentage of female entrepreneurs in Sub Sahara Africa (Mohammed et al., 2017). A current survey through the BBC suggests that about 40% of Nigerian ladies are entrepreneurs and this is greater than somewhere else in the world (BBC). With the upward increase in female entrepreneurship in Nigeria, a study about of them is timely, vital and relevant.

OBJECTIVE OF THE STUDY

•To promote the idea of female entrepreneurship as a tool that may employed and deployed as a game changer towards poverty reduction in Nigeria.
•To highlight the challenges of female entrepreneurship in Nigeria.
•To mobilize the female folks for economic prosperity leveraging on female entrepreneurship.

RESEARCH METHODOLOGY.

This paper adopted a qualitative research design which entailed a review of literature on the roles of female entrepreneurship in economic growth and development which could be deployed effectively to emancipate the womenfolk from excruciating poverty as a result of their entrepreneurial failures. The study adopted a conceptual approach. The use of systematic literature review.

UNRAVELING THE MYSTERY OF FEMALE ENTREPRENEURS

Female entrepreneurs refer only to women who are fully involved in the business, take risks, and pool resources in a special way to use insight into their environment through production and services (Chinonye & Qima, 2010). Olumide (2012) defines female entrepreneurs as women business leaders who start new businesses. In addition, female entrepreneurs accept the risks and social responsibilities involved in changing their daily activities. Women entrepreneurs are also known as women who enter business life by using their knowledge, skills and creative ideas.
Ganesamurthy (2007) defines women entrepreneurs as thoughtful and innovative private women who are required individually or through collaboration to achieve financial independence for themselves and create jobs for others. However, people initiate, develop and demonstrate a sense of adventure consistent with their family and public activities

Female entrepreneurs are women who plan and manage businesses (Pandian & Jesurajan, 2011). They generate incomes for their families and employment for their communities," Female entrepreneurs are essential for the economic development, poverty and unemployment reduction in a nation._Women entrepreneurs come to families, provide communities with products and services that add new value to business and the world around them.
"Women entrepreneurs are important for the economic development of a country and the reduction of poverty and unemployment. They have roles to play in the social, economic, and political existence of any nation. Moore and Buttner (1997) in Farr-Wharton and Brunetto (2007) described female entrepreneurs as: "women who use their information and assets to strengthen or create new enterprise opportunities, who are actively concerned in managing their businesses, own at least 50 per cent of the commercial enterprise and have been in operation for longer than a year.
Female Entrepreneurship is one of the best tools to ensure gender equality and women's advancement in society. Investing in women-specific projects can affect the country's economic development. The aim is not only to reduce the gap between women and men, but also to eliminate economic and social discrimination, programs and practices that prevent women from participating in business life.

FEMALES' ENTREPRENEURIAL TRAITS

Female business owners have two characteristics (women first, business second). For this reason, Chinonye & Chima (2010) noted that the characteristics of female entrepreneurs include power and internal control, quick thinking and needing for a long time , adaptability, innovation/creativity (Schumpeter, 1934, Drucker 1985), managing expertise, responsibility, and credit risk taking.

CONCEPT OF FEMALE ENTREPRENEURSHIP.

Female entrepreneurship is an economic undertaking that entails starting an enterprise, gather and organize each and every one of the factors of production, delegate responsibilities, bear risks and manage the economic vulnerability involved in growing a commercial enterprise.
Throughout the world, female entrepreneurs constitute themselves as significant supporters of the economy because they make their impacts felt the financial field.

They contribute their thoughts and a lot of energy coupled with capital assets to their networks, and produce jobs seekers and provide other side project business linkages. The women business has undergone changes and has finally risen, but it still has a long way to go before it becomes a productive business. The importance of female entrepreneurship for families and businesses is well documented. Women's entrepreneurship makes a special contribution to economic growth in low- and middle-income countries.

Women entrepreneurs around the world are important supporters of the business world due to their influence in the financial sector. They advise with energy and resources important to their networks and create jobs such as sidelines for providers and other business contacts.

They are imaginative and innovative women that are fit for accomplishing self-financial freedom exclusively or in coordinated effort, provide work openings for other people however starting, building up and showing the venture and supporting her own family and public activity Ganesamurthy (2007),

WHY FEMALE ENTREPRENEURSHIP?

The Need of Women Entrepreneurship

Source: Sonu Garg1 andParul Agarwal(2017): Problems and Prospects of Woman Entrepreneurship. A Review of Literature.

THE ATTRACTIONS OF FEMALE ENTREPRENEURSHIP

Women's participation in business development has increased in the last two decades. Women's employment and personal property became a global problem (Butler, 2003). In the United States, for example, women-owned companies have grown one and a half times over the size of other small businesses over the past 15 years and now account for about 30 percent. all businesses. Today, four out of ten business owners (40 percent) in the United States are women. Women entrepreneurs make up 8 percent of the workforce and 4.3 percent of total income (USCCF, 2016). Although women entrepreneurs are involved in economic growth and prosperity, women's business worldwide also faces challenges (Kelley et al., 2017). Out of the 49 economies surveyed by GEM in 2018, only 6 have the same TEA rates for men and women; 2 of them are in East and South Asia (Indonesia and Thailand), 1 in Latin America (Panama) and 3 in the Middle East. and Africa (Qatar, Madagascar and Angola). Today, many women entrepreneurs are struggling with sustainability issues. They cannot reduce their costs due to business failures, which causes unemployment and poverty (Franco & Haase, 2009).

While women entrepreneurs in developed and developing countries have many characteristics, many women in developing countries are still illiterate – even without the skills, knowledge and skills – and live in poor communities. However, women have always worked in the local economy. For example, 80 percent of food in Africa is produced by women. They make up 60% in Asia and 40% in Latin America.

Most of the women not only produce food but also sell it by providing information about local markets and consumers. Most of the poor people in the world are women and children.

Some of these women work in small businesses that allow them to improve the quality of life for themselves and their families. Small businesses and micro businesses are starting to gain traction. Community organizations and nonprofits have shown that investing in women is the most effective way to improve health, nutrition, sanitation and hygiene.

The International Foundation for Community Assistance (FINCA) defines women as "the best, most productive and creative members of the poor". As the problem of women gaining skills and experience in developing countries remains, and their full participation in the economy in their own communities has disappeared, the important

thing should be to place women in the workplace and to create a humane and balanced job. Because of their unique leadership styles, women entrepreneurs often provide a caring, collaborative work environment that fosters personal growth and development. At the same time, the way women lead has proven to be unique in today's business world.

THE DEVELOPING WORLD AND FEMALE ENTREPRENEURS

Throughout the world, female-owned businesses represent between one-fourth and one-third of the commercial enterprise population. While female entrepreneurs in each developing nations and developed nations share many characteristics, many female entrepreneurs in the developing world stay illiterate, inexperience, lack wisdom and stay in terrible rural communities. Nonetheless, female have continually actively participated in their nearby economies. In Africa, for example, female entrepreneurs produce eighty percentage of the food. In Asia, they produce 60 percentage and in Latin America forty percent.

Women in developing countries acquire competence and experience, and as the artificial barriers to their full participation in the economic life of their communities gradually fall, the integration of feminine values into the workplace should create a more humane and balanced work environment. Because of their unique leadership style, women-run enterprises generally provide a caring, cooperative work environment in which individual growth and development are fostered.

However, female entrepreneurs, now not solely produce meals however market it as well, giving them a well-developed know-how of neighborhood markets and customers. The majority of the impoverished in the world are ladies and children.

NIGERIA' PRACTICE OF FEMALE ENTREPRENEURSHIP

Traditionally, women are seen as housewives and caretakers in Nigerian culture. Female entrepreneurs tend to be fewer than male entrepreneurs, raise less capital through debt and equity, and rely on internal sources of finance (households, friends, and self-protection) (Adesua-Lincoln, 2012). In Nigeria, the economic performance of women entrepreneurs is lower than that of men (Ekpe, Alabo, & Egbe, 2014).

The reason for this is institutional barriers that do not allow women to participate in economic empowerment (Ekpe et al., 2014). Women are considered to be related to

the family and most of the management of the house is given to them (Motilewa, Onakaya & Oke, 2015).

The widespread use of the word "sex" in the Nigerian language suggests that women should not work in stressful and high-risk jobs. This hinders many Nigerian women from starting, running and growing commercial businesses. Aladejebi (2020) found that the main problem faced by women entrepreneurs in Western Nigeria is not the general perception of social discrimination. He concluded that lack of adequate education, lack of start-up capital and inadequate family support, including spousal support, hindered the growth of women's business in the country.

THE ROLE OF FEMALE ENTREPRENEURS IN ECONOMIC GROWTH

It is important to understand that small businesses owned by women play an important role in the world economy, hence reasons for the failure (or success) of small businesses is critical to the stability of the global economy (Titus, 2008). Lawmakers in many countries resent the job creation potential of small businesses. The high failure rate of small businesses has caused significant waste of resources and has brought economic and human costs.

The high failure rate of small businesses has resulted in large waste products, thus incurring economic and human costs. That's why it's important to understand reasons why new small businesses fail. Most women are in small and medium-sized enterprises (MSMES), which account for more than 97% of all businesses, 60% of the country's GDP and 97% of all jobs (Ndubusi, 2004). Women's entrepreneurship mainly ranges from home-based enterprises (HBB) to micro, small and medium-sized enterprises (MSE) (ILO, 2006). Okafor and Mordi (2010) think that women have two characteristics (ie they are women first and then entrepreneurs).

ENABLING WOMEN THROUGH FEMALE ENTREPRENEURSHIP

Entrepreneurship is one of the best ideas for women's empowerment and advancement in their ideas. For millions of women around the world, life is a complex web of restrictions, responsibilities and sacrifices, many of which are set from birth. The tribe or race into which a woman is born determines her rights and freedoms. The identity of the group is only part of the situation. Patriarchal family structures continue to determine many aspects of women's lives. Many women in developing countries have no other way to survive than to marry and have children.

INFORMATION TECHNOLOGY AS A CATALYST FOR FEMALE ENTREPPRENEURSHIP

The use of new information and communication technologies such as the Internet is an important factor in accessing global markets.

Female owners of SMEs can now use computers to exchange information on supply and demand, market prices /and microcredit facilities. Throughout the developed world, the Internet has proven its great potential to compete in international markets as well as local ones. ICT can also contribute to important social goals by providing women and rural families with access to basic health and education services that they would not normally have.

CHALLENGES FACED BY FEMALE ENTREPRENEURS

Globally, female entrepreneurs face almost the set of problems which include:

• **LACK OF EDUCATION:** the ability to find, analyze and understand ways and build a good business around them. In this sense, education is important. Experience shows that female citizens in developing countries are more educated than women in developing countries. 16 In India, 56 percent of the female population is educated, and most of them have no education outside of school. This results in businesswomen not having enough skills to understand innovation in business or business, let alone new business. Therefore, due to this deficiency, women entrepreneurs face many problems in the process of establishing and operating a business.

• **SOCIAL BARRIERS:** Factors such as gender discrimination, fear of social impact, family responsibilities and commitments combine to create social barriers to the way women do business. In India, women are seen as secondary workers and men's dependents, so it is decided that commerce is not a women's matter, because everything belongs to men.

Roles, responsibilities and family responsibilities are defined as barriers to women's entrepreneurship. Many studies have shown that this behavior is due to pressure from society because women should prioritize having children at home for other reasons. This phenomenon is reported in rural areas where women do not have or do not have time for work due to their traditional responsibilities and is important.

Women feel guilty when they do not fulfill their responsibilities in the family, which shows that they lack family support and commitment to the social development of women. This also prevents women from starting and running businesses, visiting

banks, attending meetings and conferences as well as business training, attracting customers or finding more vendors.

• FINANCIAL PROBLEMS:

Financial problems of the business, lack of sufficient capital, difficulty in obtaining loans from banks, low risk, difficulty in disseminating financing, not knowing the necessary resources, lack of responsibility, difficulty and complexity, etc. The borrowing process is long etc. Women entrepreneurs in India have always faced the problem of insufficient and insufficient capital. Due to women's limited assets and bank balances, lack of creditworthiness and originality, they are unable to obtain financing from other sources such as financial institutions.

Robert's research in non-OECD and emerging economies shows that 59% of respondents view the financial crisis as a major problem, followed by 41% finding it difficult to get a loan. To do. Decisions to ask for a loan from a female entrepreneur, when the female entrepreneur gives the product and a letter of approval to start a business from a blood relative or spouse or local leader. It is often assumed that feminist women cannot be dangerous. As a result, women entrepreneurs start businesses with low capital and low debt, and do not use much equity to manage their businesses due to their internal and external disadvantages. This financial withdrawal is due to both voluntary and involuntary reasons. Women entrepreneurs were voluntarily excluded from banking services due to a lack of cultural knowledge and complex and lengthy bank loan procedures. On the other hand, banks cannot exclude financial services due to high interest rates, low credit history, lack of credit history, insufficient credit and good relations with banks that are not interested in lending. Also, take advantage of a bank loan.

22 Moreover, women entrepreneurs are unaware that financial aids such as subsidies, incentives, tax payments from financial institutions and the state make it useless. This has caused women to rely more on small savings and loans from family and friends to manage their day-to-day operations, which is not enough to keep the business sustainable.

• Personal problems: Personal problems affect the personal abilities or mental health of women entrepreneurs that prevent them from taking risks in business life. In addition, the stereotypes of society regarding female characteristics such as lack of work ability, lack of self-confidence and fear of failure, difficulty in gaining trust and

support from other businesses, lack of cooperation with colleagues, etc., also personal. block.

• **CONFIDENCE AND FEAR OF FAILURE** - a common feeling around the world that men are more optimistic and confident about business and entrepreneurship than women.

Lack of self-confidence is the biggest barrier for women to enter small and micro businesses.

Women have been shown to have lower self-esteem than most women. However, trust levels vary from person to person and situation to situation, so this may not be true when it comes to trust in competitive business. However, according to research by Halkias et al., there is a fear of failure that affects the social and economic conditions women business owners face. Many studies have shown that women can overcome this problem and increase their self-confidence by participating in various business education, training and seminars from government and projects.

• **LACK OF ENTREPRENEURSHIP** - A lack of entrepreneurial skills and attitudes is a personal barrier to starting and growing a business venture. In general, women are not as good as men in terms of business sense, so they do a lot of business development and training, workshops, conferences, etc. Only some women start their own business and develop their negative thoughts or misconceptions to start a business and improve their risk and performance.

• **BARRIERS TO MARKETING:** Marketing is an organization that creates, communicates and delivers value for customers. However, intense competition, weak markets, weak sales, slow payments from customers, less information in the industry and rapid demand changes. Technology is an important factor forcing women's businesses to respond quickly to changes in the economy.
Overall, female-owned SMEs have survived intense competition from manufacturers and male entrepreneurs on the basis of price, quality, standards and meeting users' needs. There is also the experience of businessmen, business knowledge and the use of new technologies in production. However, women do not have enough money to advertise their products and services, as they start businesses with little savings and little investment. Therefore, the commercial activities carried out by women entrepreneurs are limited and rely only on intermediaries, that is, intermediaries.

Distributors, retailers etc. Try to capture most of the profit, which makes profits low for the company. This has resulted in less money for expansion and modernization. Weak and inefficient technology leads to low quality products, high prices, making them uncompetitive in the market, which is one of the main causes of job loss. Building links on your own social network is another way to market your products because it's cheaper and has an impact on the mind. It will also increase their access to information and facilitate women entrepreneurs' access to customers, suppliers and financial resources through networking.

• **IMPACT OF SKILLS:** Skills and general management are qualities that entrepreneurs acquire in their lives through past work and management, as well as through job education and training. This enables business people to identify and take advantage of better business or business opportunities. However, women entrepreneurs in India and many other developing countries face significant skills barriers.

• **ACTIVITY BARRIERS:** Many organizations have business plans to start new businesses, but when starting a business, women entrepreneurs are left to compete on their own in an uneven environment. Women entrepreneurs do not have work experience, so consulting, training, coaching and mentoring can help them overcome the problems they face in running a business that requires hard work and success. complete.

Other problems: These include:

• Technological obsolescence/technical development issues
• Legal formalities
• Raw material shortages
• Lack of government support / government job
• Lack of incentives
• Direct and indirect tax-related issues
• Tax-related issues

CONCLUSION

Support for female entrepreneurs can meet many needs of the economy by creating new jobs.

Women entrepreneurs face many difficulties in achieving their ambitions. They face social problems at the beginning of the enterprise, followed by financial problems.

Commercial and intellectual barriers make it difficult for them to start a business. Problems arising from their own fears and their behavior in business decisions are another important factor in the uncertainty of women entrepreneurs. But, despite all, they have proven not only their ability to run a small business, but also their ability to turn it into a large one.

A good environment can solve many problems with the support of the community (not only their families) and the government, so the government has implemented many ideas and projects to help women in business overcome these problems. There are many ideas that women can get more benefits/advantages/helps support agencies and foreign governmental organizations. Also, with higher education and better literacy, society's perspective on women entering the business world has changed. During the transition period, the government should not only widely publicize various initiatives for women entrepreneurs, but also set up a special center to assist women entrepreneurs.

In addition, a window has been opened for women entrepreneurs with knowledgeable and talented people who can help women entrepreneurs manage important processes of the state and solve problems related to tax and legal compliance. In addition, a window has been opened for women entrepreneurs with knowledgeable and talented people who can help women entrepreneurs manage important processes of the state and solve problems related to tax and legal compliance.

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TRANSFORMATIONAL LEADERSHIP STYLE AND EMPLOYEE PERFORMANCE OF MICROFINANCE BANK IN MINNA METROPOLIS, NIGER STATE.

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ABSTRACT

This study aims to investigate how transformational leadership style has impacted in microfinance banks and compare the employer performance. A quantitative research approach was thus employed with the use of a questionnaire for collecting data from the staffs of the microfinance banks in Minna, Niger state with a focus on two local government areas (Chanchaga and Bosso local government). For this study, a sample size of 126 was used to obtain data for finding answers to the questions posed by the research. The analysis of the data was carried out with the use of a frequency count, percentage, and T-test the results of the analysis of variance (ANOVA). The findings show that the model as a whole was statistically significant. The findings also suggest that the independent variables are reliable indicators of the employee performance of microfinance banks in Minna Niger state. An F statistic of 17.49 and the reported p=0.000, which was below the usual probability of 0.05 significant threshold, corroborated this. The model

summary employed in the regression model to describe the research phenomena is shown in Table 4.9. These was found to be well explained by idealized influence, inspirational motivation, individual consideration, and intellectual stimulation. The R square, commonly referred to as the coefficient of determination, was 0.657, which corroborated this. This indicates that the employee performance of microfinance institutions in Minna, Niger State, is the dependent variable. The independent variables include idealized influence, inspirational motivation, individual consideration, and intellectual stimulation explain 65.7% of the variability in the dependent variable. The results obtained from the analysis of the data led to the conclusions stated in this section. It was recommended that; microfinance banks should employ a transformational leadership in order for them to effectively and efficiently boost their employee performance.

INTRODUCTION

Background to the Study

Globally, microfinance bank provides financial and non-financial product and services mostly to low-income clients and the unbanked population (Yahaya, 2021). Microfinance bank is key to improving access to finance in emerging markets, supporting economic growth, and helping communities rebuild after the pandemic (Wahid *et al.,* 2022). Microfinance bank provides financial services and products to individuals, cooperatives and institutions (Tahir *et al.*, 2021). Microfinance banks are therefore the cornerstone in the promotion of rural development through financial inclusion and financial literacy (Lindah and Mokvist, 2020).

However, the challenges of microfinance institutions include; a lack of infrastructure, panic withdrawal by customers, competition, regulations, government policies, monitored evaluation, licensed withdrawal, lack of government support, and inadequate banking culture among rural customers (Das *et al.,* 2020). Consequently, they are exposed to a spectrum of risk, which includes credit risk, interest risk, liquidity risk, and operating risk (Gunay, 2020). Regular changes in government policies, lack of requisite human capital, infrastructural inadequacies, and sociocultural misconceptions (Groot *et al*., 2021).

Microfinance banks are further inhibited by corruption, forgeries, and poor corporate leadership (Sanya and Olalemi, 2021). Challenges faced by microfinance banks are

worse in developing nation which includes, a lack of training opportunity, the poor performance of many of the staff, inefficiency, and high level of forgeries (Dey *et al.*, 2021). The banks also suffer from low staff motivation and poor personnel practice which hinders performance (Herlisha *et al.*, 2021). This is evident by the poor risk management, management technique, auditing system, loan lending system, and marketing approach (Yarovaya *et al.*, 2020).

LITERATURE REVIEW

Transformational Leadership Style (TLS)

Leadership style refers to the approach or manner in which a leader leads, influences, and guides their followers or team members (Ajonbadi *et al*., 2020). Leaders varies best on their styles it may depend on their personality, values, beliefs, and the specific situations they encounter (Azeem *et al.,* 2020). Some common recognized leadership styles and their characteristics (Stoller, 2021). Transactional leaders focus on providing rewards and punishments in exchange for desired performance from their followers (McCord *et al.,* 2021).

Dr. Muhammad Yunus is a prominent figure in the field of microfinance and social entrepreneurship. In 1976, he founded Grameen Bank in Bangladesh as a microcredit institution, to provide small loans, known as microloans, to impoverished individuals, particularly women, who lacked access to traditional banking systems.

Evolution of Microfinance Banks in Nigeria

The evolution of microfinance banks in Nigeria can be outlined as follows:

Community banks: In the 1980s, community banks were established to provide financial services to rural and underserved populations.

Employee Performance

Employee performance refers to the level of productivity, effectiveness, and efficiency demonstrated by an employee in carrying out their job responsibilities (Ichsan *et al*., 2022).

Transformational leadership theory

Transformational Leadership Theory (TLT) was postulated in 1978 by American historian and political scientist, James Mac Gregor Burns (Leung, 2020).

Organizational leadership theory

Organizational leadership theory (OLT) was postulated during the beginning of the industrial revolution in the late 1800s and early 1900s by James Gardner March, a German sociologist (Borja *et al*., 2022).

Spiritual leadership theory

Spiritual Leadership Theory (SLT) was developed by Fry (2003) after the 1990s, there was a growing tendency of integrating spirituality into management in the USA (Houghton *et al.,* 2020).

Motivation theory

Motivation Theory (MT) was postulated by American, Abraham Maslow in 1970 (Navy, 2020). Motivation theory is the study of understanding what drives a person to work towards a particular goal or outcome (Wigfield and Koenka, 2020).

Empirical Review

Ogolla (2021) examine the influence of transformational leadership on employee performance of State Corporation in Kenya. Transformational leadership was conceptualized into four dimensions (ii) idealized influence (ii) inspirational motivation (iii) individual consideration (iv) intellectual stimulation on employee performance and was measured using multifactor leadership questionnaire (MLQ-5X), while, a balanced scorecard (BSC) was used to measure performance. Data was collected from 215 top leadership and management from 55 state corporations, while the data were analyzed using the statistical package for social science (SPSS) and structural equation modeling (SEM). The result revealed that there is a positive relationship between transformational leadership and employee performance.

Research gaps

The extensive review of scholarly evidence in the one important section above disclosed several research gaps that deserved to be bridged. The gaps so identify are (i) sample and (ii) Geography gaps.

RESEARCH METHODOLOGY

Description of Study Area.

The study area is Minna metropolis, the capital city of Niger state in Nigeria. Minna is centrally located in the state, making it a hub for economic activities.

- **Approach**

  To study the relationship between transformational leadership style and employee performance of microfinance in Minna metropolis, Niger state.
  Quantitative research design may be appropriate, as it allows for collecting numerical data on leadership style and employee performance.
  The target population of microfinance institutions in Minna metropolis include Chanchaga, and Bossa local government areas.

- **Strategy**

  In terms of strategy, this study intends to use a survey strategy to collect data from selected respondents.

- **Methodological Choice**

  This study intends to use a mono-method (survey) to collect data.

- **Time Horizon**

  The time horizon for the study of the transformational leadership style and employee performance of microfinance banks in Minna metropolis, Niger state is cross-sectional.

- **Data Collection and Analysis**

  The four hypotheses will be tested using multiple regression, this is because TLS has been divided into four variables (idealized influence, inspirational motivation, individual consideration, and intellectual stimulation), while EPMB serves as the dependent variable.

Data Analysis

The first four hypotheses will be tested using multiple regression, this is because TLS has been divided into four variables (idealized influence, inspirational motivation, individual consideration, and intellectual stimulation), while EPMB serves as the dependent variable will be measured using job satisfaction.
indicates another variable not captured within the model).

Model Specification

Multiple regressions will be used in the statistical evaluation of the impact of the independent variables i.e. idealized influence, inspirational motivation, intellectual stimulation and individual consideration on the employee performance of the microfinance banks in Minna, Niger state. Thus expressed,

$PERF = B_0 + B_1II_1 + B_2IM_2 + B_3IC_3 + B_4IS_4 + £$

Where PERF = Microfinance bank performance calculated as the cumulative score of job

Satisfaction.

RESULT AND DISCUSSION

Demographic Information of the Respondents

This section presents the demographic information of the respondents, which includes their gender, age, location of bank, length of career in the banking sector, and length of employment in the current bank.

Response Rate

A total of 126 questionnaires were administered, a total of 123 (98%) were returned, and only 120 (95%) were found valid for the analysis. The remaining 3 were wrongly filled by the respondents with lots of contradictions; hence, they were nullified and not used for the analysis. Table 1 shows the demographic characteristics of the respondents. As regards the gender of the respondents, 61.7%, which constitutes the majority, were male, while 38.3% were female. For the age group, 37.5% of the respondents were between 30 and 39 years old, 31.6% were between 21 and 29 years old, 25.0% were between 40 and 49 years old, 4.2% were between 50 and 59 years old, and 1.7% were 60 years and older. Regarding the local government area where the respondent's bank is situated, 58.3% of the sampled banks were situated in Chanchaga local government, while 41.7% were situated in Bosso local government area. In the case of the number of years spent in the banking sector, 37.5% of the respondents have spent 0–5 years in the sector, 25.0% have spent 6–10 years in the sector, 20.8% spent 11–15 years, 12.5% spent 16–20 years, 2.5% spent 26–30 years, and 1.7% have spent 31 years and above in the banking sector. In terms of the number of years the respondents have spent in the branch, 62.5% of the respondents have been in the branch for a period of 0–5 years, 20.8% have spent 6–10 years in the branch, and 16.7% have spent 11–15 years in the sampled branch. This implies that the respondents are well experienced and can provide valuable information for this research.

Table 1: Demographics Characteristics of Respondents

Variables		Frequency	Percentage (%)
	Female	46	38.3
Gender	Male	74	61.7
	Total	**120**	**100.00**
Age	21-29	38	31.6
	30-39	45	37.5
	40-49	30	25.0
	50-59	5	4.2
	60 years above	2	1.7
	Total	**120**	**100.00**
Local government area of your bank	Chanchaga local government	70	58.3
	Bosso local government	50	41.7
	Total	**120**	**100.00**
How many years have you worked in the banking sector	0-5years	45	37.5
	6-10years	30	25.0
	11-15 years	25	20.8
	16-20years	15	12.5
	26-30years	3	2.5
	31 years and above	2	1.7
	Total	**120**	**100.00**
How many years have you been in the bank?	0-5years	75	62.5
	6-10years	25	20.8
	11-15 years	**20**	**16.7**
	Total	**120**	**100.00**

Collinearity diagnostic test for independent variables

A test for collinearity was carried out by checking the "tolerance" and "VIF" values of performance of microfinance banks variables. Collinearity usually occurs when there are two or more independent variables that are highly correlated with each other. That is where one of the independent variables can be linearly predicted from the others

with a substantial degree of accuracy. Four variables were captured in the Collinearity test. These includes: including individual consideration, intellectual stimulation, inspirational motivation, idealized influence. The four variables that were captured in this model were each less than the reference value of 10. This means that there is no interaction between the independent variables. Thus, all the independent variables are fit to be used for analysis as shown Table 2.

Table 2 : Collinearity Diagnostic Test

	Collinearity Statistics	
Model	**Tolerance**	**VIF**
Individual Consideration	.466	2.146
Intellectual Stimulation	.492	2.031
Inspirational Motivation	.657	1.521
Idealized Influence	.539	1.854

Source:
bining correlated variables.

Hypothesis Testing

The composites of the important variables served as the basis for regression analysis. The data was input into the SPSS software. Results were then presented in Tables 3, 4 and 5.

Table 3 model summary

R	R square	Adjusted R Square	Std. Error of the Estimate
0.734	0.657	0.634	0.32345

Predictors: (Constant), Individual Consideration, Intellectual Stimulation, Inspirational Motivation, Idealized Influence

The model summary employed in the regression model to describe the research phenomena is shown in Table 3. The was found to be well explained by idealized influence, inspirational motivation, individual consideration, and intellectual

stimulation. The R square, commonly referred to as the coefficient of determination, was 0.657, which corroborated this. This indicates that the performance of microfinance institutions in Minna, Niger State, is the dependent variable. The independent variables include idealized influence, inspirational motivation, individual consideration, and intellectual stimulation explain 65.7% of the variability in the dependent variable.

Table 4: Anova

	Sum of squares	df	Mean square	F	Sig.
Regression	18.21	2	6.827	17.49	.000
Residual	51.867	118	0.645		
Total	70.077	120			

Dependent Variable: Performance of Microfinance Banks

Predictors: (constant), individual consideration, intellectual simulation, inspirational motivation, idealized influence

The results of the analysis of variance (ANOVA) are shown in Table 3. The findings show that the model as a whole was statistically significant. The findings also suggest that the independent variables are reliable indicators of the performance of microfinance banks in Minna Niger state. An F statistic of 17.49 and the reported p=0.000, which was below the usual probability of 0.05 significant threshold, corroborated this.

Table 5: Regression of Coefficients

	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	Beta		Beta		
	B	Std. Error			
(Constant)	1.765	0.657		4.845	0.001
Idealized influence	0.134	0.056	0.038	3.456	0.034
Inspirational motivation	0.178	0.055	0.023	5.760	0.000

Intellectual stimulation	0.320	0.301	0.017	3.045	0.003
Individual consideration	0.672	0.890	0.348	6.892	0.000

Dependent variable: Performance of Microfinance Banks

$Y= 1.765 + 0.672X_1 + 0.320X_2+ 0.178X_3+ 0.134X_4$

Where

Y = Performance of Microfinance Banks

X_1= Individual consideration

X_2= Intellectual motivation

X_3= Inspirational motivation

X_4= Idealized influence

Regression of coefficients results in Table 5 show that idealized influence has a positive and significant effect on performance of microfinance institutions $\beta = 0.134$, $p = 0.034$). The results imply that a unit improvement in leadership style in terms of idealized influence leads to a subsequent unit increase in the performance of microfinance banks by 0.134 units. Transformational leaders behave in a manner that enables them to serve as role models for their employees. Leaders that make a difference are recognized, appreciated, and trusted. Their subordinates are drawn to them and connect with their captivating personalities. Additionally, the followers of these leaders bestow upon them remarkable powers, perseverance, and resolve. The capacity of the workers to not only have a vision and objective for the business and its members, but also to exhibit the proper conduct necessary for optimal performance, is the emphasis of idealized influence behavior. The findings support Jerobon *et al.* (2016) who found a correlation between idealized influence and worker performance, suggesting that increasing idealized influence resulted in higher performance. The findings, however, contradict Orabi's (2016) conclusion that idealized influence was not a major factor influencing this outcome. Table 5 further indicated that inspirational motivation has a positive and significant effect on the performance of microfinance banks ($\beta = 0.178$, $p = 0.000$). The results imply that a unit improvement in leadership style in terms of inspirational motivation leads to a subsequent unit increase in the performance of microfinance banks by 0.178 units. Through their excellent communication styles, employees with inspirational motivation draw others to the

organization's mission. Effective and confident vision communication, an uptick in optimism and excitement, and engaging speeches that energies others are all characteristics of inspirational leadership. Employees that are motivated by inspiration engage their followers in imagining desirable future states, set expectations that are well articulated and that followers desire to fulfill, and show dedication to their objectives and the common vision. The findings concur with Orabi's (2016) assertion that inspirational motivation contributes to organizational success. Table 5 further indicated that intellectual stimulation has a positive and significant effect on the performance of microfinance banks (β = 0.320, p = 0.003). The results imply that a unit improvement in leadership style in terms of intellectual stimulation leads to a subsequent unit increase in the performance of microfinance banks by 0.320 units. Finally, the findings further indicated that individual consideration has a positive and significant effect on the performance of microfinance banks (β = 0.672, p = 0.000). The results imply that a unit improvement in leadership style in terms of individual consideration leads to a subsequent unit increase in the performance of microfinance banks by 0.672 units. The findings imply that idealized influence, which is having complete faith, and the respondents being proud of their manager increase the relationship, which will subsequently increase the level of performance of microfinance banks in Minna. Also, the manager has always been clear regarding what the employees can do or cannot do, and words of encouragement from the manager also boost the level of performance of microfinance banks in Minna. The manager making provision for the basic needs of the employee and also showing concern about the feelings of the employee motivates the employee and, thereby, improves the level of performance of microfinance banks in Minna.

Conclusion and recommendation

This study addressed the extent to which a manager’s practice of transformational leadership can affect the performance of microfinance banks in Minna Metropolis. The study investigated the influence of transformational leadership styles on the performance of microfinance banks in Minna, Niger State The performance of microfinance banks was found to be well explained by idealized influence, inspirational motivation, individual consideration, and intellectual stimulation. The R square, commonly referred to as the coefficient of determination, was 0.657, which corroborated this. The independent variables, which include idealized influence,

inspirational motivation, individual consideration, and intellectual stimulation, explain 65.7% of the variability in the dependent variable. Lastly, the research comes to the conclusion that managers who exercise this kind of leadership give careful consideration to the requirements of their workers and coach staff to bring about sustained progress. A manager who shows personal concern for their followers models the behavior of treating each employee as an individual and ignites a passion for each employee's long-term success. In the light of the findings and conclusions of this study, the following recommendations were made: The study recommends that microfinance institutions foster a good working atmosphere for employees and management staff. By appointing worthy managers, the employees can feel good being around them and have faith in them.

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HAEMATOLOGICAL ASSESSMENT OF THE EFFECTS OF ETHANOLIC LEAF EXTRACT OF *Senna alata* IN ALBINO RATS

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ABSTRACT

Senna alata is a medicinal that belongs to the family Fabaceae. A different part of the plant has been used in traditional medicine. Despite its use in the management different diseases there is limited or no comprehensive scientific information on the haematological assessment. This study aimed at the haematological assessment of the effects of the ethanol leaf extract of *Senna alata* orally administered on albino rats for fourteen days. Twenty albino rats divided into four groups of five rats were used throughout the experiment. Group 1 was the control group while group 2, 3 and 4 were the extracts

administered group at dose of 125.250 and 500mg/kg body weight. The extract did not show any serious effect on the body weight of all the experimental animals as there was an increase with a percentage weight variation that ranges from 3.01-4.23. The result from the haematological parameters did not showed significant difference on RBC, Hb, PCV, MCH, MCV and MCHC compared to the control, but there was a slight Significant increase in WBC and slight significant decreased (P>0.05) in the average mean value of PLT in group 2 and 4 compared to the control. The result from white blood differential count values did not showed any significant difference at both P>0.05 - 0.001 compared to the control. Likewise the result of serum metabolites showed no significant differences in the albumen, globulin, urea and the total protein, but there was a high reduction in the mean average glucose in all the extracts administered group compared to control. The result on serum enzymes activity showed a slight significant differences (p>0.05) on Alkaline transaminase (ALT) in group 2 and Alkaline Phosphatase (ALP). It can be drawn from this study that the ethanol leaf extract of *Senna alata* did not produce any serious effect on the body weight and all the haematological parameters of the albino rats at the tested doses. The claim of its efficacy, safety and the extensive use of the plant extract in herbal or traditional medicine are therefore justified.

Keywords: *Senna alata*, Haematology, Albino rats, Ethanol extracts, Serum enzymes.

Introduction.

Nature has made plants useful throughout the existence of man and many plants form an important part of our natural wealth. They also serve as an important therapeutic agents as well as valuable raw materials for the manufacturing of numerous traditional and modern medicines. Man uses plants as food, clothing, fuel, shelter and the most useful necessity of life which is the maintenance and management of different diseases. Today, most pharmaceutical drugs are derived from active ingredients from medicinal plants (Alqasim, 2013). According to the World

Health Organization (WHO), more than 80% of the world's population relies on traditional medicine for their primary health care system, majority of which uses plants or their active principles (Yomi *et a.l*, 2014).

Plants that possess therapeutic properties or exert beneficial pharmacological effects on human body are generally designated as medicinal plants. The use of medicinal plants in the tropical and subtropical regions is diversified and most of the uses are for medicine, source of food, clothing and shelter (Ige, 2011). The demand and utilization of medicinal plants have increased globally; this may be due to their availability, affordability and low toxicity. There is now a consensus regarding the importance of medicinal plants and the traditional health care system, efficacy and safety of medicinal plants in curing various diseases (Motaleb, 2011).

Senna alata L, (Fabaceae) is an underutilized shrub growing in many parts of the world and is used for its traditional treatment as dermotophytes and related ailments (Douye *et al.,* 2014). The plant is commonly a tropical shrub growing to about 4m, has yellow flowers and large leaves whose juice is used to cure ringworms and poisonous bites (Wikaningiyo and Sukandar, 2015). It is widely distributed in the wilds and as ornamentals in many houses in Mubi. *Senna alata* is used in Nigeria in the treatment of several infections which includes ringworms and other parasitic diseases. The effectiveness of *senna alata* against skin diseases was confirmed by recent studies (Makinde *et al*., 2007).

The use of medicinal plants in the treatment and management of various ailments is becoming more popular in both the developed developing countries like Nigeria. Some of these medicinal plants which are so common, cheap, and available are always without side effects and toxicity. It is a common practice that plant products or remedies are administered over a long period of time without due to their toxicity and side effects (Obinna *et al*,2019). Toxicological studies have revealed that ingestion of medicinal plants or drugs may alter the normal haematological value which can due to the interaction of the cell and the plant products.

Blood or haematological parameters are key factors in diagnosing the actual physical status of organism (Pjagi *et al,* 2015). Organism must keep the normal the normal blood composition to function effectively. The assessment of haematological parameters con be used to determine the effects of foreign compound including plant extracts and drugs on blood constituent of animals. Therefore the aim of this study is to determine the haematological assessment of the effects of ethanolic leaf extract of *Senna alata* in doses administered healthy albino rats.

Collection of plant Materials.

The fresh leaves of the plant samples *Senna alata,* were collected locally from Mubi town in Mubi North Local Government Area of Adamawa State, Nigeria. The plant samples were transported to the Department of Biological Sciences, University of Maiduguri for authentication by a botanist, the sample was washed clean with tap water and air dried for 14 days. It was ground into powder form using Pestle and Mortar. The powdered plant leaf samples were put in black polythene bag to be used for extraction and further experimentation. The plant sample was being deposited in the Herbarium section of the Department of biological Sciences, University of Maiduguri Borno State, Nigeria for identification and future references

Extract Preparation

Exactly 100g of the powdered sample was weighed into a five Litre round bottom flask and 800ml of absolute ethanol was added. A condenser was attached to the flask with rubber tubing for water to circulate for about 4 hours. The mixture was removed for filtration to remove the debris. The filtrate was poured into an evaporating dish to produce a semi solid dried extract in a hot air oven at 40-50°. Exactly 6.625g of the extracted was weight and transferred into a clean air tight container and placed in a freezer until further analysis

Experimental Animals

A healthy Albino rat of both sexes weighing between 150-200g was purchased from the animal house of the Department of pharmacology, Faculty of Pharmacy University of Maiduguri, Borno State Nigeria. They were kept in plastic cages and allowed free access to poultry feed (finishers mesh) and water *ad libitum* for 7 days to acclimatize them to the new environment. The animals were kept at room temperature and 12h/12h light/darkness cycle.

Twenty healthy Albino rats were used for this study. The animals was randomly selected and divided into four (4) different groups of 5 rats and given oral administration of the ethanol leaf extract of *Senna alata* for fourteen (14) days as follows:

Group 1: Normal control group (fed on poultry feed and water only)

Group 2: Were given oral Administration of ethanol leaf extract of *Senna alata* at a dose of 125mg/kg body weight.

Group 3: Were given oral Administration of ethanol leaf extract of *Senna alata* at dose 250mg/kg body weight.
Group 4: Were given oral Administration of ethanol leaf extract of *Senna alata* at dose 500mg/kg body weight.

Collection of blood and Preparation of sera samples

This was done according to the method described by Gatsing *et al (*2005) with little modification. At the end of the fourteen (14) days of oral ethanolic leaf extract administration, the albino rats were anaesthetized using chloroform vapor prior to dissection. Blood samples were collected by cardiac puncture into two different tubes, one containing anticoagulant [ethylene diaminetetraacetic acid (EDTA)] and the other without anticoagulant. The blood in the tube with EDTA was used for the determination of haematological parameters, whereas that in the tube without EDTA was used for the preparation of serum samples. For serum preparation, the blood was allowed to clot by standing at room temperature for one hour and then refrigerated for another 1 hour. The resultant liquid part was centrifuged at 3000 rpm for 10 min, and then the clear serum (supernatant) was removed and analyzed immediately.

Haematological parameters

Haematological parameters that were analyzed includes Red blood cell (RBC), White blood cell (WBC), Hemoglobin (Hb), Park cell volume (PCV), Mean corpuscular volume (MCV), Mean corpuscular hemoglobin (MCH), Mean corpuscular hemoglobin concentrations (MCHC) and Platelets (PLT)

Serum Biochemistry.

The following liver Function test was determined by employing standard ready-to-use kits and methods as described by Randox laboratory limited U.K to determine the levels of Alkaline phosphatase (ALP), Alanine aminotransferase (ALT) and Aspartate aminotransferase (AST).

Ethics

This work was carried out with respect for the welfare of animals as recommended by the World Health Organization research guide line for evaluating the safety and efficacy of herbal medicine, as used by Donald *et al* (2015).

Statistical Analysis

Data obtained were expressed as mean ± SEM and statistically analyzed using one way ANOVA. The Student-Newman-Keuls multiple comparison test was used to compare the means of the different groups. A p-value of P≤ 0.001-0.05 were considered statistically significant

RESULTS.

Table 1. Effects of the ethanolic leaf extract of *senna alata* on body weight of the albino rats

Experimental group	Initial body weight	Final body weight	% Weight variation
1. Normal control	142.00±14.39	146.00±14.35	4.23
2. 125mg/kg	149.00±13.24	156.00±14.43	4.70
3. 250mg/kg	170.00±25.78	175.00±24.06	4.28
4. 500mg/kg	166.00±36.085	170.00±35.42	3.01

Result are presented as the mean ±SED (n= 5). All values were not significantly different from the control at both P≤0.05-0.001.

Table 2 : Effects of ethanolic leaf extract of *Senna alata* on the haematological

Exp. Group	RBC (10^3/mm^6)	WBC (10^3/mm^3)	Hb (g/dl)	PCV (%)	MCV (%)	MCH (%)	MCHC (%)	PLT (%)
1. Normal	5.33	3.41	13.53	35.43	63.03	20.84	38.45	160.84
	±0.35	±0.52	±0.54	±1.81	±2.50	±0.68	±2.89	±1.65
2.125mg/kg	4.86	6.04*	11.25	36.15	60.31	18.25	36.06	146.39***
	±0.32	±0.51	±0.53	±1.05	±0.75	±0.80	±4.11	±3.08
3.250mg/kg	3.41	4.32	11.09	37.66	66.99	23.81	41.79	160.12
	±0.30	±0.49	±1.38	±0.82	±2.36	±0.14	±4.53	±0.72
4.500mg/kg	4.69	4.67	11.56	32.86	60.86	22.80	39.38	150.18*
	±0.37	±0.80	±0.35	±1.89	±0.49	±0.74	±3.74	±1.12

Results are presented as the mean ±SED Mean ±SD, n= 5. ***P≤0.001 highly significant compared to control, *P≤0.05 slightly significant compared to control

Red blood cell (RBC), White blood cell (WBC), Hemoglobin (Hb), Park cell volume (PCV), Mean corpuscular volume (MCV), Mean corpuscular hemoglobin (MCH), Mean corpuscular hemoglobin concentrations (MCHC) and Platelets (PLT)

Table 3: Effect of ethanolic eaf extract of *Senna alata* on white blood cell differential count values

	Parameters				
Expt. group	Lymphocyte	Monocyte	Neutrophil	Eosinophil	Basophil
1. Normal	49.20±0.53	3.23±0.12	46.99±0.55	0.59±0.11	0.00±0.00
2. 125mg/kg	49.72±0.46	2.51±0.47	46.66±0.33	0.69±0.03	0.08±0.03
3. 250mg/kg	50.37±2.14	2.97±0.35	45.85±1.84	0.77±0.03	0.00±0.00
4. 500mg/kg	48.50±0.81	2.99±0.11	47.87±0.27	0.67±0.06	0.00±0.00

Result are presented as the mean ±SED (n= 5).

Table 4: The effects of the ethanolic leaf extract of *Senna alata* on the serum metabolites

Experimental Group	Glucose (mg/dl)	Albumin (mg/dl)	Globulin (mg/dl)	Urea(mg/dl)	Total Protein
1. Normal	70.14±1.12	4.74±0.24	3.20±0.12	71.56±2.50	6.77±0.46
2. 125mg/kg	48.67±2.91***	3.89±0.23	3.39±0.50	73.81±1.74	6.51±0.66
3. 250mg/kg	45.80±3.18***	2.90±0.37	3.07±0.75	73.13±2.32	7.07±0.58
4. 500mg/kg	51,03±1,74***	3.33±0.45	2.85±0.55	75.67±0.34	7.09±0.51

Results are presented as the mean Mean ± SD, n= 5. *** P≤0.001 Denotes means values with high significant difference compared to the control

Table 5: Effects of Ethanolic leaf extract of *Senna alata* on Serum enzymes Activity in albino rats.

Experimental group	ALP(*iu*)	**ALT**(*iu*)	AST(*iu*)
1. Normal	41.65±1.82	7.32±0.42	16.62±1.04
2 125mg/kg	38.69±1.43	16.41±0.42*	12.67±0.90
3. 250mg/kg	48.11±5.31*	9.17±1.14	12.53±0.56
4. 500mg/kg	41.83±1.43	9.30±0.52	12.63±0.69

Results are presented as the mean Mean ± SD, n= 5. * P<0.05 Denotes mean values high significant difference compared to control.

ALP- Alkaline phosphotase, ALT-Aminotrasfarase alanine, AST-Aminotransferase aspartate Discussion

The benefits of the use of medicinal plants in some health issues cannot be overemphasized. The bioactive compositions of medicinal have given rise to treatment of various diseases and production of new drugs (Ugbagu *et al.,* 2016). *Senna alata* has been used for a long a time, in the treatment of various ailments in Africa and Nigeria in particular. There are still very few documented scientific studies on the haematological effects of its uses in the traditional medicine as medicinal plants. This study therefore was aimed at the determination of the effects of the ethanol leaf extract of *Senna alata* on some haematological parameters in albino rats to ascertain its efficacy and safety usage as herbal remedies for human consumption

Table 1. Show the effect of the various doses on the body weight changes in albino rats. The body weight increased in the entire experimental group. The percentages mean weight variation ranged from 3.01-4.70. This increase may be due to the nutritional content of the *Senna alata* as it contains carbohydrate 26.89% which serves as a source of energy and protein 9.24% which help in building of new cells and formation of hormones as reported by Ugbogu *et al*, (2016).

The evaluation of blood parameters can be used to determine the level of negative effects of foreign compounds including medicinal plants (Akuodor *et al*, 2017).The haematological changes in the albino rats administered orally with the ethanolic leaf extracts of *S. alata* are summarized in table 2**.** There was no significant difference in the haematological parameters almost all the tested groups. However WBC of the animals in group 2 showed a high significant

(P≤0.01) increase and also a slight significant (P≤0.05) increase in PLT of the same group compared to the normal control group. The platelets (PLT) of the albino rats in group 4 also showed high significant (P≤0.01) decreases and also slight significance (P≤0.05) decreased compared to the control

The results of the effects of ethanolic leaf extract of *Senna alata* on the serum metabolites on the albino rats are presented in table 4. The result showed no significant at both (P≤0.01 and P≤0.05) in the mean average values of the albumin, globulin, urea and total protein in all the tested groups of the experimental rats compared to the control group (normal control group1).

However, the extract administered group 2, 3, and 4 produced a high significant (P≤0.01) decrease in the mean average glucose values of the tested groups compared to the control group.

There was a low level of the glucose in the extract administered group compared. This was reported by Roy *et al*, (2016), which according to him may be due to inadequate insulin secretion that indicates normal functioning of the liver. From the result obtained the extract from *Senna alata* may be used in the treatment of hypertension and diabetes.

The effects of ethanolic leaf extract of *senna alata* on the serum activity in albino rats are summarized in table 5. AST and ALT are enzymes commonly used as markers of hepatic necrosis and increase in hepatotoxicity. In case of hepatotoxicity, ALT and AST increased simultaneously in serum, but ALT increase persists longer than the AST (Singh *et al*, 2013). Generally there was no significant difference in the average mean values of ALP, ALT and AST in the entire tested group compared to the normal control group. However, the activity of ALT was significantly (P≤ 0.05) elevated in albino rats in group 2 that were dose with 125mg/kg body weight compared to the control group 1. Also the average mean values of ALP significantly

(P≤0.05) increased in albino rats in group 3 with a dose of 250mg/kg body weight compared to the control group.

Conclusion

It can be drawn from this study that the ethanol leaf extract of *Senna alata* did not produce any serious effect on the body weight and all the haematological parameters of the albino rats. The ethanol leaf extract is relatively nontoxic at the doses used. The glucose lowering levels of the various concentrations suggest its use as anti-diabetic. The claim of its efficacy, safety and the extensive use of the plant extract in herbal or traditional medicine are therefore justified.

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GENETIC VARIATION IN FRUITS AND SEEDS MORPHOLOGY OF *Gambeya albida* (Don) IN SOUTHWESTERN NIGERIA

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Abstract

The demand for fruits tree have increase across the Africa as well as Nigeria. The young and the old people do search for the location of any fruit tree especially for *Gambeya albida.* The fruit can easily consume and enjoy by everyone without any side effects. *Gambeya albida* is a unique tree that grow in wild mostly, but have vitamins c for proper growth of children and body maintenance of the older ones. The establishment of the plantation are scares across the country. This bring about sources for the seeds to know which state have the best morphological characteristics for the establishment of the plantation in Nigeria. The research was carried out at Federal College of Agriculture, Akure but there were visitation to Osun, Oyo, Ekiti and Ondo state to collect the fruits in which the seeds were watched, extracted and the measurement were done. The materials used for this experiment were top loading balance, digital venire caliper and water to clean the fruits and seeds. The result were analyzed using minitab 17. After the analysis, the fruits and seeds from Ekiti and Ondo state have the highest values in weight, diameter of fruit, fruit length while seed the number of seeds in each fruits across the four

selected states are between 4 to 5 compare to Oyo and Osun state with the least value across the parameters. Base on this experiment for establishment of *Gambeya albida* the best seeds should be acquired from either Ekiti or Ondo state of Nigeria.

Keywords: *Gambeya albida,* parameters, morphological

Introduction

Due to population growth, unsustainable farming practices, a lack of viable employment options, intense human pressure on forests, and poverty, indigenous forest trees with specific nutritional and gastronomic values are currently being over-harvested in Nigeria (Anegbeh et al., 2004). Fruit trees are rapidly going to extinction, which threatens not only the availability of food but also the ecology, health, and genetic preservation of species.

According to Ehiagbonare et al. (2008), the African star apple (*Gambeya albida*) is an edible fruit tree from the Sapotaceae family, which includes up to 700–800 species. The species, which is mostly a lowland rainforest tree, has been observed naturally in a number of biological zones (Bada, 1997). According to Olayode et al. (2018), the species was one of the top 14 tropical hardwood species that dominated the continent's international timber commerce between 1950 and 1975. *C. albidum* is one of the species of forest trees that provide Non Timber Forest Products (NTFPs) of substantial domestic value to rural and urban residents in West and Central Africa, with significant export potential (Nwoboshi, 2000). A small to medium-sized buttressed tree species, the tree can reach heights of 25 to 40 metres with mature girths of 1.5 to 2 metres (Bada, 1997). Due to greater understanding of the nutritional value, social, cultural, and therapeutic worth of *Gambeya albida*, its economic significance has grown recently (Onyekwelu and Stimm, 2014). Consequently, the fruit is crucial for ensuring the safety of household food.

According to Ruiz-Perez et al. (2004) and Leakey et al. (2005), wild harvesting of these fruits from woods and semi-domesticated trees growing on farms and homesteads can significantly increase rural income and job opportunities. Farmers

have identified these regional species as trees for domestication through agroforestry as a result of their commercial relevance (Franzel et al 1996). The process of domesticating trees entails using genetic principles to raise the value of tree crops and the final product's economic returns. The process of market-driven domestication, inventory of the natural resource, and sustainable production of agroforestry products based on strategies that take into account the needs of farmers and their priorities for domestication are all contributing to an increase in the quality and productivity of agroforestry trees (Simons and Leakey 2004; Leakey et al. 2005). However, due to intensive fruit extraction brought on by *Gambeya albida* 's high economic value and the consequent scarcity and rapid decline in fruit availability, the species has been listed as endangered or threatened (FORMECU, 1999). *Gambeya albida* may be a victim of unsustainable exploitation, as evidenced by high rates of male to female sex ratio, high rates of fruit and seed consumption, and scant or no regeneration efforts. The species' genetic diversity may have been eroded as a result.

In order to identify the best trees for domestication, this study intends to define the intraspecific variability among *Gambeya albida* trees in four selected states of southwestern Nigeria using fruit and seed attributes, and to analyse correlations between these traits.

Materials and methods

Determination of variation in fruit morphology of *Gambeya albida* from different sources

In the Southwestern Nigerian states of Ekiti, Ondo, Osun, and Oyo, forty matured *Gambeya albida* trees were chosen at random (ten mother trees from each state). For the purpose of identifying variations in fruit and tree morphology, thirty fruits from each of the mother trees in the chosen states with a total of one thousand two hundred (1200) fruits were carefully chosen. The dimensions of the fruit, including the length (mm), diameter (mm), number of seeds per fruit, weight of seeds (g), and fruit weight (g), were measured. According to Gontcharova's (2009) description, the weight and size of the fruits were measured using digital top loading balances and vernier callipers, respectively. The seeds of each fruit were meticulously taken out, washed in clean water, allowed to dry for 48 hours, and then weighed on an electronic scale. The diameter at breast height (1.3 metres above ground level), the crown diameter, and the overall height of each selected mother tree were measured using a Spiegel relascope, a diameter tape, and a metre rule, respectively.

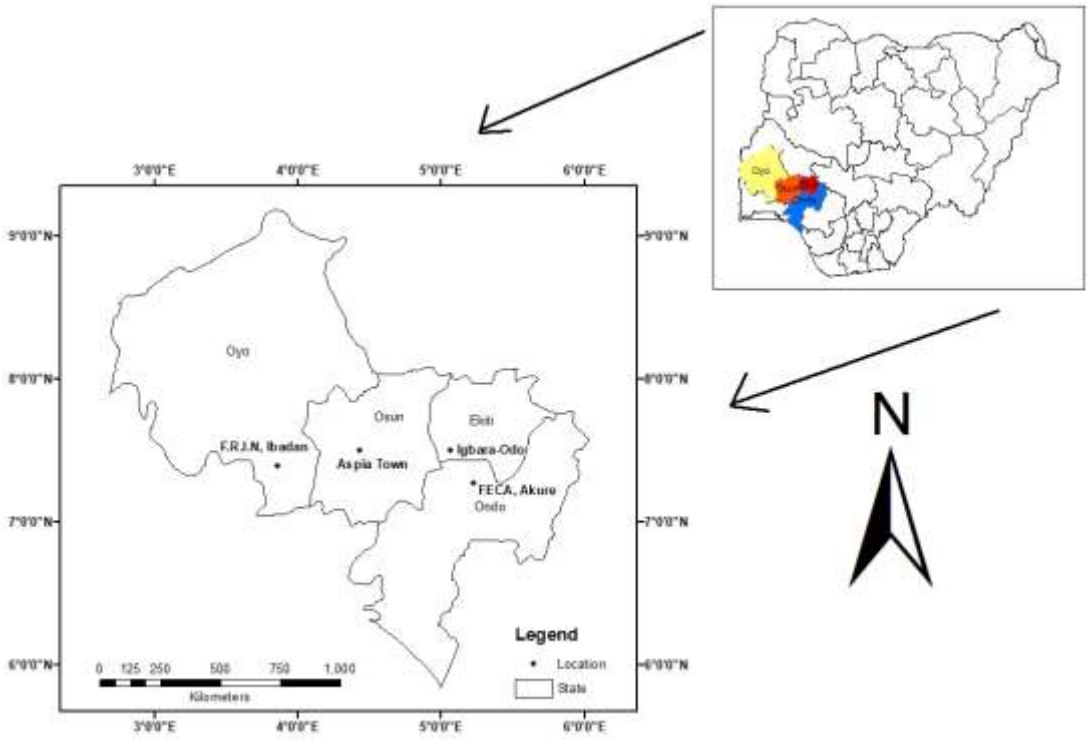

Figure 1: Selected locations for collection of *Gambeya albida* in Southwestern Nigeria

Plate 1: Fruit and Seeds of *Gambeya albida* in Southwestern Nigeria

Results and Discussion

Morphology characteristics of *Gambeya albida* fruits in Oyo, Osun, Ondo and Ekiti states in Southwestern Nigeria.

Oyo State

A significant difference in the Fruit Length of *Gambeya albida* in Oyo state was observed as shown in table 4.9. Largest fruit length was obtained from *Gambeya albida* (Ga) 1 with value of (46.193^{a}) followed by Ga 6 with value of (45.780^{a}) while the least value were obtained from Ga 9 (37.393^{c}) and Ga 3 (31.108^{d}) respectively.

There is significant difference in the Diameter of Fruit of *Gambeya albida.* Largest fruit diameter was obtained from Ga 6 (40.632^{a}) followed by Ga 2 (40.479^{ab}) and Ga 10 (40.076^{ab}) while the least was obtained from Ga 8 (35.724^{c}) and Ga 3 (30.703^{d}) respectively.

In addition,' there is significant difference in the Fruit Weight of *Gambeya albida.* Highest fruit weight was obtained from Ga 6 (45.400^{a}) followed by Ga 2 (44.667^{a}) and Ga 1 (43.333^{a}) while the lowest was obtained from Ga 8 (29.833^{e}) and Ga 3 (18.867^{f}).

Also a significant difference were observed in the Number of Seeds per Fruit of *Gambeya albida.* The Highest number of seeds per fruit were obtained from Ga 9 (5.233^{a}) followed by Ga 5 (5.167^{a}) while the least was obtained from Ga 8 (4.867^{b}).

There is significant difference in the Seed Weight of *Gambeya albida*. Highest seed weight was obtained from Ga 6 (5.767^{a}) followed by Ga 10 (5.667^{ab}) while the least were obtained from Ga 3 (4.100^{c}) and Tree 4 (3.933^{c}).

Osun State

There were significant differences in Fruit Length across the *Gambeya albida* trees in Osun State as shown in table 4.9 below. Highest fruit length was recorded for Ga 6 with the value of 42.098^{a} followed by Ga 1 (41.976^{a}) while the shortest fruit length was recorded for Ga 8 (37.527^{ab}) and Tree 9 (36.507^{b}).

Also significant differences were observed in Diameter of Fruit across the *Gambeya albida* trees. Highest fruit diameter was recorded in Ga 9 and Ga 6 with the same value (39.656^{a}) while the least fruit diameter was obtained from Ga 9 (34.355^{c}) and Ga 3 (28.961^{d}).

Moreover, there is no significant difference in Fruit Weight across the *Gambeya albida* trees. Highest fruit weight was obtained from Ga 6 (41.867^{a}) followed by Ga 8 (41.533^{a}) while the least was recorded for Ga 9 (37.333^{a}) and Ga 10 (36.367^{a}).

There is no significant difference in the Number of Seed per Fruit across the *Gambeya albida* trees. Highest number of seed was obtained from Ga 1 and Ga 10 with equal value of 5.067[a] while the least was recorded for Ga 3 (4.967[a]).
However, there were significant differences in the Seed Weight across the *Gambeya albida* trees. Highest seed weight was recorded for Ga 4 (4.300[a]) followed by Ga 10 (4.233[ab]) while the lowest was recorded for Ga 1 (3.367[ab]) and Ga 2 (3.300[b]).

Ondo State

There is significant difference in the Fruit Length of *Gambeya albida* (Ga) in Ondo State as shown in table 4.9 below. Highest fruit length was obtained from Ga 8 (52.251[a]) followed by Ga 9 (52.167[a]) while the least were obtained from Ga 10 (44.169[cd]) and Ga 7 (42.075[de]) respectively.
There is significant difference in the Diameter of Fruit of *Gambeya albida* in Ondo State. Highest diameter of fruit was obtained from Ga 3 (45.143[a]) followed by Ga 7 (44.628[a]) while the least were obtained from Ga 9 (40.170[ef]) and Ga 1 (39.645[f]) respectively.
In addition, significant difference were observed in the Fruit Weight of *Gambeya albida* in Ondo State. Highest fruit weight was obtained from Ga 3 (51.233[a]) followed by Ga 7 (50.067[ab]) while the lowest was obtained from Ga 9 (43.900[c]) and Ga 1 (42.333[c]) respectively.
Significant difference were discovered in the Number of Seed per Fruit of *Gambeya albida* in Ondo State. Largest number of seed was obtained from Ga 4 (4.967[a]) followed by Ga 3 (4.933[ab]) while the least was obtained from Ga 5 (4.667[an]), Ga 6 (4.667[ab]) and Ga 1 (4.567[b]) respectively.
There were significant differences Seed Weight of *Gambeya albida* in Ondo State. Ga 3 has the highest seed weight with a value of 6.300[a] followed by Ga 4 (6.000[ab]) while the least was recorded for Ga 8, Tree 10 and Ga 9 with the value of 5.400[bcd], 5.400[bcd] and 5.267 respectively.

Ekiti State

There were significant differences in the Fruit length of *Gambeya albida* across the trees in Ekiti State shown in table 4.9 below. Ga 8 has the highest fruit length followed by Ga 9 with a value of 52.251[a] and 52.167[a] respectively while the least were found with Ga 7 (42.075[de]) and Ga 3 (39.876[e]).

However, there is no significant difference in the Diameter of Fruit across the *Gambeya albida* trees. The most robust fruit was obtained from Ga 10 (57.8383[a]) followed by Ga 4 (45.380[a]) while the less robust fruit was obtained from Ga 3 (39.159[a]).

There are significant differences in Fruit Weight across the *Gambeya albida* trees. Highest fruit weight was obtained from Ga 4 (65.667[a]) followed by Ga 6 (65.167[a]) while the lowest was found with Ga 1 (40.700[d]) and Ga 2 (38.133[e]).

There is no significant difference in Number of Seed per Fruit across the *Gambeya albida* trees. Highest number of seeds were obtained from Ga 6 (4.917[a]) followed by Ga 7 (4.900[a]) while the lowest were recorded for Ga 2 (4.733[a]) and Ga 1 (4.700[a]).

There were significant differences in Seed Weight across the *Gambeya albida* trees. Highest seeds weight were obtained from Ga 4 and Ga 6 with the same value (6.600[a]) followed by Ga 3 (6.200[ab]) while the lowest were found with Ga 1 (4.800[d]) and Ga 2 (4.733[d]) respectively.

Result summary

Generally, the genetic variation across the selected locations in Southwestern Nigeria shows that for fruit length selection in *Gambeya albida* the highest value were recorded from Ondo, Ekiti states respectively, follow by Oyo and Osun states. Highest value of diameter of fruit occurred in Ekiti, Ondo state while Oyo and Osun have the least values this correspond to selection of seeds from Ekiti state by Olayode et al., 2018 for research work. For fruit weight the highest value were observed in Ekiti, Ondo, Oyo and Osun respectively (Olayode et al., 2018). There is no significant change in the number of seeds in each fruit across the four selected states in southwestern Nigeria. However, there were significant changes in the seed weight across the four states. Ekiti state have the highest value in seed weight per fruit follow by Ondo, Oyo and Osun respectively.

Table 4.9: Morphology characteristics of *Gambeya albida* fruits in some selected states in Southwestern Nigeria.

PARAMETER	Ga 1	Ga 2	Ga 3	Ga 4	Ga 5	Ga 6	Ga 7	Ga 8	Ga 9	Ga 10
Oyo										
Fruit Length (mm)	46.193[a]	43.825[ab]	31.108[d]	37.467[c]	40.722[bc]	45.780[a]	39.201[c]	38.047[c]	37.393[c]	40.717[bc]

Diameter of fruit (mm)	39.590^{ab}	40.479^{a}	30.703^{d}	37.778^{b}	38.502^{a}	40.634^{a}	39.609^{ab}	35.724^{c}	36.879	40.076^{ab}
	b	b		c	bc				bc	
Fruit weight (g)	43.333^{a}	44.667^{a}	18.867^{f}	31.567^{de}	36.333^{c}	45.400^{a}	39.200^{ab}	29.833	32.767	36.967^{bc}
	bc	b			de		cd	e	de	de
No. of seed per fruit	5.067^{ab}	4.967^{ab}	4.933^{ab}	4.933^{ab}	5.100^{ab}	5.000^{ab}	5.167^{ab}	4.867^{b}	5.233^{a}	5.067^{ab}
Seed weight (g)	5.067^{abc}	5.533^{ab}	4.100^{c}	3.933^{c}	5.300^{ab}	5.767^{a}	5.167^{abc}	5.167^{abc}	4.300^{bc}	5.667^{ab}
					c					
Osun										
Fruit Length (mm)	41.976^{a}	38.098	30.821^{c}	40.446^{a}	40.434^{a}	42.098^{a}	40.630^{ab}	37.527^{a}	36.507	40.896
		ab		b	b			b	b	
Diameter of fruit (mm)	39.656^{a}	34.859	28.961^{d}	39.032^{a}	38.628^{a}	39.656^{a}	38.901^{ab}	34.950	34.355	38.947^{ab}
		bc		b	bc			bc	c	
Fruit weight (g)	39.933^{a}	41.333^{a}	40.233^{a}	38.800	38.633^{a}	41.867^{a}	39.567^{a}	41.533^{a}	37.333	36.367^{a}
				a					a	
No. of seed per fruit	5.067^{a}	5.000^{a}	4.967^{a}	5.000^{a}	5.000^{a}	5.000^{a}	5.033^{a}	5.033^{a}	5.000^{a}	5.067^{a}
Seed weight	3.367^{ab}	3.300^{b}	3.400^{ab}	4.300^{a}	3.767^{ab}	3.767^{ab}	3.700^{ab}	3.800^{ab}	3.500^{a}	4.233^{ab}
									b	
Ondo										
Fruit Length (mm)	46.822^{ab}	44.487^{c}	45.896^{b}	44.171^{d}	49.068^{a}	47.140^{bc}	42.075^{de}	52.251^{a}	52.167^{a}	44.169^{cd}
	cd	d	cd							
Diameter of fruit (mm)	39.645^{f}	43.747^{a}	45.143^{a}	43.417^{ab}	42.496^{b}	40.697^{d}	44.628^{a}	41.388^{d}	40.170^{e}	41.576^{cde}
		b		cd	cd	ef		ef	f	
Fruit weight (g)	42.333^{c}	47.467^{a}	51.233^{a}	44.533^{a}	47.733^{a}	45.933^{a}	50.067^{ab}	46.467^{a}	43.900	46.700^{ab}
		bc		bc	bc	bc		bc	c	c
No. of seed per fruit	4.567^{b}	4.800^{ab}	4.933^{ab}	4.967^{a}	4.667^{ab}	4.667^{ab}	4.700^{ab}	4.600^{ab}	4.900^{ab}	4.767^{ab}
Seed weight	4.967^{d}	5.600^{bc}	6.300^{a}	6.000^{ab}	5.738^{abc}	5.667^{bc}	5.733^{abc}	5.400^{bc}	5.267^{cd}	5.400^{bcd}
								d		
Ekiti										
Fruit Length (mm)	43.400^{d}	43.702^{d}	39.876^{e}	47.931^{b}	49.135^{ab}	47.140^{bc}	42.075^{de}	52.251^{a}	52.167^{a}	44.169^{cd}

Diameter of fruit (mm)	40.607[a]	39.048[a]	39.159[a]	45.380[a]	44.220[a]	45.331[a]	40.883[a]	43.655[a]	42.318[a]	57.838[a]
Fruit weight (g)	40.700[d]	38.133[e]	59.700[ab]	65.667[a]	60.033[ab]	65.167[a]	47.967[bc]	53.767[bc]	53.767[bc]	52.633[bc]
No. of seed per fruit	4.700[a]	4.733[a]	4.783[a]	4.783[a]	4.817[a]	4.917[a]	4.900[a]	4.800[a]	4.867[a]	4.833[a]
Seed weight	4.800[d]	4.733[d]	6.200[ab]	6.600[a]	5.900[abc]	6.600[a]	5.433[bcd]	5.266[cd]	5.533[bcd]	5.500[bcd]

Means that do not share the same letter are significantly different

Conclusion and Recommendation

In conclusion, Ekiti state fruit genetic characteristics performed better in structure and phenotypic than Ondo State but the gap is not significant enough. But Oyo and Osun state phenotypic are smaller compare to the previous state. These made it necessary to recommend Ekiti state fruits of *Gambeya albida* for research work and for farmers and forest for establishment of their plantation for good yield that will attract consumers.

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HOUSEHOLDS' PREFERENCE HETEROGENEITY AND WILLINGNESS TO PAY FOR IMPROVED SOLID WASTE COLLECTION SERVICES IN KANO, NIGERIA: A LATENT CLASS TECHNIQUE.

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Abstract: Solid waste management (SWM) is one of the critical environmental issues in Kano metropolis due to the dwindling financial problem and population increase. These problems pave ways to poor control and handling SWM effectively and efficiently. Thus, it results to an adverse threat on both the environmental quality and public health. An effective, efficient and improved solid waste collection (SWC) services is a better management option for ensuring sustainability towards SWM in Kano metropolis. This study has examined the economic values and determinants of waste collection services and their potentials for an effective waste management in the metropolitan Kano. Choice Experiment (CE) valuation technique was used. Thus, five (5) categories of nonmarket values of waste collection services were defined, viz; collection frequency, storage facilities, disposal method, pre collection service and collection value. A total of 400 respondents were interviewed face to face. Using cluster sampling method. This study generates a significant information on the practical potentials for improving waste collection services in the metropolis. Hence, the finding can be used for a larger societal awareness for collection services and the incurred benefits. The result can also be beneficial to policy makers and stakeholders to set priorities to ensure that polluters' pay principal is observed accordingly for environmental sustainability.

Keywords: Solid Waste Management, Waste Collection Services, Choice Experiment, Latent Class

INTRODUCTION

Solid waste management (SWM) issue is deemed as one of serious environmental concerns especially in most major cities and urban centers in Nigeria. It was observed that there has been a tremendous increase in the amount of daily solid waste generation in Nigeria (Nabegu, 2010; Olanrewaju & Ilemobade, 2009). According to Ogwueleka (2009), about 25 million metric tons of annual solid waste were generated in Nigeria. The consequence of waste mismanagement could be great when a country is facing population expansion, whereby waste generated cannot be sufficiently and adequately handled (Aliu et al., 2014). Most streets in major Nigerian cities experience the persistent presence of indiscriminate dumps of wastes from the households or commercial activities (Babayemi & Dauda, 2009).

Hoornweg and Bhada-Tata (2012) reported that globally, about 1.3 billion tons of solid wastes are collected annually, contributing to about 5 percent emission of greenhouse gases of organic component of the solid waste decayed. Its generation is expected to increase significantly to about 2.2 billion tons by 2025. Ineffective waste management, which consists of a poor collection system and inefficient disposal method, may result in pollutions of both air, water, and land, and consequently contribute to the contamination of drinking water sources, and pose serious threats to public health. According to Nabegu (2008), in the Kano metropolis, the per capita generation of waste ranges from 0.75 kg/day in the suburban areas, with 1.2 to 1.7kg/day in the city and government reserved areas (GRA) respectively, perhaps due to variations in the socio-economic status of the residential zones.

SWC services used to be the responsibility of municipal authorities in the past (Yusuf et al., 2007). This obligation is not mutually exclusive because none of the local governments in the country meets the expense of the huge financial, technical, administrative and human resource requirements to efficiently carry out this particular constitutional obligation (Alabi, 2004). An account of the inability of the government at both local and state levels to manage SWC effectively ascended conceivably from the misconception of this task as a public good.

The ability to address the problems of waste collection depreciates with time due to the increase in capital costs for plant, equipment, operation and maintenance costs, coupled with the rapid population and spatial growth, as well as increasing level of waste generation and decreasing coverage levels, confronted by the growing public demand for improved SWC services (Sule, 1979; Solomon, 2009; Oyeniyi, 2011). Hence, there is a need for the involvement of private service providers in the provision of SWC services in Kano metropolis. In relation to this, it is deemed feasible to evaluate households' WTP for improved SWC services in the metropolis.

MATERIALS AND METHODS

Generating Attributes for the Choice Experiments

This requires several steps; the first stage involves choosing attributes and their corresponding levels for improvement of the problem for an adequate comprehension of the researcher's point of the current condition in choice experiment (CE) study. The second stage is to define possible alternatives based on Hensher et al. (2005). The selected alternatives in this work are labesled as Collection Frequency, Storage

Facilities, Disposal Method, Pre-collection Services, and Monthly Charges, whereas these alternatives are dubbed as Management option 1, Management option 2, and Status quo. The decision for choosing the labelled alternatives is an integral part of the CE design for its impact on the number of parameters to be estimated (Rose & Bliemer, 2009). Hence, the attributes and their levels must be determined right after identifying the number of alternatives to be included in the survey (Hensher et al., 2005; Rose & Bliemer, 2009).

Selection of the Attributes and their Levels

Defining the attributes of SWM may be valuable at the first stage of identifying the most relevant attributes of non-market goods undervaluation in the development of a CE study. In this stage, the relevant attributes and their levels in the choice decisions were identified through an intensive literature review of economic evaluation studies on SWM. Focus group discussions (FGD) was performed with stakeholders including public officials, experts or professionals in the field, private service providers in waste management and households' heads in order to determine the number of attributes and their levels, and the values given to the attributes. The task of FGD is to provide information on reliable minimum and maximum attribute levels. Identifying any possible interactions between the defined attributes is also essential. If the researcher's aim is to estimate welfare measures, then the cost attribute must be included too (Bateman et al., 2002; Hanley & Barbier, 2009). This study consists of five main survey attributes with the bid amounts, which are specified in each choice alternative, as indicated in Table 1 below.

The Experimental Design

One common problem with CE application is its complication in terms of the number of choice sets and attributes. Thus, each choice set may affect the quality of response in a survey. There is a tradeoff between the complexity in CE survey and the quality of responses (List et al., 2006; Alpizar et al., 2003). The orthogonal design was obtained using SPSS software based on the attributes and levels selected for the experiment design approach in this survey.

The final design in the CE part includes 12 options in 6 choice sets, with each choice set includes two purposed options and a status quo. Three distinctive options were presented, distinguished by their attributes and related cost. Option 1 and option 2

involve various combinations of SWC services and monthly cost, while option 3 is the baseline and has no cost. The choice of options 1, 2, or 3 to each question produces information as to the rank of each scenario for a respondent. Analysis of several of such responses, although sets of options change between questions, permits statistical computation of the value for each attribute level. All the responses from a respondent are presumed to be independent, therefore the sample size for regression in the model will simply reflect not the number of persons sampled, rather the total number of valid choice question responses of the respondents. Table 2 is an example of a choice card used in the survey: "*suppose service option 1 and option 2 are service options for SWC as below, which option do you prefer*?"

Analytical Framework

The basis of random utility theory is the utility function, which is not directly observable, but categorised into deterministic and random components. Established on the hypothesis that the individual choices depend on the characteristics of goods together with some degree of randomness. Although individuals know their utility function, due to unmeasured attributes of the goods undervaluation, the random component can be ascribed to the element of randomness in their preferences. Thus, the researchers may not have the complete information from the survey respondents due to the unobserved components of the utility function. However, the individual utility function (for individual i), where the respondent is fronting a set of K choices (j =1… K), can be expressed as:

$$U_{ij} = V_{ij} + \varepsilon_{ij} \qquad [1]$$

Where U_{ij} is the utility individual i obtain from alternative set j, V_{ij} is a not stochastic utility function, and ε_{ij} is a random component.

This function can also be expressed in another way by decomposing the indirect utility function for each respondent i (U) into two: deterministic and stochastic elements, thus, a deterministic element (V), which would typically be specified as a linear index of the attributes (X) of the jth alternative in the choice set, and a stochastic element (e) which represents the error term; viz:

$$Ui\ j = Vij(Xij) + \varepsilon ij = bXij + \varepsilon ij \qquad [2]$$

The purpose of equation (2) is to show the socio-economic variables. It can be incorporated alongside with the choice set attributes (the X term). As the socio-economic variables are constant for the choice sets for individuals and as long as individuals' income does not change from the first to the other choices, these variables can simply be entered as interaction terms by main attributes or splitting the data set (Hanley et al., 2001).

At this instant, suppose an individual is being asked to choose among two alternative goods, which are presumed to be distinguished by their attributes and levels. For instance, for the case of this study, this two could be the two alternatives of waste collection services, with different attributes such as collection frequency, storage facilities, disposal method, etc. These alternatives were termed, j and k. To choose between them, a respondent was assumed to compare the utility he/she could get with either choice, for selecting the alternative with the highest utility. The respondents were asked to make a choice from them and assumed that they were the only available choices. The list of all available options was termed as choice set.

Though an error component is used in the utility function, estimates cannot be made with certainty. Thus, the analysis becomes a probabilistic choice. The probability of a respondent (individual i) prefers option j in the choice set to any other alternative, if Uij > Uik, (this utility is known only to the individual). This means that the utility correlated with option j exceeds that associated with all other options:

$P_{ij} = (V_{ij}+\varepsilon_{ij}) > (V_{ik}+\varepsilon_{ik})$

$= P\,[(V_{ij}-V_{ik}) > (\varepsilon_{ij}-\varepsilon_{ik})]$ [3]

Therefore, it can be expressed that the probability of choosing alternative j over k is simply that the differences between deterministic parts of their utility beat the differences in error parts. If the error terms are assumed to be independently and identically distributed (IID), and if this distribution can be assumed to be Gumbel, the above can be expressed in terms of the logistic distribution (McFadden, 1973). Then, the probability of choosing option j by respondent i is:

$$P_{ij} = \frac{\exp(\mu V_{ij})}{\sum_{j}^{i} \exp(\mu Vik)} \quad [4]$$

The assumption of (IID) error terms implies to the independence of irrelevant attributes (IIA). This means that the ratio of choice probabilities for any two alternatives is unaffected by adding or removing other unchosen alternatives (Bennett & Blamey, 2001). While "μ" is a scale parameter, an appropriate value for which may be chosen without upsetting evaluation results, if the marginal utility of income is presumed to be linear. Following Yacob et al. (2009), if it is assumed that the vector V_{ij} is linear, the utility function of the respondents' components can therefore be:

$$Vij = \beta 1Xij + \beta 2X2in\ j + \ldots + \beta nXnij \qquad [5]$$

Where, Xs variables in the utility function, βs coefficient to the estimates. If a single vector of coefficient βs applies to the whole, and the associated utility functions and scale parameter μ are assumed to be equal to 1, equation 5 can then be rewritten as:

$$Pij = \frac{exp(\beta Vji)}{\sum_j^i exp(\beta\beta Vik)} \qquad [6]$$

Where P_{ij} = probability of respondent i choices alternative j
X_{ij} and X_{ik} = vectors of attributes i and j, while,
B = vector of coefficient
The LIMDEP, Nlogit 4.0 econometrics software was applied to estimate the LCM by conventional maximum likelihood procedure:

$$\log L = \sum_{i=1}^{N} \sum_{j=1}^{J} Yij\ log \left[\frac{exp(Vij)}{\sum_{j=1}^{J} exp(Vij)} \right] \qquad [7]$$

Where:
Y_{ij} is an indicator variable that takes the value of one if the respondent i chooses option j and zero otherwise, and N is the number of samples.
The last step of CE technique was to compute WTP estimate, based on β values. Refer to Equation (5) to clarify the meaning of β values; it can be seen that the model estimates the value β, which indicates the effect on the utility of a change in the level of each attribute. For instance, β_1 shows the effect on the utility of change in attribute X_1 (Hanley et al., 2009).

The price or cost attribute must be included for WTP estimation. WTP value is typically derived by dividing the β value of each non-monetary attribute by β value of the price attribute, for marginal change in an attribute. Thus:

$$MWTP = \beta_{X1}/\beta_C \qquad [8]$$

The implicit price or marginal rate of substitution (MRS) is the value for any attributes other than price (Hanley et al., 2009).

Results and Discussion

Respondents' Socioeconomic Profiles

A summary of the respondents' socioeconomic profiles is presented in Table 3. Households' disproportion across gender showed that the males (n=234) represented 59.8 percent, while females (n=157) accounted for a relatively smaller size of 40.2 percent. On average, the age of the households was 36 years. This Indicated that majority of the respondents were within their active or productive age at the time of the study. Among these age cohorts, 9.7 percent disclosed to have attended informal educational system, while 90.3 percent of the samples have formal education. The average household size was 6 members per household. The mean households' income was approximately ₦38,000, in which 46.8 percent of the surveyed respondents earned a monthly income of ₦40, 000 and below ($203 and below).

Latent Class Model (LCM)

The model presented in Table 4 has two classes with no interaction to attributes of SWC services, while the coefficient of estimated latent class probability or the percentage of respondents in class 1 is 54 percent, and class 2 is 45 percent, implying that majority of the respondents are categorised in class 1. Thus, all the attributes are significant, with appropriate prior sign, and the price has appropriate sign, which is also significant at 1% level. However, class 1 maintained the appropriate prior sign and significance at 1% confidence level. PCS_2, in basic class 2, has a negative sign that is inappropriate, although it was found to be statistically significant at 1% level. Invariably in both class 1 and class 2 of the basic LCM models, the respondents' strongly favoured CF_3 improvement.

The Latent Class Model (LCM) with Interaction

For interpretability and deducing a reasonable meaning from the interaction using the socio-demographic variables from such behavioural model, the class 2 model was adopted in this study because it is more viable than the others. Thus, each latent class represents a certain population or a class that differs with another class, with respect to weight or importance given to the attributes of alternatives in the CE (Kloos, 2009). Majority of the respondents are represented in class 2, with 75 percent of the total respondents, while class 1 accommodates the remaining 25 percent in the model. Class 1 utility parameter are indicated as positive, except for the price, with an appropriate prior coefficient sign, and significance at 1% confidence level. This implies that the households have value to them, and are willing to pay for any increase in the price level.

Utility parameters of Class 2 show that SF_3 is significant at 10% and positive with the appropriate prior coefficient sign. However, PCS_2 is statistically insignificant and negative. Although PCS_3 also insignificant, it is positive, and this indicates that the households do not value these service attributes of PCS at both levels and are therefore not willing to pay for any additional increase in the price levels. However, for comparison basis, all the attributes remain significant in both classes, except for PCS in both levels 1 and 2 of service improvement, while PCS_2 has no prior coefficient sign. Hence, the class comparison of coefficients attributes reveals that CF_3 has the highest valued service attributes, followed by DM_2 in class 1, and CF_3 and CF_2 in class 2. What is obvious in all the LCM basic and interactive models is basically that the households remain consistent in their choice of CF_3, and this implies higher WTP for the highest level of solid waste collection service improvement in Kano metropolis.

The latent behaviour that motivated the respondents revealed that when other covariates of the respondents' socio-demographic factors interacted in the model, other covariates did not stimulate belonging to class 1 since they were found to be statistically insignificant. From the class 2 LCM model, the significant positive sign on the age variable interacting with pre-collection service level 3 in PCS3_AGE variable implies that older household heads have more interests than the young ones to improve solid waste collection services to a higher level than the status quo. Education variable was significant at the 1% level, and negative sign, in interaction with level 2 in PCS2_EDU. This finding indicates that the respondents with low

education level prefer pre-collection service at the second level of improvement via motorised pre-collection service that entails waste collection using either push-carts or light-weight trucks for final transportation. In Kano, this is done by using motorised tricycles truck which has the ability to access roads in urban poor settlements, or urban slums areas where roads are often narrow and with no asphalt (untarred roads). These makes the urban slums inaccessible to heavy compactor trucks. Most respondents with low education levels reside in such urban slums that are regarded as the urban poor settlements characterised by high population density, and are mostly dominated by the low-income earners.

In class 2 of the LCM model, the significant negative sign on the gender variable at 1% in interaction with waste collection frequency levels 2 and 3 in CF2_GEN and CF3_GEN variables implies that women have more interests than men to improve waste collection services to a higher level than the status quo. This is perhaps women at the domestic level are the ones managing solid wastes. Likewise, there is a significant negative sign on the gender variable at 1% in interaction with waste disposal method level 2 in DM2_GEN variable. However, this negative sign may suggest that the female respondents tend to go for the higher improvement options in SWM than the baseline. These findings are also in conformity with the similar results obtained in Malaysia using both CVM and CM techniques by Othman (2002; 2007), who found that women, in general, were more willing to opt for SWM improvement compared to men.

Consequently, the economic function of the model is provided as follows:

$U = \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 9X1Y1 + \beta 10X2Y2 + \beta 11X3Y3 + \beta 12X4Y4 + \beta 13X5Y5 \ldots + \varepsilon$

Where X1 is CF2, X2 is CF3, X3 is SF2, X4 is SF3, X5 is DM2, X6 is DM3, X7 is PCS2, and X8 is PCS3.

While, Y1 is Age, Y2 is Edu, and Y3 is Gen, as the parameters interacting with main attributes.

β = the coefficient

ε = the error term, thus:

$U = \beta_1 CF2 + \beta_2 CF3 + \beta_3 SF2 + \beta_4 SF3 + \beta_5 DM2 + \beta_6 DM3 + \beta_7 PCS2 + \beta_8 PCS3 + \beta_9$ PCS3_AGE + β_{10} PCS2_EDU + β_{11} CF2_GEN + β_{12} CF3_GEN + β_{13} DM2_GEN + ε

The positive function of all the attributes in both levels 2 and 3 means that higher improvement of solid waste collection services is preferred more than the baseline or

status quo. However, the increase in Pseudo R^2 implies that in the expanded model, the proportion of choice has increased compared to that of the basic model. All the attributes are statistically significant at 1% confidence level.

All the coefficients of the non-monetary parameters (attributes) or variables in the extended model were expected to positively correlate with utility. The Wald test indicates that all the coefficients are significant at 1% confidence level. This implies that improvements in all the non-monetary parameters (attributes) lead to positive utility among the respondents. The coefficient of the parameters of CF2, CF3, SF2, SF3, DM2, DM3, as well as PCS2 and PCS3, is positive with a prior positive sign expectations to the parameters, and similar to that of the simple or basic model, with both levels 2 and 3 in the models are significant at 1% confidence level. In fact, the positive signs, as a theoretical expectation in all the models, imply that increasing improvement of solid waste collection brings more utility to the respondents. Hanley et al. (2002) observed that the respondents prefer moving away from status quo situation and this rationally contributes in a high level of environmental improvement even if they would have to pay for it.

The variable CF (Waste Collection Frequency) was significant at 1% for both level 2 and 3. Both of these levels had correct positive signs. The finding showed that the coefficient for CF was positive, and it seemed that waste collection frequency was much more familiar than other attributes, and people were more concerned about it. Positive sign means that improvement in waste collection frequency results in higher level of utility for individuals. Thus, the positive sign of the variable coefficient for waste collection frequency denotes that households derive positive utility by the improvement of waste collection frequency and may be deduced as the net increase in utility (benefits) accrued to the households towards a sustainable SWM. In a nutshell, the coefficient for waste collection frequency is very high compared to other attributes in magnitude. The result can be described in the fact that, even though the residents generally recognise the need to improve on environmental quality, however, because the waste collection frequency is more noticeable, the households are especially concerned about waste collection frequency improvement to a higher level as much as possible. The results revealed that the households acknowledge that environmental quality also depends on the improvement in the cleanness via effective and efficient waste collection frequency, the high improvement of waste collections may therefore have implications on the public health and environmental risks. Previous studies have

found that respondents pay (or WTP) for improving waste collection frequency increases from their income (Othman, 2007; Othman, 2002; Das et al., 2010).

In both the basic and the extended LCM models, the PRICE (i.e., monthly charges, or MC) was found to be significant at 1%. The research finding shows that the coefficient for PRICE, which is the monetary attribute, was a negative sign, and it indicates that the respondents prefer improvement in solid waste collection services that are less costly for them. In all the samples, the monetary attribute had a negative sign and was significant at the 1% level. This entails that the higher the cost (PRICE) associated with an alternative (option), the lower the probability that alternative (option) was chosen, given the fact that all other attributes are equal. Comparing the results obtained (especially in term of attribute signs) with those of the previous studies showed that our results are consistent with some past studies (Othman, 2007; Othman, 2002; Das et al., 2010).

From the LCM, the significant positive sign on the age variable in interaction with pre-collection service level 3 in PCS3_AGE variable implies that the older household heads have more interests than young age to improve solid waste collection services to a higher level than the status quo. Education variable was significant at the 1% level, and negative sign, in interaction with level 2 in PCS2_EDU. It indicated that the respondents with low educational level prefer pre-collection service at the second level of improvement via motorised pre-collection service that entails waste collection using either push-carts or light-weight trucks for final transportation. In Kano, this is done by using motorised tricycle trucks which can access roads in urban poor settlements, or urban slum areas in which roads are often narrow and with no asphalt (untarred roads). This makes urban slums inaccessible to heavy compactor trucks. However, most respondents with low education levels reside in such urban slums (i.e. regarded as urban poor settlements) characterised by high population density, and mostly dominated by the low-income earners.

In the final model, the significant negative sign on the gender variable at 1% in interaction with waste collection frequency levels 2 and 3 in CF2_GEN and CF3_GEN variables implies that women have more interests than men to improve waste collection services to a higher level than the status quo. This is perhaps, women at the domestic level are the ones managing solid wastes. Likewise, there was significant negative sign on the gender variable at 1% in interaction with waste disposal method level 2 in DM2_GEN variable. However, the negative sign might suggest that the

female respondents also had the tendency to go for the higher improvement options in SWM than the baseline. These findings are also in conformity with the similar results obtained in Malaysia by Othman (2002; 2007) who stated that women were generally more willing to opt for SWM improvement compared to men.

Conclusively, from the results obtained in the models, it can therefore be deduced that households in Kano metropolis support improvement in SWM for solid waste collection services in terms of collection frequency, storage facilities, disposal method and pre-collection services.

Estimation of Households' Marginal Willingness to Pay

The marginal willingness to pay (MWTP) was computed by calculating the marginal rate of substitution between the attribute of interest and the cost factor, thus, by taking the total derivative of the utility index. The "value ratio" is identifiable between non-monetary elements of a utility called the implicit price (IP) (Hanley et al., 2009). For example, in this study, one of the attributes was collection frequency; dividing the β value of this attribute by the β value of price would show the respondents' average willingness to pay to improve collection frequency from the current level. For the dummy coded, the marginal value of solid waste collection attributes was estimated using the following formula:

MV = - βattribute / β monetary variable

The results reported in Table 6 showed that the mean values range from ₦272 ($1.3) for pre-collection services to ₦2593.2 ($13.2) for improvement in waste collection frequency. Thus, waste collection frequency (CF3) has the highest marginal value, followed by waste disposal method (DM3), waste collection frequency (CF2), pre-collection services (PCS3), waste storing facilities (SF3), waste disposal method (DM2), storing facilities (SF2), and finally the pre-collection service (PCS2) in the LCM model class2 respectively, while both improvement levels of options 2 and 3 have a positive sign which means increased utility.

The marginal value of CF3 (four times a week) of regular waste collection frequency was found to be higher than that of CF2 (three times a week) regular waste collection frequency. This means that CF3 is the most preferred choice attribute with the highest improvement level for waste collection frequency in this survey and it has a positive effect on the utility. For waste storage facilities, the statistic for the probability of SF2 and SF3 shows that the marginal value of SF3 (wheel waste bin) for waste storage

facilities was higher than SF2 in the CLM Class2; thus, the survey respondents preferred choice attribute SF3 to SF2, since SF3 is also the highest improvement level here.

For the waste disposal method, however, the result revealed that the marginal value of DM3 is higher than that of DM2, this means that the survey respondents prefer DM3 over DM2 improvement level. Meanwhile, the marginal value for the pre-collection services of PCS2 and PCS3 showed that PCS3 is also higher than PCS2, which means PCS3 is preferred over the PCS2 level of improvement in all the models.

Conclusions

A disaggregate relative importance for attribute levels' pair indicates that CF3, DM3, SF3, and PCS3 are the most preferred improvements of attributes combination levels, while CF2, DM2, SF2, and PCS2 are considered as least preferred by the households. This shows the utility people get from improvement in waste collection services and the situational change from status quo, which is feasible. To the authors' knowledge, this work is the first economic valuation study in Nigeria that has attempted to evaluate the households' preferences and marginal values for heterogeneity on their willingness to pay for solid waste collection services using a choice experiment technique.

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ELECTRONIC TAX SYSTEM AND INTERNALLY GENERATED REVENUE: MEDIATING EFFECT OF INTEGRATED PAYROLL AND PERSONAL INFORMATION SYSTEM (IPPIS) IN NIGERIA

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Abstract.

This study examined the mediating effect of IPPIS on it relationship between electronic tax system and internally generated revenue in the Nigerian emerging economy, using North Eastern States board of internal revenue as the case in point. To achieve this objective, electronic tax registration, electronic filing of tax returns and electronic payment of tax was used as proxies for electronic tax system. This study was anchored on expediency theory of taxation and technology acceptance model. A quantitative cross-sectional survey data from the six North Eastern States board of internal revenue was formulated using the questionnaire for over 425 staff of state board of internal revenue service within the north eastern state. Findings from the study revealed positive and significant effect of that major variable examined, electronic tax registration and electronic filing of tax returns affect internally generated revenue among the North Eastern States through IPPIS and by extension, the Nigerian emerging economy. The time scope for this study was 6month. Therefore the study concluded that IPPIS has a mediating effect on the relationship between electronic tax system and internally generated revenue in

North eastern Nigeria. Finally the study recommends that other geo-political in Nigeria should adopt the same approach when thinking about how best it's internally revenue can be improved upon.

Keywords: Electronic tax system, internally revenue generation and Integrated Payroll and Personal Information System

Introduction

In emerging countries like Nigeria, electronic income collection has gained improved importance. About 30 years ago, the e-tax system was initiated globally (Cobham, 2010); and since then, e-tax system has come to be a common network, helping several tax payers across the universe annually. E-taxation is the electronic tax filing system. It requires taxpayers to pay their duties online from their individual or business bank accounts (FIRS, 2015). Okoye & Ezejiofor (2014) identified e-taxation as a tax system administration carried out online. They noted that because e-taxation is electronic tax filing system, the payment of e-tax can be made directly through bank account and via the use of ATM via debit card or credit card. While it is believed that the purpose of presenting e-taxation is to progress revenue generation in the system.

There has been unprecedented advancement in technology in the last ten decades, to the extent that several roles that were hitherto played by man manually have been taken over by computer. To remain competitive and viable, therefore most governments, organizations, businesses and people have adopted technological systems and the internet of thing in various businesses. The technology adoption increased the advancement in the growth of the concepts of e-commerce and e-governance including tax administrators all over the world are not left out as it become necessary to use computer systems and networks in the process of tax registration, filing of tax returns and payment of taxes (Newman & Eghosa, 2019).Technology has influenced lives in many ways and continues to change the way of doing things from the simple day to day activities to the complex and less routine tasks. The impact of technology can be seen and felt in every area of lives from commerce to entertainment, education, communications, healthcare, defense and taxation (PWC, 2013).

In the area of governance, many developed and developing economies around the world have experimented and proven that no nation can truly develop without developing its technology-based tax system; hence the primary function of a good tax

system is to raise enough revenue to finance essential expenditures on the goods and services provided by government (Emmanuel, 2010). Therefore, a high lucrative means of generating the amount of revenue needed for providing the necessary infrastructure for our country through tax is no doubt by a well-structured tax system based on technology.

However, Nigeria is yet to reap the full benefit of electronic-based taxation system as the case in developed countries of the world (Eneojo & Gabriel, 2014).Uremadu and Ndulue (2011), observed that tax revenue in Nigeria accounts for a small proportion of total government revenue over the years compared with the bulk of revenue needed for developmental purposes that is derived from oil. Chandler (2013) also observed that today's policymakers are still grappling with the questions of effective tax administration leading to adequate tax revenue.

Enahoro and Olabisi (2012), corroborate this view when they stated that there is a huge scale of corrupt practices prevalent in emerging economy such as Nigeria tax administrative system, which tells to a reasonable extent that the economy is at a disadvantaged position. Consequently, Nigerian tax system over the years has not been able to reach the expected objectives as a result of these setbacks and challenges, some of which include multiplicity of taxes, tax evasion, corruption, non-compliance with relevant tax laws, poor information base and records keeping. It is the view of some scholars that the loss of revenue caused by widespread tax evasion and tax avoidance in Nigeria is due to inefficient and inept tax administration. For instance, Angahar and Alfred (2012) opined that the machinery and procedures for implementing a good tax system in Nigeria are inadequate, hence tax evasion and avoidance of the self-employed individuals and organizations whose data base are not captured in the relevant tax authority's data system poses a great challenge and impediment to national economic growth. James and Moses (2012) corroborate this view when they stated that the prevalence of tax evasion in the Nigerian tax system, has curtailed the amount of revenue collected from tax income, which in no doubt has effect on the governance expenditure.

Consequently, the rationale for the adoption of electronic tax system in Nigeria came as a result of the invitation of the officials of International Monetary Fund (IMF) to appraise the Nigerian tax system in line with the global standards. Upon a critical scrutiny of the Nigerian tax system, the IMF recommended the modernization of the Federal Inland Revenue Service (FIRS) for it to remain virile and relevant amidst

economic realities. In line with the recommendations of the International Monetary Fund (IMF), the FIRS adopted a seven fold programme of reforms which included re-engineering and automating tax collection and tax administration generally. It has been observed that in most countries where tax revenues significantly constitute a major part of the economy's revenue, they have been using electronic tax system for years (Umenweke and Ifedora, 2016).

For the purpose of clarity of the concept within the background; electronic tax system is the integration of information technology (IT) into tax administration in the form of electronic-tax (E-Tax). The use of IT to aid tax administration is the initiative that gave birth to the popular E-tax system. This is a master tool in combating the challenges of any tax system as it provides information, education and support to taxpayers and facilitates compliance and administration. It should be clear, however, that E-tax system do more than provide information, education and assistance to taxpayers due to its unique components such as Electronic Tax Registration, Electronic Tax Filing and Electronic Tax Payment, it also guarantees reduced cost of administering taxes. Electronic tax system provides convenience to taxpayers for tax assessment and payment (Agrawal, 2016). This convenience can serve as a key driver for e-filing adoption especially in developing countries like Nigeria. Electronic tax system provides many aspects of convenience to taxpayers, for example, tax filing can be conducted at any time, any location, easy use of system, easy search of information and other online transactions that are not available in the traditional channels (Ndayisenga & Shukla, 2016). It also offers flexibility of time, reduces calculation errors on tax return forms to the taxpayers, taxpayers privacy and security (Agrawal, 2006). Furthermore, electronic tax system minimizes the work load of tax authorities and operational cost due to submission of tax returns on a paperless environment. It also reduces the costs of processing, storing and handling of tax return (Jayakumar & Nagalakshmi, 2006).

Revenue generation has remained a major concern for numerous nations comprising Nigeria (Okauru, 2011). This is on the grounds that revenue is the thing that the administration uses to convey open products for the individuals (IMF, 2010). It is the measure of cash that an organization really gets during a specific time (Ofurum et al., 2018). Government income is cash the government got. The incomes of the government are normal from bases, for example, charges charged on the benefits and flourishing develop of people and organizations and on the properties and offices

made, fares and imports, non-assessable bases, for example, government-claimed organizations' benefits, national bank pay and capital receipts as outside credits and obligations from worldwide money related establishments (Ofurum et al., 2018). Government income is an important apparatus of the financial strategy of the government.

While it is believed that the intention of introducing E-taxation is to increase income collection in the system, though, there is a paucity of empirical evidence that has shown the degree to which the new technology has achieved this purpose on company income tax, value added tax and capital gain tax as well as the introduction on the integrated payroll and personnel information system (IPPIS) hence necessitating this research.

Problem statement

Poor contributions of tax revenues to total revenue collected in Nigeria are alarming (Okauru, 2011). African states such as Ghana, Tunisia, Morocco, and so on, have their tax incomes constituting important share of their entire revenue, Nigeria being the giant of Africa has an important low portion of tax-to-total revenue when likened with these nations (Ofurum et al., 2018). OECD (2014) exposed that in Ghana 73% of its total revenue was made from tax; in Tunisia, tax revenue accounted for 31.3% of her total revenue, while in Morocco, tax-to-total revenue ratio was 28.5%. Though, in Nigeria, tax-to-total revenue ratio was 5.2 percent in 2014 (Federal Inland Revenue Service, 2015, & CBN, 2016). Also obtainable archives displays that this figure has remained below 13% since 2001, and tax revenues has not accounted up to 50% of collected revenue of government since this period to date (Ofurum et al., 2018).

The E-tax was introduced with the chief aim of combating vices that were mainly associated with the collection of taxes like; Tax evasion, filing of wrong tax returns and claiming of undeserved tax refunds (Wamathu, 2014). Income resulting from taxes has remained very low and no physical growth really took place, hence the influence on the poor is not being felt. Inadequate tax workers, deceitful actions of tax collectors and absence of understanding of the significance to pay tax by tax payers are few of the difficulties of tax income (Afuberoh & Okoye, 2014).

Previous study by Onuiri et al. (2015) noted that the tax system in Nigeria is bounded by myriad of problems ranging from slight data available on the history of tax revenues or taxpayers owing to an absence of good archives keeping system (Federal Republic

of Nigeria, 1997); the nonexistence of complete tax figures and a centralized archive for the current ones (Federal Republic of Nigeria, 2002); inadequate manpower and other essential capitals into redundant parts and job purposes (Ariyo, 1997); repetition of taxes and its bad influence on taxpayers a problem resulting from a clash in the administrations' fiscal accountability and its fiscal power (Odusola, 2002); and thoughtful efforts by taxpayers to evade taxes (Odusola, 2003). With the application of E-taxation, it is anticipated that after empirical investigation, E-taxation will increase revenue generation in Nigeria. While it is believed that the intention of introducing E-taxation is to increase income generation in the system, though, there is a paucity of empirical evidence that has shown the degree to which the new technology has achieved this purpose on company income tax, value added tax and capital gain tax, hence the need for this study.

One of the major challenges of North Eastern States board of internal revenue is the issue of tax evasion and avoidance which most times are as a result of corruption. This can be seen in the form of bribery by the taxpayers to the tax officials for reduction in the amount of tax to be paid or absolute non-payment of tax, patronage/nepotism, collusion between taxpayers and tax officers. Other major problems with the traditional system of taxation in North Eastern States board of internal revenue are the issues of lack of tax statistical data or poor data base due to its manual nature, poor records keeping of the available information they have which has resulted to missing files, torn documents, multiplicity of taxes, poor tax administration, inability of the state government to prioritize tax efforts which have all resulted to very low tax yield However, in a bid to improve on tax revenue, the federal government has in traduced the enrollment of staffs into the IPPIS which will greatly improve the tax collection process as well as improving the internally revenue generation among these states under study. This electronic tax system, revotax, is provided by an independent ICT consultants called APPMART Limited. When effectively implemented, it is aimed at curtailing the loopholes, weaknesses and problems associated with the manual system of taxation in North Eastern State Board of internal revenue (NESBIR), thereby eliminating physical contacts between the taxpayers and tax officials and increasing her revenue generation.

Electronic registrations, electronic filing of tax returns and electronic tax payments, provide adequate tax records for easy communication of information and efficiently minimize cost of administration so as to boost her internal revenue generation. Extant

studies to the best our knowledge focused on examining the impact of e-taxation on revenue generation in Nigeria (Eneojo and Gabriel, 2014; Leyira, Chukwuma and Asia, 2012). Electronic tax system has been in operation in North Eastern State without any assessment of its effectiveness. Currently and to the best of the researcher's knowledge, there is no existing study that has empirically shown the extent to which the new adopted IPPIS has affected tax revenue in North Eastern Nigeria. It is to bridge this gap that this study is highly imperative as it will bridge gas in literature.

Objective

(i) Determine the effect of Electronic tax registration on internally revenue generation in Nigerian Emerging economy for sustainable development

(ii) Examine the effects of Electronic filing of tax returns on internally revenue generation in Nigerian Emerging Economy for sustainable development

(iii) Ascertain the extent to which Electronic tax payment affect internally revenue generation in Nigerian Emerging Economy for sustainable development

(iv) To examine the extent to which IPPIS mediate the relation between electronic tax system and internally generated revenue in North Eastern Nigeria for sustainable development

LITERATURE REVIEW

Ofurum, Amaefule, Okonya and Henry (2018), empirically examined the impact of E-taxation on Nigeria's revenue and economic growth: A pre-post analysis. The study aimed at determining how the implementation of E-taxation in 2015 has affected tax revenue, federally collected revenue and tax-to-GDP ratio. Data were sourced through secondary means from Federal Inland Revenue service and CBN statistical and economic reports on quarterly basis from the second quarter of 2013 to fourth quarter 2016. Analysis of data was done through the use of paired sample t-test and simple regression. The findings of the analysis revealed that the implementation of electronic taxation has not improved tax revenue, federally collected revenue and tax-to-GDP ratio in Nigeria. It was recommended amongst others that federal government through the federal Inland Revenue Services should conduct more enlightenment seminars in all 36 states in the country to increase the knowledge on the use of all electronic services on their platform.

Obert, Rodgers, Tendai and Desderio (2018), evaluated the effect of e-tax filing on tax compliance in Zimbabwe. The objective of the study was to determine how the e-tax filing has influenced tax compliance by clients in Harave, Zimbabwe. Data were collected through the aid of structured questionnaires. Analysis of data was done using multiple regression with the aid of SPSS version 20.0. The results of the analysis showed that: electronic filing actually influenced tax compliance; that there was a positive attitude by clients towards electronic filing and finally, that electronic filing has also significantly increased the case of doing business.

Madegwa, Makokha and Namusonge (2018), investigated the effect of automation of revenue collection on the performance of country government in Kenya. The objective of the study was to determine the effect of communication and the performance of Trans Nzioa country government in Kenya. The study used a semi structured self-administered questionnaires to collect data from the respondents. Data was analyzed using descriptive statistic with the application of SPSS. The result of the analysis showed that online process of automation of revenue collection process influence performance in Trans Nzioa country government office to a great extent. From the findings, the study recommended that automation of the revenue management process should be improved to enhance efficiency in the revenue collection process.

Ajape, Afara and Uthman (2017), empirically investigated the influence of E-tax system on Tax administration and Tax revenue generation in Lagos state Internal Revenue Service. The objective of the study was to determine the influence of an electronic system of taxation on tax administration efficiency and tax revenue generation in Lagos state Survey research design was adopted using a structured five point Likert scale questionnaire to obtain data. Data gathered were analyzed using descriptive statistics, while hypotheses were tested using the multivariate analysis of variance (MANOVA) with the aid of SPSS. Major findings of the study revealed that respondents do not differ that e-tax system has enhanced revenue generating potentials of Lagos state. The study recommended that relevant tax authority should formulate and implement policies that would promote the sustainability of positive effects of the e-tax system and to train tax official on how to harness the benefits of administering taxes electronically.

Monica, Makokha and Namusonge (2017), investigated the effect of electronic tax system on tax collection efficiency in domestic taxes department of Kenya revenue authority (KRA). The objectives of the study were to find out the effect of electronic

tax filing on revenue collection efficiency; examine the effect of staff competency on revenue collection efficiency and to ascertain the level of taxpayers' knowledge in operating electronic tax system in Kenya. The main data collection tools were questionnaires administered to the employees of KRA and taxpayers. Descriptive and inferential statistics were employed as data analysis technique. Findings from the study revealed that most tax payers strongly agreed that they were able to fully access and operate the tax system. Secondly, Employees competence was a significant predicator of the tax collection efficiency while taxpayers seeking clarifications on tax issues online is minimal.

Owino, Otieno and Odoyo (2017), empirically examined the influence of information and communication technology (ICT) on revenue collection in county government in Kenya. The objectives of the study were to determine the influence of ICT system for single business permits on revenue collection; evaluate the influence of ICT system for land rates on revenue collection; establish the influence of ICT system for bus park on revenue collection in Migori and Homa Bay county governments in Kenya. Primary data were collected with the use of questionnaires, and analyzed using descriptive and regression techniques. The finding showed that a strong and almost a perfect association existed between ICT systems adopted in county governments and the revenue collection; the application of ICT systems explain up to 91.9% variation in revenue collection efficiency in county governments.

Further findings revealed that the application of those systems improve revenue collection efficiency in the county governments.

Theoretical Framework

1 Benefit Theory of Taxation - According to this hypothesis, the state should impose charges on people as indicated by the advantage gave on them. The more advantages an individual gets from the exercises of the express, the more he should pay to the public authority. On the off chance that, as per the "benefits hypothesis of tax collection," we think about assessments as installments in return for government benefits, maybe states should be obliged to give individual tax reductions on inhabitants who add to their duty coffers. The advantages hypothesis would infer that an inhabitant should have the option to gather individual tax breaks to the degree that her expense installments to the source state surpass the cash estimation of any source state government benefits she as of now gets, including framework, controlled work

and capital business sectors, etc. Albeit instinctively appealing, the advantages hypothesis of tax collection experiences a few significant disadvantages. To begin with, it is difficult to actualize accurately because of the trouble of deciding the measure of government benefits, including diffuse advantages, for example, military assurance got by every occupant and non-inhabitant citizen.

Second, the advantages hypothesis doesn't accord with current understandings of pay tax assessment. In an absolutely homegrown setting, states by and large don't condition government benefits upon recipients‟ installment of assessments. Surely, citizens accepting the biggest government advantages might be the individuals who, because of their penniless conditions, settle the least duties.

Third, if the state keeps up a specific association between the advantages gave and the advantages determined. It will be contrary to the fundamental guideline of the duty. A duty, as we probably am aware, is obligatory commitment made to the public specialists to meet the costs of the public authority and the arrangements of general advantage. There is no immediate remuneration on account of an assessment. Fourth, a large portion of the consumption caused by the record is for the overall advantage of its residents, it is unimaginable to expect to assess the advantage appreciated by a specific individual consistently. In the event that we apply this standard practically speaking, at that point the helpless should make good on the heaviest duties, since they advantage more from the administrations of the state. Furthermore, in the event that we get more from the poor via charges, it is contrary to the rule of equity.

Ability-to-pay approach

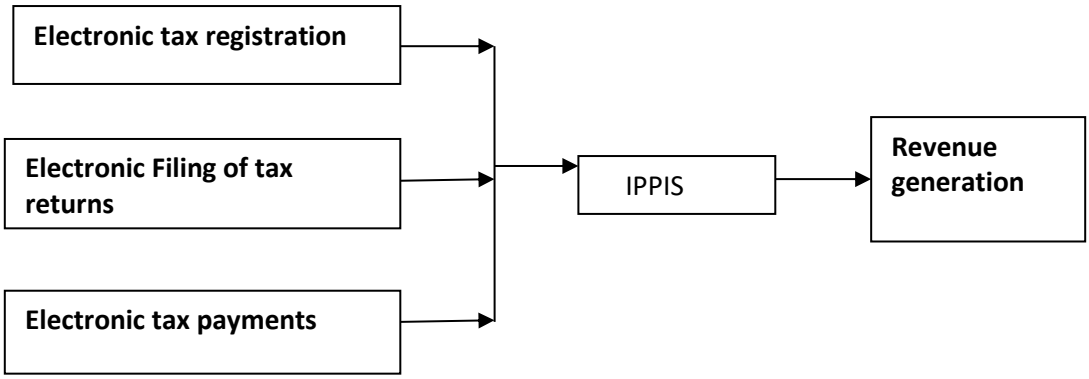
The ability-to-pay approach theory according to Akakpo (2009) as cited in Nnubia & Okolo (2018); Gatsi et al. (2013) is that, taxes are founded on taxpayers' ability to pay; thus, there is no quid pro quo. This theory is presented by Arthur Cecil Pigou (Samuelson, 2012). It treats proceeds and expenses of government distinctly. This theory pointed out that, taxes paid are understood as a sacrifice by taxpayers, which advance the subjects of what the sacrifice of each taxpayer should be and how it should be measured.

Technology Acceptance Model

The second theory is Technology Acceptance Model (TAM). This theory was developed by Fred Davis in 1986. The Technology Acceptance Model is an

information systems theory that models how users come to accept and use a technology. The theory is based on the assumption that the acceptability of an information system is determined by two main factors, being Perceived Usefulness (PU) and Perceived Ease Of Use (PEOU). Perceived Usefulness is the degree to which a person believes that using a particular system would enhance his or her job performance. Perceived Ease of Use (PEOU) is the degree to which a person believes that using a particular system would be free from effort. This theory is relevant to this study in the sense that the Technology Acceptance Model provides the bases for the adoption and implementation of the electronic tax system by the State Board of Internal Revenue Service based on the assumption of its perceived usefulness on both the tax payers and tax of officials. The primary objective of the e-tax system is to solve the challenges of the traditional tax system which makes the State Board Internal Revenue Service the forerunner in the acceptance of the e-tax technology mainly because it has a direct positive effect on their job performance in terms of efficiency, timeliness, accuracy and reliability. As for the tax payers, the perceived usefulness of the e-tax system will be the general ease of paying taxes in terms of accuracy, simplicity, convenience and trust in the tax system which will in turn bring about voluntary compliance, hence solving one of the major problems of taxation in the state. The assumption of perceived ease of use on the other hand is however, a hindrance to both tax payers and tax officials who may feel they do not have what it takes to actually use the technology without much effort. This is mainly due to lack of technological exposure which poses a major threat to the use of e-tax system in emerging economy.

Conceptual Framework



Source: Developed by the researchers, 2023

MATERIALS AND METHOD

Sampling Design and procedure

This study uses both proportional stratified sampling and simple random sampling techniques. First, proportional stratified sampling technique was applied to determine the number of staff in the revenue offices of state internal revenue service within the north eastern states. In the second stage, simple random sample was used to select the actual samples of the study from each States.

Research Design

In this research, the main objective is to investigate the effect of Electronic tax system on internally generated revenue: mediating effect of integrated payroll and personal information system (IPPIS) in Nigeria. The study was a survey in nature as it requires the use of questionnaire for data gathering. The questionnaire was designed in sections with different items on electronic tax system, revenue generation and IPPIS of which its reliability and validity was tested. The questionnaire was designed to meet the needs of the study. Missing items and outliers was detected and deleted be applying the student r and cook distances from the questionnaire. The questionnaire was structured using the five-point Likert scale for accuracy. The questionnaire was distributed to stakeholders, staffs, institutions of learning who has one way or the other has impact or contribution to the study within the North Eastern States in Nigeria.

Data analysis Method

In this study, SPSS was used to analyze data. Descriptive analysis, Cronbach Alpha analysis, correlation analysis and multiple regression analysis are conducted through SPSS software to achieve the study result from the data collected.

Results and Discussion

Table 1 demonstrates the results of a total of 425 respondents‟ profile was collected in this research study. Out of the total respondents, 42.5% are male whereas the female respondents consist of more than 50% making up to about 57.5 %. Two different age groups of respondents make up to more than 30%, which is the 31-40 years old group and the 41-50 years old group at 31.13% and 37.74 % respectively. About more than half of the respondents have a degree or equivalent qualification, at the highest

percentage of 67% out of all educational level. 34% Schools have been established for 5 to10 years and only 7.5% of Schools has been established for more than 20 years.

Profile of respondent

Table 1 profile of respondent

No	Item	Frequency (N)	Percentage (%)
1	Gender		
	Male	194	42.5
	Female	262	57.5
	Total	425	100
2	Age		
	Less than 30	52	11.3
	31-40	141	31.1
	41-50	171	37.7
	51-60	65	14.2
	Above 60	259	5.7
	Total	425	100
3	Highest qualification		
	SPM	47	10.4
	Diploma	60	13.2
	Degree	288	63.2
	Master	56	12.3
	PhD	4	0.9
	Total	425	100
4	Number of years firm established		
	Less than 5 years		
	5-10	128	26.4
	11-15	155	34
	16-20	103	22.6

Above 20 years	43	9.4
Total	34	7.5
	425	100

Cronbach's alpha Analysis

Table 2 shows the reliability of the statistic results for all the variables included in this study. Cronbach‟s Alpha has been considered as a scale reliability measurement, which can be correlation efficient when the value is between 0~1(Babin et al, 2003). All variables have a Cronbach‟s Alpha value of more than 0.8. In accordance to the rule of thumb, the result of Cronbach‟s Alpha value between 0.8~0.9 is at a very good level. This indicates that all questions contained are reliable and acceptable, and can be used for future analysis.

Table 2. Results of reliability test.

Variables	**Cronbach's Alpha**	**N of items**
Electronic tax registration with revenue generation	0.835	5
Electronic filing of tax returns with revenue generation	0.866	5
Electronic tax payment with revenue generation	0.844	4
IPPIS on Electronic tax registration with revenue generation	0.863	5

Correlation

Correlation analysis measures the relationship between dependent variables, mediating variable and independent variable. The importance of doing correlation analysis is to know whether the change on independent variables, mediating variable will cause a change on dependent variable. Pearson correlation evaluates the strength of a linear relationship for two or more variables. The value of range is between 1 to -1, the correlation of 1 gives a prefect positive correlation, -1 show a prefect negative correlation, and 0 means there is no correlation between variables. A high correlation means two or more variables are strongly related to each other, while a weak correlation indicates that the variables are hard to related (Franzese & Iuliano, 2019).

Table 3 illustrates the results of Pearson correlation analysis. Overall, the findings show that the dependent variable (revenue generation) has significant positive correlation among independent variable and the mediating variable (Electronic tax system and IPPIS).

Table 3. Pearson correlation matrix

	Electronic Tax system	IPPIS	Revenue Generation
Electronic Tax system	1	0.626**	0.576**
IPPIS	0.626**	1	0.618**
Revenue Generation	0.576**	0.618*	1

Multiple Linear Regressions

Multiple linear regression analysis is a form of linear regression analysis which is frequently used in linear regression analysis. Multiple linear regressions are used to describe the relationship between one dependent variable, mediating variable and two or more independent variables. *Table 4* demonstrates the summary of regression model. R square is the coefficient of multiple determinations for multiple regressions, it varies between 0 and 1 and it indicates the percentage of variation explained by the line of multiple regressions out of the total variation.

Table 4. MLR model summary

Model	R	R square	Adjusted R square	Std. Error of the estimate
1	.815*	.744	.741	.456787

a. Predictors: (Constant), Electronic tax registration, Electronic filing of tax returns, Electronic tax payment, IPPIS

The value of R square is 0.744, which is understood as 74.4% of the total variation of dependent variable (revenue generation) in this model, which can be explained by the independent variable and mediating variable (i.e., Electronic tax system and IPPIS). The remaining of 25.6% of R square is involves the other variables other than the independent and mediating variables included in this study.

ANOVA is an analysis of variance and it shows whether there is any potential statistical difference between the means of independent variable and the mediating variable. Table 5, provides an F statistic of 10.454 and a P- value (< 0.001) which is

below the significant value of 0.05, this indicates that the model is fit to use for further analysis since the independent variable and mediating variable have significantly predicted dependent variable (revenue generation).

Table 6. MLR ANOVA

Model	Sum of squares	df	Mean square	F	Sig.
Regression	36.977	4	2.997	14.854	0.000
Residual	32.920	421	.239		
Total	69.897	425			

a. Dependent Variable: Revenue generation.

b. Predictors: (Constant), Electronic tax registration, Electronic filing of tax returns, Electronic tax payment, IPPIS.

Table 7. Summary of findings.

Hypothesis	Pearson correlation	Multiple regression	Decision
H1: Electronic tax system has significant positive relation with revenue generation	r =0.513 p=0.000 (<.05)	P=0.025 (>0.05)	Accepted H1
H2:IPPIS has positive relation with Student revenue generation	r =0.592 p=0.000 (<.05)	P=0.003 (>0.05)	Accept H2
H3: IPPIS has significant positive mediating effect on the relationship Electronic tax system and revenue generation	r =0.635 p=0.000 (<.05)	P=0.001 (>0.05)	Accept H3

As presented in the tables of findings, the results suggest that Electronic tax system have a significant positive relation towards internally revenue generation. The analyzed outcomes from multiple linear regressions show a p-value of 0.003 and 0.001, which are less than 0.05. It indicates a significant relation between Electronic

tax system and internally revenue generation and mediating effect of IPPIS the relationship between Electronic tax system and internally revenue generation. Hence, manual electronic tax system is a major factor that affect internally revenue generation. Due to manual approach of tax collection, low tax return has been recorded which posed pose threats to internally revenue generation within North-eastern Nigeria. Researchers are finding a mean to enhance internally revenue generation. Hence, IPPIS significantly and positively mediates internally revenue generation

State government has always been considering ways of improving internally revenue generation. This study would help the government to understand factors that promote internally revenue generation. Based on the findings, IPPIS and electronic tax system have shown a significant and positive relation with internally revenue generation

Conclusion

Based on the findings, this study has analyzed the independent variable (Electronic tax system), the Mediating variable (IPPIS) and dependent variable (internally revenue generation) for sustainable development in North Eastern Nigeria. However, electronic tax system has positive and statistically significant to internally revenue generation. Therefore the findings concur to previous literatures that electronic tax system has significant influence on internally revenue generation. Also IPPIS is statistically significant to internally revenue generation and that IPPIS mediates the relationship between Electronic tax system and internally revenue generation in North Eastern Nigeria. It is believed that this study makes several contributions to the literature on Electronic tax system and internally revenue generation, and provides some useful insight to the government and other individuals that IPPIS mediates internally revenue generation in North Eastern Nigeria.

It is believed that future research on this topic may adopt different theoretical models to develop and investigate the mediating effect of IPPIS on the relationship between electronic tax system and internally revenue generation. Other Zones in Nigeria could be included in this study to investigate the mediating effect of IPPIS across other geo-political zones in the whole of Nigeria. Furthermore, study on States towards mediating effect of IPPIS could be conducted on various institutions related to internally revenue generation that might likely come out with more comprehensive position. The data only provide a snapshot of the timeline (5 months). Future research

may increase the sample size and take a more longitudinal approach which could provide a better understanding of the research findings.

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Conflict of interest

There was no case of misunderstanding, misconception and conflict of interest among the various parties to the research work

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BURDEN OF PROOF OF ADULTY CASES UNDER THE NIGERIAN LEGAL SYSYTEM

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Abstract

To prove adultery in Islamic legal system is actually a complex process. Adultery must be proved by the testimony of four eyewitnesses to the actual act of penetration, or a confession repeated four times and not retracted later. If someone saw them hugging or even lying on each other, naked but not penetrating, his testimony won't be accepted (but can entail some disciplinary punishment). Also, the eyewitness must have a clean character record. Some legal school also allows an unmarried woman's pregnancy to be used as evidence, but the punishment can be averted by a number of legal"semblances" (shubuhat), such as existence of an invalid marriage contract. Digital records (image or video) can also be used as evidence. If the accusation of adultery proven wrong, the accuser will be punished with 80 lashes.

Key words: Adultery, lashes, testimony, penetrating, accusation, proof

INTRODUCTION:

Islamic Law (*the sharia*), unlike other mundane legal systems like the common law, criminalizes an act of adultery. Adultery is a capital offence in Islamic law that attracts lapidation that is, stoning to death[1] (*al rajm*). The sister offence is fornication which attracts one hundred lashes of canes.[2] Both are unlawful sexual intercourse between

[1] A saying attributed to Caliph Umar. He is reported to have said:
There was a verse in the Book of God about *rajm* (stoning). We read it, we understood it, the prophet stoned
adulterer to death and we also stoned after him.Were it not that people might say that Omar had added in the Book
of God what not in it, I would have written it down. **Sahih Muslim 17: 4191-429 and 17: 4916 & 17:4194**

[2] See (Qur'an 24:1–2)

opposite genders who are not married. The former occurs between parties who are married to other partners other than the one with whom the coitus takes place. The same is between divorcee or widow/widower. It suffices that either of the persons is or has ever married. The latter is between unmarried persons generally. In the Islamic law, the offence of fornication and adultery is collectively known as *zina*. Thus, to convict a person alleged of *zină* (adultery and or fornication), there is a need for a serious and strict investigation, a very technical rules of evidence and procedure. Judges, prosecutors and all parties involved in a trial of adultery should know the nature and concept of the offence itself and all matters relating to the execution of adultery offence including the methods, burden and standard of proof required so that justice is served.

Under the Islamic law of evidence, the burden of proof in criminal matters lies on the prosecution. The majority of Islamic jurists agree that a high degree of proof is required in cases of *zină* to reach certainty. The burden of proof in adultery cases is discharged by testimony of four impeccable witnesses, failure of which the accuser may face the wrath of law, in the absence of confession or strong circumstantial evidence such as pregnancy of a widow outside the logical period after the death of her husband.

The burden of proof shifts in Islamic Law though rarely. Where there is an allegation of adultery for example, pregnancy is a strong evidence though circumstantial which shifts the burden of proof on the defendant. The story of Maryam in the Quran[3] lays credence to this position.

ADULTERY IN ISLAMIC LAW:

Offence of Adultery Under the Islamic Law

In Islamic law, the definition of zina (adultery) as a crime differs from one school of thought to another. The most comprehensive definition is that given by the Hanafi School of thought. According to Al-Mirghinani, zina is "sexual intercourse between a man and a woman without legal right or without semblance of legal right."[4] Anwarullah, in his The Criminal Law of Islam, states:

[3] Quran Chapter 19

[4] Al-Mirghinani (n 9) III, 344.

> *Zina means willful sexual intercourse between a man and a woman who are not, and do not suspect to be validly married to each other. Modern jurists define it as sexual intercourse between a man and a woman who are not, and do not suspect to be in a state of legal matrimony.*[5]

In spite of all the differences in defining the crime of *zina* among the schools of Islamic law, most jurists agree that the main element in the crime is willful intercourse. Hence, any sexual relationship between a man and a woman which does not involve intercourse is not punishable by the *hadd* punishment. These relations cannot be considered legal; on the contrary, they are prohibited, but their punishment is in the category of *tazir*. The *hadd* punishment for *zina* should not be applied in such cases.[6] The offence of *zina* is defined in section 92 of the Zamfara penal code as follows:

> *Whoever, being a man or a woman fully responsible, has sexual intercourse through the genital of a person over whom he has no sexual rights and in circumstance in which no doubt exists as to the illegality of the act, is guilty of offence of zina.*[7]

According to this definition, he who resumes cohabitation with a wife irrevocably divorced, even during her period of retreat following such divorce, is guilty of the offence of *zina*. Similarly, he who has sexual intercourse with a woman whom he has divorced before consummation of the new marriage is guilty of the crime of adultery.

Punishment of Adultery in Islamic Law.

The punishment for the crime of *zina generally* in the early days of Islam was confinement to the house or corporal punishment. The Holy Qur'an says:

> *And those of your women, who commit illegal sexual intercourse, take the evidence of four witnesses from amongst you against them; and if they testify, confine them (i.e. women) to houses until death comes to them or Allah ordains*

[5] Anwarullah, P. (2004). Principles of Evidence in Islam. 2nd Edition, Kuala Lumpur, A.S. NOORDEEN, p. 113.

[6] El-Awa Punishment in Islamic Law 14.

[7] Ruud Peters, Islamic Criminal Law in Nigeria (Spectrum, Ibadan 2003, 62.

> *for them some (other) way. And the two persons (man and woman) among you, who commit illegal sexual intercourse, hurt them both.* ***(Quran 4:15–16)***

Stoning the married adulterer is clearly supported by all four major schools of Islam, and while not in Qur'an, the punishment was enforced by the Prophet (PBUH)[8] since the early days of the establishment of sharia against Muslims and Jews, and followed ever since. There are, however, significant minority opinions that question or deny the punishment of stoning based on sources that argue the crime warrants 100 lashes only, applicable to everyone equally.[9]

ARGUMENTS FOR STONING

According to Siddiqi, [10] adultery is punished severely for two reasons. First, the negative outcomes from adultery, which are seen as undermining marriage and leading to family conflict, jealousy, divorce, illegitimate births and the spread of disease; and, second because early marriage is encouraged by state support and the allowance of polygamy, which are both seen as making adultery unnecessary. Stoning is thus seen as an indication of the legal, moral and social interests of society, yet juxtaposed to these interests, the nearly impossible standards to prove the offence implies that punishment is mainly a deterrent,[11] which are further tempered by the offence of slander or requirement for four witnesses.[12]

As Muslim civilisation meticulously documented judicial decisions, the Ottoman Empire is known to only once have ordered stoning to death of an adulterer in its 500-year history.[13]

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[8] As cited in Matthew Lippman, "Islamic Criminal Law and Procedure: Religious Fundamentalism v. Modern
Law," Boston College International and Comparative Law Review 12, no. 29 (1989),

[9] Mohammad Hashim Kamali, "Punishment in Islamic Law: A Critique of the Hudud Bill of Kelantan, Malaysia,"
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http://wwwjstor.org.ezprox.csu.edu.au/stable/pdf/3382008.pdf.

[10] Siddiqi, as cited in Lippman, "Islamic Criminal Law and Procedure."
http://lawdigitalcommons.bc.edu/cgi/viewcontent.cgi?article=1374&context=iclr.

[11] Postawko, "Towards an Islamic Critique of Capital Punishment."

[12] Lippman, "Islamic Criminal Law and Procedure."

[13] Heyd, as cited in Sadakat Kadri, Forced to Kill: The Mandatory Death Penalty and its Incompatibility with Fair

Some argue no one in Islamic history has been punished for adultery as a result of the oral testimony of four witnesses and rare punishments occurred by confession.[14] In fact, unlawful sexual intercourse was almost never punished in Islamic history at *hudud* level "due to [the] impossibly high evidentiary bar," but was punished under *taazir* by fines and lashings.[15]

Despite how traditional Muslim societies may have practically treated adultery, the *jumhur* (majority of jurists) believe married adulterers receive stoning. There are a number of arguments for this stance, including Qur'anic and hadith evidence. The reports based on Qur'anic evidence are that a verse was revealed stating, "*the old married man and woman who commit adultery, stone them to death as a deterrence from Allah, and Allah is Most Powerful, Most Wise"* [16] There is no number for this verse because it was apparently revealed and later abrogated, according to many scholars including al-Tabari, but interestingly its ruling remained.[17]

Trial Standards (London, UK: International Bar Association, 2016), https://www.genevaacademy.ch/joomlatoolsfiles/docmanfiles/Publications/Other%20publications/Forced%20to%20Kill%20%20The%0Mandatory%20Death%20Penalty%20and%20its%20Incompatibility%20with%20Fair%20Trial%20Standards.pdf; Fariba Zarinebaf,Crime and Punishment in Istanbul 1700-1800 (Berkeley: University of California Press, 2010).

[14] Badawy, "Towards a Contemporary View of Islamic Criminal Procedures"; Bassiouni, The Islamic Criminal Justice System.

[15] Daniel W. Brown, Rethinking Tradition in Modern Islamic Thought, Cambridge University Press, Cambridge, 1996, p. 66.

[16] Al-Tabari, as cited in Azman bin Mohd Noor, "Stoning for Adultery in Christianity and Islam and its Implementation in Contemporary Muslim Societies," Intellectual Discourse 18, no. 1 (2010), http://ezproxy.csu.edu.au/login?url=http://searchebscohost.com/login.aspx?direct=true&db=a9h&AN=518 86194&site=ehost-live; Ismail Ibn Kathir, Tafsir Ibn Kathir, trans. Safiur-Rahman Al-Mubarakpuri (Riyadh: Darussalam, 2000).

[17] Al-Asqalani, as cited in Bassam Zawadi, The Quranic Verse on Stoning, n.d, https://www.calltomonotheism.com/the_quranic_verse_on_stoning.; Al-Bukhari, as cited in Noor, "Stoning for Adultery in Christianity and Islam"; El-Awa, Punishment in Islamic Law; Sahih Muslim, vol. IIIA, Ch. 4, no. 1691.

Further and more significantly to evidence the veracity of the punishment, the penalty of stoning continued during the rule of the Rightly Guided Caliphs after the death of the Prophet.[18] Caliph Ali sentenced an adulterer to both punishments: flogging in accordance with Qur'anic provisions and stoning in accordance with Prophetic tradition.[19]

Further, Caliph Umar in a sermon stated,

> *I am afraid that after a long time has passed, people may say, 'We don't find the verses of the rajm…in the Holy Book,' and…they may go astray…I confirm that the penalty of rajm be inflicted on him who commits illegal sexual intercourse if he is already married…Allah's Apostle (pbuh) carried out the penalty of rajm, and so did we after him.*[20]

Umar's acknowledgement of the stoning punishment not being in the *Qur'an* is interesting and presents an issue. It begs the question as to how and why a verse would be used if abrogated. Perhaps he felt, even in abrogation, the offence of adultery was serious and needed to be dealt with definitively, particularly as the Empire had expanded rapidly under his rule and heinous crimes that threatened the moral fibre of the still new Muslim world were necessary to address with swift, harsh punishment. Under such circumstances, it may be viewed he was implementing a *taazir* punishment that reflected the punishment of the day. Alternatively, he may have felt, even though abrogated, it would be more appropriate to use the punishment God initially prescribed rather than creating one from human reason that may cause dispute and friction among Muslims. However, the rationale for abrogation meant the rule was no longer fit for application, so applying such a verse is inherently problematic. In fact, Brown argues Umar's fear of people abandoning the punishment of stoning does not actually state there was a verse with that ruling.[21] This is a matter for jurists to consider and rule upon to guide modern Muslim communities who may be unnecessarily holding onto a discretionary punishment. There are also many sayings of the prophet evidencing stoning. A hadith in Muslim on the authority of Abu Huraira states a man whose son

[18] Mohammad Hashim Kamali, Principles of Islamic Jurisprudence, Islamic Texts Society, Cambridge, 1989, p. 18.
[19] Abd-Elrahim, The Concept of Punishment in Islamic Law.
[20] Bukhari, vol. 8, book 82, no. 816.
[21] Brown, Stoning and Hand Cuttings.

committed adultery with his employer's wife was prescribed by the Prophet 100 lashes and one year exile for the son, and if the woman confessed she was to be stoned.[22] In another hadith, on the authority of Ubadah Ibn As-Samit, the Prophet said, Take from me. "*Verily Allah has ordained away from them...in the case of married (persons) there is (a punishment) for one hundred lashes and then stoning (to death). And in case of unmarried persons (the punishment) is one hundred lashes and exile for one year."*[23]

There are other reports in Sahih Muslim and other authors of the *Sunnan*, such as Abu Dawud, Ibn Majah, al-Nasai, al-Tirmidhi, and Bayhaqi and Ahmad in his Musnad,[24] that the Prophet received Qur'anic revelation then told his companions a new piece of legislation had been revealed to him: *a married person shall be given 100 lashes and then stoned; an unmarried person shall be given 100 lashes and banishment for one year*. Based on this hadith, jurists agree on stoning for a married offender,[25] while they disagree regarding flogging a married offender and banishment of an unmarried offender.[26] In fact, hadith scholars have stated stoning did not take place before the revelation of the Qur'anic verse that ordained flogging, rather stoning was practised after its revelation,[27] hence superseding the Qur'anic punishment. This is also the *ijma* (consensus) of the ummah.[28]

Further evidence is based on four cases of stoning reported during the Prophet's time. Two were Jews and the Prophet ordered stoning by following Old Testament as he normally did when applying laws to Jews. However, in three cases (including the famous cases of Maez and Ghamidiyyah, and the wife of Makhdoum Al-Aseef), they confessed to adultery and were sentenced to stoning,[29] when there was no reason to apply Jewish law since all were Muslim.[30] The final argument for proponents of stoning is that this penalty was part of the Old Testament, retained in the New

[22] Book 17, no. 4209.
[23] Sahih Muslim, vol. IIIA, ch 3, no. 1690; Noor, "Stoning for Adultery in Christianity and Islam."
[24] As cited in Noor, "Stoning for Adultery in Christianity and Islam."
[25] Noor, "Stoning for Adultery in Christianity and Islam."
[26] Muhalla, Shu'rani, as cited in El-Awa, Punishment in Islamic Law. 45 Abd-Elrahim, The Concept of Punishment in Islamic Law
[27] Abd-Elrahim, The Concept of Punishment in Islamic Law.
[28] Ibn 'Ashur, as cited in Noor, "Stoning for Adultery in Christianity and Islam."
[29] Abd-Elrahim, The Concept of Punishment in Islamic Law
[30] Noor, "Stoning for Adultery in Christianity and Islam."

Testament and reaffirmed by Islam.[31] The similarity to Jewish law only supports the strength of the claim it is correct as both laws are divinely revealed.[32]

ARGUMENTS AGAINST STONING

The issue is, while there are seemingly clear hadith advocating stoning for married adulterers, Quran 24:2 does not distinguish between married and unmarried persons. Traditionally, only *Kharijites* adhered to the literal text of the Qur'an and did not stone offenders, yet El-Awa notes recent jurists of other schools have argued against stoning for adultery based on the same Qur'anic verse.[33] Most jurists, however, state in this case Sunnah supersedes or explains more fully the Qur'anic law,[34] as mentioned above.

These conflicts indicate a literal reading does not necessarily establish a *hadd* offence. This is problematic as normally to reach the level of being haram (sinful), there must be clear textual evidence, or to evidence such a severe punishment it should be proven by decisive evidence via the Qur'an or *hadith mutawatir*.[35]

Accordingly, a small number of scholars argue against the *jumhur*, mostly *Kahirjites* and *Mu'tazilites* who believe the penalty for adultery, irrespective of marital status, is 100 lashes.[36] This is based on a number of arguments. The Qur'anic evidence in 24:2 prescribes 100 lashes for adultery and makes no distinction between married and unmarried offenders.[37] If meant for implementation, then punishment of such severity would have been mentioned specifically in the *Quran.*[38]

Further, the assertion by those who support stoning based on the abrogated verse in the Quran is believed by some scholars to be uncertain, not proven beyond doubt, and it is further argued this verse does not fit the literary style of the Quran.[39] Further, the narration by Said ibn al-Musayyib, who states he heard Umar in a sermon say the

[31] Abd-Elrahim, The Concept of Punishment in Islamic Law.
[32] El-Awa, Punishment in Islamic Law.
[33] See Quran 24:2
[34] As cited in Postawko, "Towards an Islamic Critique of Capital Punishment."
[35] A mutawattir hadith is one that is reported by such a large number of people that they cannot be expected to collectively agree upon a lie. Abu Zahrah, as cited in Kamali, "Punishment in Islamic Law."
[36] Noor, "Stoning for Adultery in Christianity and Islam."
[37] The Quran 24:2
[38] Abd-Elrahim, The Concept of Punishment in Islamic Law.
[39] Al-Alusi, as cited in Abd-Elrahim, The Concept of Punishment in Islamic Law.

stoning verse was in the *Quran* but later abrogated, has been rejected by some scholars, who state Al-Musayyib was only two years old when Umar was killed and Umar's statement implies the *Qur'an* was altered, which would be classified as an act of disbelief.[40] While this counter-argument to abrogation appears quite solid, the reality is pre-modern scholars accept there was a verse in the *Quran* about stoning adulterers that was removed as ordered by God, yet its ruling maintained.[41] The Shafi'i/Ashari hadith scholar Al-Bayhaqi (d.1066) stated he knew of no disagreement on the possibility of a verse of the Qur'an being removed in entirety while its ruling remained.[42]

Al-Ghumari (d.1993), a leading traditionalist scholar of the modern age, disagreed, saying this was irrational and adding all reports describing it as having occurred are narrated by too few transmissions (*ahad*[43]) to match the certainty of Qur'anic verses.[44]

Another Qur'anic argument states, since the *Quran* (4:25) has the offence of adultery by a slave-wife (50 lashes) as half that of the free woman (100 lashes), it is argued only flogging can be halved and not stoning, so flogging is the Qur'anic punishment in all cases of adultery.[45] The majority respond by saying this is an incorrect interpretation of the Quran and cannot be used to regulate the penalty for a convicted fornicator, married or unmarried.[46]

Further, the assumption is the hadith of stoning took place before the revelation of *Quran* 24:2, which prescribes flogging.[47] The eminent scholars Sarkhasi (d.1096) and Zailai state stoning was practised before the revelation of 24:2 because the hadith has the Prophet state, "*Take from me!" and if it had been after the divine revelation he*

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[40] Ahmed Mansour, Mawjiz Linafi Hukum al-Rajam [A Summary of Negating the Rule of Stoning], Ahlalquran.com, November 15,2007, accessed December 6, 2017, http://www.ahlalquran.com/arabic/show_fatwa.php?main_id=376.

[41] Brown, Stoning and Hand Cutting.

[42] *Ibid.*

[43] Ahad refers to a hadith narrated by only one narrator. In hadith terminology, it refers to a hadith not fulfilling all the conditions necessary to be deemed mutawatir.

[44] Brown, Stoning and Hand Cutting.

[45] Al-Zayla'i, Abu Zahrah, Mansur, Kamali, as cited in Noor, "Stoning for Adultery in Christianity and Islam."

[46] Noor, "Stoning for Adultery in Christianity and Islam."

[47] Abd-Elrahim, The Concept of Punishment in Islamic Law; Kamali, "Punishment in Islamic Law"; Noor, "Stoning for Adultery in Christianity and Islam."

would have said "Take from Allah!" [48] Thus, 24:2 nullified stoning as the punishment for adultery per the previously revealed religions.[49] There is a further claim that no punishments were carried out after the revelation of 24:2, meaning flogging abrogated stoning.[50] Many scholars respond to this claim stating this argument has no basis as it is unlikely the punishment would have been abrogated without the knowledge of the companions (such as Umar and Ali who continued enforcing the punishment), otherwise every law in Islam could be claimed as abrogated.[51] In fact, the famous hadith of Maez and Ghamidiyyah,[52] who confessed to adultery and were stoned, is rejected by some scholars, stating the small number of reporters of this hadith do not suffice to supersede a Qur'anic injunction.[53] In fact, Abu Hanifa refused to accept this report on the basis it was *ahad*, and even the hadith's successive reporting by multiple numbers do not invalidate Quranic decree according to Imam Shafi'i and some Zahiri school scholars.[54] However, other scholars argue the stoning of Maez and Ghamidiyya was witnessed by a large number of companions to reach the level of *mutawatir*, and is related in all authentic *hadith* books with details of the chain from different companions who were present, and these chains support each other leaving no room for fraud and doubt.[55]

The stoning of Maez and Ghamidiyyah has some further apparent inconsistencies. There is doubt by a companion whether their stoning was before or after the revelation of the specific verses in *Surah Nur* (Quran 24;2} which means the punishment collapses on the rule that doubt invalidates the *hudud*.[56] The conflict over this report means current jurists and scholars need to reassess and determine its validity and strength as the consequences are serious particularly in the modern age where more people have been killed for adultery in the last century than in many, if not all, preceding periods of Islamic history.

[48] As cited in Abd-Elrahim, The Concept of Punishment in Islamic Law.
[49] Abd-Elrahim, The Concept of Punishment in Islamic Law.
[50] Noor, "Stoning for Adultery in Christianity and Islam."
[51] El-Awa, Punishment in Islamic Law.
[52] Bukhari, vol. 8, book 82, no. 814; Muslim, vol. IIIA, no. 1695.
[53] Al-Ghazali, Al-Amedi, Showkani, as cited in Abd-Elrahim, The Concept of Punishment in Islamic Law.
[54] Abd-Elrahim, The Concept of Punishment in Islamic Law
[55] Noor, "Stoning for Adultery in Christianity and Islam."
[56] Abu Zahrah, as cited in Kamali, "Punishment in Islamic Law.

Another *hadith* is reported by Bukhari and al-Shaibani, a second-generation scholar, who asked companion Abdullah bin Abi Awf whether stoning was before the revelation of 24:2 or after, and he responded he did not know.[57] Hence, this hadith is not persuasive as Ibn Abi Awf was unsure of the circumstances, and it is further diminished in value as *hadith* scholars say the *ahadith* of stoning came after revelation of Sura Nur and hence abrogated it, as mentioned above, which is also why Umar and other companions acted on the hadith ruling of stoning.[58] Outside of the Qur'an and hadith, some argue the Prophet took the stoning punishment from the Jews, as there is no revelation in the Quran confirming it, and applied the same punishment towards guilty Muslims,[59] implying there is no textual basis for the punishment. Some modern jurists have considered the issue of stoning and developed their own thoughts based on the sources. Twentieth century jurists Mahmoud Shaltut (d.1963) and Mustafa AlZarqa (d.1999) do not favour the penalty of stoning, and Shaltut, a scholar and former president of Azhar University, says stoning can be considered a taazir punishment at a judge's discretion, rather than a *hadd* punishment prescribed by scripture.[60]

Al-Zarqa agreed, stating stoning was enforced as a taazir punishment applied by the Prophet to "curb the rampant immorality and corruption of the time of ignorance".[61] Abu Zahrah (d.1974), another leading 20th century scholar, doubted reports the Prophet punished by stoning as it was too cruel a punishment.[62] Abu Zahrah concluded evidence for stoning was doubtful and therefore preferable not to apply.[63]

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[57] Al-Asqalani, as cited in Abd-Elrahim, The Concept of Punishment in Islamic Law; I. Al-Otaibi, "Abu Zahra: b
Stoning is Jewish!," Forum Ahl al-Hadeeth, July 20, 2018, http://www.ahlalhdeeth.com/vb/showthreadphp?t=64354 ; El-Awa, Punishment in Islamic Law; Sahih Bukhari,
vol. 8, book, 82, no. 804; Sahih Muslim, vol. IIIA, ch. 6, no. 1702.

[58] Abu Zahrah, as cited in Kamali, "Punishment in Islamic Law"; Mughni, as cited in El-Awa, Punishment in
Islamic Law.

[59] El-Awa, Punishment in Islamic Law

[60] Mansour, as cited in Abd-Elrahim, The Concept of Punishment in Islamic Law; Mansour, as cited in Kamali,
"Punishment in Islamic Law."

[61] As cited in Kamali, "Punishment in Islamic Law," 228.

[62] Brown, Stoning and Hand Cutting.

[63] Mansur, as cited in Kamali, "Punishment in Islamic Law."

Mohamed S. El-Awa,[64] a modern commentator and interpreter of Islamic and modern law, in looking at both sides of the argument, believes stoning is prescribed by *sunnah* not the Qur'an, yet agrees *hudud* punishments should only apply in a just society, one that does not necessarily exist today. In fact, many Muslim countries have *hudud* laws, but evidence suggests they are not serious about implementing it, and Muslim governments have often yielded to pressures and found means to avoid implementation of *hudud,* often on technical juristic grounds.[65]

The arguments for and against stoning are very persuasive. There is clearly scholarly debate among traditional and current scholars. The question over an abrogated Qur'anic verse, *ahadith* that have strong arguments both ways, the fact of a severe punishment having no clear textual evidence, and the hadith of Umar apparently related by a two-year-old, collectively serve to create sufficiently strong doubt. However, the strongest argument in favour of stoning is Umar and Ali, who would have unlikely imposed their punishments without precedence and surety. The possibility of their using the punishment as a form of taazir likewise serves to place doubt and beg for revisions by scholars of Islam.

Another aspect to assess in seeking ways to limit capital punishment under sharia is the concept of repentance. This has been closely assessed by the scholar Kamali based on the interpretation of *hudud* and its use in the Quran. The word *'hudud'* in the *Qur'an* represents limits, not punishment.[66]

Kamali further states, where the Qur'an specifies a punishment for an offence, there are provisions for repentance, forgiveness and reformation, and this should be facilitated at least on a selective basis by positive incentives.[67] Hence, Kamali argues the *Quran* leaves room for reformation and repentance in all *hudud* offences and denial of this overrules the clear text. This is an interesting argument that scholars should consider when formulating penal codes.

Scholars give three views on repentance. First, it suspends punishment if done prior to completion of the *hudud* offence. For example, because *hiraba* [68](highway robbery), the most serious of crimes, allows repentance, this should be available for lesser

[64] As cited in Badawy, "Towards a Contemporary View of Islamic Criminal Procedures."
[65] Noor, "Stoning for Adultery in Christianity and Islam."
[66] Kamali, "Punishment in Islamic Law."
[67] Ibid.
[68] Qur'an 5:34.

crimes, including adultery.[69] When the Prophet was told Maez ran away while being stoned, he said, "Did you not leave him alone to repent so that Allah would have granted him a pardon?"[70]

A second repentance view is that it has no bearing on *hudud* except for *hiraba* due to the clear text, as references to theft and adultery concern repentance after imposition of punishment.

The third view holds that punishment purifies from criminality and so does repentance, so if a person repents they will not be punished provided they do not demand punishment.[71] The Prophet often tried to persuade individuals confessing to a *hadd* offence, particularly adultery, to retract their confession. Consequently, Kamali argues Qur'anic injunctions regarding reformation and repentance should be combined with fixed penalties.[72] These arguments give a basis for repentance to be formally instituted into the elements of penal laws and for modern judiciary and legislators to give it greater emphasis.

Burden of Proof in Adultery in Islamic Law

Like in all offences (irrespective of classification; *hudud, taazir or Qisaas,)* the onus to prove the allegation is generally on the accuser. By the very nature of adultery, the accuser may be the spouse (usually husband) or any other person. The burden of proof is discharged by the accuser by calling four witnesses as mandated under the Sharia.[73] Failure of which to either retract the allegation or face the wrath of law; receive eighty lashes of canes.[74] Where the accuser is the husband (spouse of the accused), and there is a denial by the accused, then *Lian* (mutual imprecation) shall be administered by the Court to settle the matter. The end result is always dissolution of the marriage.

The burden of proof of allegation of adultery is discharged by calling four independent witnesses as legislated under the Islamic Law[75]. This is known as testimony as a means of proof which has been extensively discussed in chapter two of this work. Failure to discharge this burden where the accuser is not the husband of the accused, the

[69] Kadri, Forced to Kill; Kamali, "Punishment in Islamic Law.
[70] Ibn Qudamah; Abu Zahrah, as cited in Kamali, "Punishment in Islamic Law."
[71] Al-Jawziyyah; Al-Muniriyyah, as cited in Kamali, "Punishment in Islamic Law."
[72] Kamali, "Punishment in Islamic Law."
[73] See Quran 4:15
[74] See Quran 24:4
[75] The Quran Chapter 4 verse 15.

provisions of Quran 24:4 shall apply. The provision is to the effect of eighty lasses of cane on the accuser.

In the instant of a husband denying the paternity of a child or pregnancy conceived during the subsistence of a marriage, *lian* then becomes expedient. Islam does not treat accusation of adultery and by extension all forms, with kid's gloves. This is because it touches two of the cardinal objectives of the Sharia: protection of blood (lineage) and protection of honour and human dignity.

When the hypocrites of Madinah accused Aisha (the Prophet's wife of Adultery, Allah did not take it easy with them. He revealed a whole chapter of the Quran[76] to exonerate her. In that surah, not only did Allah curse the hypocrites, He also warned the believers to desist from entertaining such wicked and baseless thought about their spouses. The Surah also prescribes *Lian* (mutual imprecation) for couples who accuse their spouse of adultery.

It is expedient to look into the doctrine of Lian under the Islamic Law as a method of discharging the burden of Proof on the husband who accuses his wife of adultery but unable to call four witnesses as commanded in both the Quran and the Sunnah.

LI'AN (mutual imprecation).

Li'an or otherwise known in English as "imprecation" is an oath taking process resulting in the separation of a husband from his wife due to his inability to prove a charge of adultery against his wife. By invoking *li'an* the husband is excluded from the punishment of false accusation of *zina.*

Most *Ulama* consider *li'an* as part of the family law. There are others however who thought that it is also part of the law of evidence as it is a type of oath while in another view *li'an* was thought of as a type of testimony. I agree that it is better called a type of testimony for the purpose it sets out to perform.

In the literal sense *li'an* means to tum away or to exclude oneself from Allah's Mercy, as a person who invokes *li'an* will also invoke the wrath of Allah if he is lying.

From the Sharia sense, *li'an* consists specific and understood words used as argument for those who invokes it for the purpose of accusing their wife of *zina* or to deny their paternity over a child.[77]

[76] Quran Chapter 24 (An Nur)

[77] Wahbah Al Zuhaili, Al Fiqhi Al Islami Wa Adilatuh, Dar Al Fikr, Beirut, undated, vol. 7, p. 556"

If a man were to find his wife committing adultery or if a husband were to accuse his wife of inchastity but he could not prove it, he may be liable for the *hadd* of *qazaf*. Another example would be where 'a husband refuses to acknowledge a child as his and he could not prove that such a child was not his; he may be liable for punishment of *qasaf*. To escape the punishment, the husband is allowed to resort to the process of l*ian*.

The authority (*dalil*) for the admissibility of *li'an* in Islamic law of evidence stems from the Qur'anic verse:

> *And for those who launch a charge against their spouses, and have (in support) no evidence but their own, their solitary evidence (can be received) if they bear witness four times (with an oath) by Allah that they are solemnly telling the truth. And the fifth(oath) (should be) that they solemnly invoke the curse of Allah on themselves if they tell a lie. But it would avert the punishment from the wife, if she bears witness four times (with an oath) by Allah, that (her husband) is telling a lie; And the fifth (oath) should be that she solemnly invokes the wrath of Allah on herself if (her accuser) is telling the truth.* (**Surah Al-Nur 24:6-9**)

The above verse was revealed when Hilal bin Umayyah had accused his wife of *zina* with Sharik bin Sahma before the Prophet {s.a.w}. After hearing the charge, the Prophet (s.a.w) had said to the effect, *"Bring evidence or the hadd will be upon your back*". Hilal said, "*O Prophet of Allah, if a man had seen his wife having sex with another man would he be required to bring Proof?* "The Prophet (s.a.w.) again repeated several times the need to bring evidence and thereafter Hilal said,

"By the One Who had thee righteously as a Messenger, verily I am speaking the truth and l pray that Allah will free my back from the hadd." Thereafter, the verse was revealed to the Prophet {s.a.w.}as an answer to *Hilal's* prayer.

The majority of the '*ulama* of Islam have said that the above incident was the first instance of *lian* in Islam while there are other opinions stating the first incident was with regards to Umar Al Ajlani.[78]

[78] Al Shaukani Muhammad bin Ali bin Muhammad, Nail Al Autar, undated, vol. 6, p. 268

CONCLUSION

Islamic law is such a robust legal system with five cardinal objectives to wit protection of sanctity of human life, protection of human honour and dignity, preservation of property of the people. Others are protection of sanity or reasoning of man and protection faith or religion of the people. Thus, anything that will affect the attainment of any goals will not be spared. Given the nature of human beings who may want to tarnish the image of another through bogus allegations, Islamic law has put in place mechanisms and doctrines to checkmate this evil. One important of these mechanisms, is the burden of proof of allegation on the accusers which generally rests on them except in instances where there is a shift.

Burden of proof under the Islamic law is akin in nature to as it is obtainable under the common Law. It generally rests on the plaintiff / Prosecutor / accuser but only shifts in certain given circumstances. With respect to burden of proof under the Islamic Law in cases of adultery, the two methods of discharging the onus are through testimony of four witnesses or through mutual imprecation. It's submitted that accusation of adultery should not be joked with by anybody especially by a spouse against another save for strong proofs. This is because of the emotional torture that the accused is thrown into as a result of the malign on his/her honour that the false accusation may cause.

Medical Waste Generation and Segregation Methods in Primary Healthcare Facilities in Borno State, Nigeria: Implications for Counselling

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Abstract

The study adopted survey research design to determine types and segregation methods of medical waste generated by primary healthcare facilities in Borno State, Nigeria. Population of the study comprised of all the 15,210 medical and para-medical staff in the 47 Primary Healthcare Facilities in Maiduguri Metropolitan Council and Jere Local Government Area. However, 375 staff drawn from 10 Primary Healthcare Facilities in Maiduguri and Jere was used as sample for the study. The sample was picked based on Krejcie and Morgan Table for determining sample size of a given population. Stratified random sampling technique was adopted in selecting the sample based on gender, location, educational status and work experience. Researchers' self-designed 29 items open ended instrument tagged Medical Waste Questionnaire (MWQ) was used to obtain data for the study. The questionnaire was divided into 3 sections (A-C). Section A collected information on demographic characteristics of the respondents such as

gender, age, educational status and nature of work. Section B elicited data on types of waste generated while Section C sought data on segregation methods. Face and content validity of the instrument was 0.76 as determined by 3 experts from Medical College, Measurement and Evaluation, and Guidance and Counselling of the University of Maiduguri. Items in the MWQ with less than 80% acceptance by the experts were removed. Reliability of the instrument was established through pilot-testing among 4 Primary Healthcare Facilities outside those under study. The test-re-test method adopted using Cronbach alpha yield a reliability coefficient of 0.81 Data for the study was collected through the administration of MWQ to the sampled subjects by the researchers. The responses were collected on the spot which ensures 100% retrieval. The data collected on the research questions were analyzed using descriptive statistical techniques of frequency counts and percentages, the responses were further rank ordered which gave a pictorial view of the respondents' ratings of each item on the instrument while t-test inferential statistic was used in testing the null-hypothesis at 0.05 confidence level. Three objectives, two research questions and one null-hypothesis piloted the study. Findings of the study revealed 31 different types and 4 segregation methods of medical waste generated at the primary healthcare facilities in the study area. The null-hypothesis was maintained as no significant gender difference exist on the types of waste generated at the Primary Healthcare Facilities in Borno State. Organizing workshops, seminars and conferences for the stakeholders on regular intervals by Counsellors involving Ministries of Health and Education, National Orientation Agency and Borno State Environmental Protection Agency were some of the counselling implications proffered.

Keywords: Medical Waste, Segregation, Healthcare Facilities, Counselling Implications.

Introduction

Waste has been and perhaps will remain the focus of educationists, environmentalists, researchers, policy makers and counsellors up to the next century. This is based on the visible hazardous consequences of waste on quality of the ecology on life of both fauna and flora. The generation, disposal, segregation and management of waste is one of

the most intractable problems that render most developmental programmes invalid especially in third world nations (Ngohi, 2019).

Healthcare facility waste or biomedical waste collection, segregation and management has recently emerged as an issue of major concern not only to healthcare facilities but also to the government. The wastes generated from facilities depends on a number of factors such as waste management methods, type of healthcare units, occupancy of healthcare facility, specialization of units, ratio of reusable items in use, availability of infrastructure and resources (Mathur, Patan and Shobhawat, 2012). According to Mathur, Patan and Shobhawat (2012), any waste generated during diagnosis, treatment or immunization of human beings or in research activities pertaining thereto or in the production or testing of biomedical refer to healthcare waste. The World Health Organization (WHO) according to Mathur et'al (2012) classified biomedical waste into eight categories viz: General waste, pathological, radioactive, chemical, and infectious to potentially infectious wastes, sharps, pharmaceuticals and pressurized containers. The major sources of biomedical wastes include: Government/private health facilities, medical colleges and research centers/paramedic services, veterinary colleges and animal research centers, blood banks, mortuaries, autopsy centers, biotechnology institutions and production units while the minor sources include: Physicians, dentists, clinics, slaughter houses, blood donation camps, vaccination centers, acupuncturists, psychiatric clinics, cosmetic piercing, funeral services and institutions for disabled persons

The United States Environmental Protection Agency (USEPA) defined waste as any useless, unwanted or discarded material (American Public Works Association, 2001). Festus (2014) defined waste as an awfully heterogeneous blend of elements that appears to vary according to organizational operations, the social characteristics of the vicinities and changed lifestyles. Adobe and Danbury (2015) defined waste as substances or objects discarded, worthless, unwanted, and defective or of no value from production to the end user. Waste may also be considered as substances or objects, which are disposed of or are required to be disposed of according to the provision of a national law. Adobe and Danbury (2015) perceived waste as a final placement, discharge or deposit of waste in the environment or the destruction of the waste without residue. Adeboye (2016) opined that wastes could be liquid, solid or gaseous residue from institutions (schools, prisons or hospitals), industries or commercial/business centers, construction firms, cooking recreation or agriculture.

Council on Environmental Quality (2018) maintained that waste has the quality of accumulating and physically insulting the environment if not well managed. Adelman, Pious and Morris (2011) expressed that conurbations are the most efficient agents of producing waste. As cities grow in population and physical size, so does its land use became more complex and consequently, the waste generated increases in volume and variety. Thus, the phenomenal increase in the generation and disposal of wastes in the cities poses threat to life requiring urgent attention.

The first interim report of the Medical Waste Management by the Environmental Protection Agency (EPA) in the United States (1990) reveled that, historically, medical waste often has been disposed of in municipal waste landfills or improperly combusted in poorly designed and inadequately controlled hospital incinerators. Due to current changes in landfill regulations, medical wastes are frequently excluded from municipal waste landfills, additionally, older medical waste incinerators in USA are replaced or upgraded because of more stringent State and local policies. The agency is currently developing Maximum Achievable Control Technology (MACT) (Adeboye, 2016).

More than 3.5 million tons of medical waste are generated annually within the US and the common sources are hospitals, nursing homes and rest home, medical and pharmaceutical research centers, veterinary offices, pharmacies, laboratories, clinics, dentists' and doctors' offices and mortuaries (Hyland, 2000). An estimated 300,000 tons per year of medical waste are shipped off-site, and this amount is projected to grow to 450,000 tons per year by the year 2000. Other studies suggested that these estimates and projections of medical wastes quantities could be low by as much as 50%, this could be attributed to lack of agreement on the definition of medical waste (Okitipi, 2018).

Awodele, Adewoye & Oparah (2016) expressed that the WHO estimated that each year there are about 8 to 16 million new cases of Hepatitis B virus (HBV), 2.3 to 4.7 million cases of Hepatitis C virus (HCV) and 80,000 to 160,000 cases of Human Immunodeficiency Virus (HIV) due to unsafe injections disposal and mostly due to very poor waste management system. George (2019) added that contaminated injection equipment may be scavenged from waste areas and dump site either to be reused or said to be used again. The negative health and environmental impacts of medical waste includes transmission of diseases by virus and microorganisms, defacing the aesthetics of the environs, as well as contamination of underground water

tables by untreated medical waste in landfills. Good medical waste management in facilities depends on a dedicated waste management team, good administration, careful planning, and sound organization, underpinning legislation, adequate financing and full participation by trained staff (Okitipi, 2018).

In Nigeria, just like other third world nations, many people are not aware that medical waste constitutes threat to life and environment. In this study however, waste is defined as any substance(s) that is/are undesirable, defective, damaged, discarded or unwanted to get rid of that may or will end-up being hazardous to the environment. Waste can be generated from a number of sources including private and public health facilities in form of biological or inorganic wastes (incombustible or non-bio-degradable), inert, radioactive and sewage treatment residue. This study however, focuses on medical waste generation and disposal method with particular reference to primary healthcare facilities in Maiduguri Metropolis and Jere Local Government Areas.

Objectives of the Study

The following objectives were achieved by the study:

1. Identify the types of waste generated at the Primary Healthcare Facilities in Borno State
2. Identify how the waste generated are segregated at the Primary Healthcare Facilities in Borno State
3. Determine if there is a significant gender difference on the types of waste generated at the Primary Healthcare Facilities in Borno State

Research Questions

The following research questions were answered in this study:

1. What are the types of waste generated at the Primary Healthcare Facilities in Borno State?
2. How are the wastes generated being segregated at the Primary Healthcare Facilities in Borno State?

Hypothesis

The following null-hypothesis was tested for the study at 0.05 confidence level:

Ho_1: There is no significant gender difference on the types of waste generated at the Primary Healthcare Facilities in Borno State.

Methodology

Descriptive survey design was adopted for the study that identified waste generated and segregation method by Primary Healthcare Facilities in Borno State. Target population of the study comprised of all the 15,210 medical and para-medical staff in the 47 Primary Healthcare Facilities in Maiduguri Metropolitan Council and Jere Local Government Area. However, 375 of the medical and para-medical staff in 10 Primary Healthcare Facilities that is 6 from Maiduguri Metropolitan Council and 4 from Jere Local Government Area were used as sample for the study. The sample was picked based on Krejcie and Morgan Table for determining sample size of a given population. Stratified random sampling technique was adopted in selecting the sample based on location, gender, medical experience and number of patients attended to. Researchers' self-designed 29 items open ended instrument tagged Medical Waste Questionnaire (MWQ) was used to obtain data for the study. The questionnaire was divided into 3 sections (A-C). Section A collected information on demographic characteristics of the respondents such as gender, age, educational status and nature of work among others. Section B elicited data on types of waste generated while Section C sought information on segregation methods.

Face and content validity of the instrument was 0.76 as determined by 3 experts from Medical College, Measurement and Evaluation, and Guidance and Counselling of the University of Maiduguri. Items in the MWQ with less than 80% acceptance by the experts were removed. The experts' views were appropriately and adequately incorporated. Reliability of the instrument was established through pilot-testing among 4 Primary Healthcare Facilities outside those under study. The test-re-test method adopted using Cronbach alpha yield a reliability coefficient of 0.81 which was considered suitable, adequate and adjudged appropriate for what the study purports to achieve. Data for the study was collected through the administration of MWQ to the sampled subjects at the Primary Healthcare Facilities in Maiduguri by the researchers. The participants were met in their various Primary Healthcare Facilities where copies of the MWQ were administered and the responses were collected on the spot which ensures 100% retrieval. The data collected on the research questions were analyzed using descriptive statistical techniques of frequency counts and percentages, the responses were further rank ordered which gave a pictorial view of the respondents' ratings of each item on the instrument while t-test inferential statistic was used in testing the null-hypothesis at 0.05 confidence level. Three objectives, two research questions and one null-hypothesis piloted the study. The results are presented in Tables 1 to 3.

Results

Research Question One: What are the types of waste generated at the Primary Healthcare Facilities in Borno State?

Table 1: Types of Waste Generated at the Primary Healthcare Facilities in Borno State

S/No.	Waste	Responses	Rank
1.	Needles	22(5.9)	1st
2.	Surgical blades	11(2.9)	15th
3.	Syringes	22(5.9)	1st
4.	Test-tubes	14(3.7)	9th
5.	Glass wares	22(5.9)	1st
6.	Ampoules	11(2.9)	15th
7.	Pipettes	14(3.7)	9th
8.	Sharp metals	22(5.9)	1st
9.	Radioactive papers	19(5.1)	7th
10.	Gloves	22(5.9)	1st
11.	Cotton swaps	20(5.3)	6th
12.	Spent radiation	19(5.1)	7th
13.	Patient defecation	14(3.7)	9th
14.	Batteries	02(0.5)	31st
15.	Thermometers	14(3.7)	9th
16.	Dental amalgam	14(3.7)	9th
17.	Blood pressure gauges	09(2.4)	17th
18.	Fluorescent tubes	09(2.4)	17th
19.	Laboratory waste	09(2.4)	17th
20.	Materials potentially infected by blood	09(2.4)	17th
21.	Body tissues resulting from surgery	09(2.4)	17th
22.	Autopsy	05(1.3)	26th
23.	Urine/Blood products	09(2.4)	17th
24.	Foetus	07(1.9)	24th
25.	Placenta	12(3.2)	14th
26.	Expired vaccines	05(1.3)	26th

27.	Expired drugs	05(1.3)	26th
28.	Expired disinfectants/solutions	06(1.6)	25th
29.	Switchblades	05(1.3)	26th0
30.	Sputum	05(1.3)	26th
31.	Blood bags	09(2.4)	17th
	Total	**375(100)**	

Note: All figures in parentheses are percentages of the row scores

Table 1 revealed that needles, syringes, glass wares, sharp metals, gloves, cotton swaps, spent radiation, radioactive papers, test tubes, pipettes, patients' defecation, thermometers, dental amalgam, placenta, surgical blades and ampoules constitute the major medical wastes generated at the Primary Healthcare Facilities in Borno State thus, ranked from 1st to 15th while blood pressure gauges, fluorescent tubes, laboratory waste, materials potentially infected by blood, body tissues resulting from surgery urine/blood products, blood bags, foetus, expired disinfectants/solutions, autopsy, expired vaccines, expired drugs, switchblades and batteries comprised the minor medical waste generated in the study area ranked from 17th to 26th .

Research Question Two: How are the wastes generated being segregated at the Primary Healthcare Facilities in Borno State?

Table 2: Waste Segregation in Primary Healthcare Facilities in Borno State (N=375)

Segregation	Collection Bin	Responses	Rank
Non-hazardous/Non-infectious Healthcare Waste			
All items used for medical care but are visually not contaminated with blood or body fluids of patients. Some of these include: Bandage, gauze and swaps	Black Color	126(33.6)	1st
Hazardous/Infectious Healthcare Waste			
These categories of wastes include: Pharmaceutical, pathological, chemical	Yellow Color	117(31.2)	2nd

wastes and those with high contents of heavy metals and pressurized containers. Examples are expired drugs, body parts and fluids, tissues, placenta, blood, halogenated and non-halogenated solvents, photographic fixing and developing solutions, thermometers and other gaseous, liquid and solid chemical wastes.			
Highly Hazardous/Highly Infectious Healthcare Waste These categories of waste include: Radioactive, sharp objects and viable biological and pathological agents such as cultures and stocks, dishes or devices used to transfer, inoculate and mix cultures of infectious agents, needles, surgical blades, liquids, gas and solids contaminated with radionuclide whose ionizing radiations have genotoxic consequences.	Red Color	103(27.5)	3rd
Waste waters Consist of physical, biological and chemical compositions made up of backwater (sewage) like fecal matter and urine, food remnants and toxic chemicals usually considered as heavily polluted water waste. Grey water (silage) like bathing and washing waters, laboratory processes, laundry or technical processes such as cooling water or the rinsing of x-ray films which are usually considered as low polluted water waste. Storm water (rainfall) consist of rain water collected on facility roofs, grounds and paved surfaces, which may be used for toilet	Sanitary sewer system by gravity flow to treatment center	29(7.7)	4th

flushing, irrigation of facility grounds or seep into ground water.	

Note: All figures in parentheses are percentages of the row scores

Table 2 revealed 4 segregations based on infectious nature of the waste and colors of the collection bins used. Generally, the wastes are collected in black, yellow and red bins while the liquid aspects were collected through sanitary sewer system by gravity flow to treatment center.

Hypothesis

Ho_1: There is no significant gender difference on the types of waste generated at the Primary Healthcare Facilities in Borno State

Table 3: t-test Analysis of Gender Difference on the Types of Waste Generated at the Primary Healthcare Facilities in Borno State

Variable	N	X	SD	DF	t-cal.	t-crit.	Decision
Male	193	3.77	1.10	17	0.42	0.87	Accepted
Female	182	3.61	1.07				

Evidence from Table 3, revealed that the calculated t-value of 0.42 is less than the t-critical of 0.87. Thus, the null-hypothesis was upheld.

Discussion

The study explored the medical waste generated and segregation methods in primary healthcare facilities in Borno State. The study answered two research questions and tested one null-hypothesis at 0.05 confidence level. The finding on research question one which stated that what are the types of waste generated at the primary healthcare facilities in Borno State? The finding of this study revealed thirty-one (31) different types of wastes generated at the primary healthcare facilities in Borno State. Studies (Council on Environmental Quality 2018, Adelman, Pious and Morris 2011, Channing 2011, Federal Ministry of Housing and Environment 2013, Sada and Odemerho 2018, Adegbite 2018, Gourlay 2012, Douglas 2012, Longe 2014, Moon 2014 and Miller, 2019) reported the generation and segregation methods of medical waste in Nigeria and other parts of the globe. This study corroborates the earlier findings of Adegbite (2018), Maduike (2018) and Ahoove (2016) who reported that both biodegradable and

non-biodegradable wastes are generated at medical healthcare facilities comprising of infectious and non-infectious substances that are hazardous to human life and to a larger extent, the wastes are so pervasive that no area of the country is free from the menace. Maduike (2018) and Ahoove (2016) for example, stressed that domestic, industrial, commercial, agricultural and some institutional wastes may have some economic importance of serving as manure, reclamation purpose, animals feed and source of daily bread to scavengers through recycling, but the health hazards of medical waste is detrimental to life of both fauna and flora. Some of the costs of improper medical waste management according to Adegbite (2018), Maduike (2018), include air and water pollution by way of odor and leaching, breeding grounds for insects such as flies and mosquitoes, abode for rats and other rodents. All these will culminate in the spread of diseases such as plague, typhoid, histoplasmosis, leptispirosis, fever, cough, malaria, cholera, dysentery, diarhorea, loss of appetite and a range of other inherent psychological disorders.

On research question two which seeks answer on how the waste generated are being segregated, the finding of this study revealed the use of color containers (black, red and yellow) for collection and segregation of medical wastes in the healthcare facilities. This finding affirms the earlier findings of Ngohi (2019) and Miller (2019) who reported that all the primary, secondary and tertiary health facilities follow the stipulated guideline of the Nigeria State Health Investment Project (NSHIP) for using red, blue, green, yellow and black waste collection bins to ease segregation of highly infectious, infectious and non-hazardous medical wastes. The only variation according to Ngohi (2019), is that some healthcare facilities use waste bins that can be emptied on regular basis while others use disposable polythene bags for economic purpose and the goal remain the same.

One null-hypothesis was tested using t-test statistics at 0.05 confidence level. The hypothesis (Ho_1) stated that there is no significant gender difference on the type of waste generated at the primary healthcare facilities in Maiduguri, Borno State. The hypothesis was upheld because the calculated t-value of 0.42 is less than the t-critical of 0.87 at 0.05 confidence level. Significant gender difference does not exist on the types of waste generated at the healthcare facilities in the study area. This may not be unconnected with the long period of experience in collection and segregation of the facilities' wastes by male and female respondents. It could also be attributed to the

respondents' adequate knowledge on environmental policies and weak enforcement of existing legislation.

Implications for Counselling

Based on the findings of this study, sufficient information is given to the counsellor on the medical wastes generated and segregation methods adopted in primary healthcare facilities in Borno State. The Counsellors, Faith Based Organizations, Community/Traditional leaders, International and national non-governmental organizations and mass media (visual and blind) should champion sensitization campaigns toward halting the menace of unprotected disposal of medical waste by organizing seminars, conferences, symposia and other public lectures, intermittent radio jingles, one-on-one programmes as well as using posters and hand-bills to parents and other stakeholders with the momentum of a war to curtail the tendencies of contracting contagious ailments as a consequence of wanton medical waste disposal. In addition, counsellors should emphasize that containers for waste collection should be non-transparent, impervious to moisture, should have the strength of preventing damage during handling or use, leak resistant, closed-fitted lids, have handles for easy manipulations, light weight and should have foot pedals for convenience.

The Borno State Environmental Protection Agency (BOSEPA) should enlighten the waste management staff of all primary healthcare facilities across the State that when transporting wastes off-site or collection centers of the primary healthcare facilities, the vehicles should be kept closed at all times except when loading or offloading, containers must be disinfected on daily basis due to the hazardous nature of the wastes, waste bags should be placed in containers such as cardboard boxes or wheeled, rigid, lidded plastic or galvanized bins before being placed directly into the transportation vehicle. The counsellors should in collaboration with BOSEPA equally enlighten and counsel the waste management staff, cleaners, laboratory staff, environmental health officers, waste regulators and handlers, health assistants and auxiliary staff of all the primary healthcare facilities across the State on destruction/transformation of used or expired chemicals and pharmaceuticals, sharp and other materials capable of causing physical injuries, decomposition of radioactive waste materials as well as disposal methods of body parts, tissues, blood and other organic materials.

Conclusion

Based on the findings of this study, it is concluded that both biodegradable (combustible), non-biodegradable (incombustible) and water wastes were generated which are classified into non-hazardous/non-infectious, hazardous/infectious and highly hazardous/highly infectious healthcare wastes in the primary healthcare facilities in the study area and three different colors (black, yellow and red) of collection bins were used for segregation of the wastes generated. Some of the medical wastes identified in the study include bandages, expired drugs and other substances, used syringes and injections, gauze, glass wares, blades, used gloves, placenta and other body parts. Finding of the study revealed no significant difference between male and female respondents on the types of medical wastes generated at primary healthcare facilities in Borno State, Nigeria. Thus, counsellors, medical personnel, waste disposal agencies and other stakeholders should consider the use of incinerators and other medical wastes disposal methods for proper segregation and disposal of medical wastes with a view to avoiding transmission of contagious ailments as a consequence of moving wastes from one location to another.

Recommendations

Based on the findings, the following recommendations were made:

1. Counsellors should organize workshops and seminars to medical personnel involving cleaners and wastes collectors on the attendant dangers of collecting, segregating and improper disposal of medical wastes to themselves and the society at large.
2. The Borno State Ministry of Health and National Orientation Agency should in collaboration with World Health Organization, inter and intra national health related organizations or agencies provide all primary healthcare facilities with waste bins, trucks and incinerators for proper collection, timely evacuation and disposal of medical wastes.
3. The Borno State Ministries of Health and Education, Counsellors and Borno State Environmental Protection Agency (BOSEPA) should organize training programmes at regular intervals to all stakeholders involve in generation and segregation of medical waste.

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ECOLOGICAL IMPLICATION OF AIR POLLUTION FROM QUARRY AND STONE CUTTING INDUSTRIES ON AGRICULTURE AND PLANT BIODIVERSITY IN MPAPE, FCT, ABUJA

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ABSTRACT

Quarry activities are important to modern day life and the socio-economic development of local communities. Unfortunately, this industry is usually associated with air pollution. To assess the impact of quarry dust on plant biodiversity and agriculture, $PM_{2.5}$, PM_{10} and some meteorological parameters were measured using Gas analyzer, handheld thermometer and Multifunction Anemometer (PCE-EM 888) as well as taking a social survey. High amount of particulate matters that exceeded the international standard were recorded at the study locations which include the Julius Berger Quarry and 1km away from the quarry site which serve as the base for the farmlands. The correlation coefficient between the particulate matters with the meteorological parameters of the locations all show a strong relationship with temperature recording a stronger value of 0.952 and 0.931 for $PM_{2.5}$ and PM_{10} respectively. Similarly, the coefficient of determination 0.906 and 0.866 shows that temperature has

the highest meteorological percentage variation on $PM_{2.5}$ and PM_{10}. Furthermore, a notable negative impact of quarrying on plant biodiversity and local farm crops are also revealed based on respondents' results where wide range of local plants were affected with Maize and Azadiracta indica (Neem) been the most with respondent of 31.5% and 27.5%. According to the obtained results, it is highly recommended to develop green belt surrounding the quarrying using pollutant-tolerant trees (usually with broad leaves) in order to restrict spreading of quarrying dust via intercepting, filtering and absorbing pollutants.

Keywords: Quarry, Air Pollution, Agriculture, Biodiversity

Introduction

Quarrying is the exploitation of various lithological materials given by nature to mankind while, quarry It is a place from where stones, rocks, construction aggregates, riprap, sand, gravel or slate have been and is being excavated (Ukong, 2012: Nartey et. al 2012). The quest for harnessing the litho materials that abound in our environment will continue to increase due to the need for urbanization, road, rail and airport construction and beautification of infrastructural facilities around us.

Mineral exploration, mining and processing have resulted in environmental damages including ecological disturbance, destruction of natural flora, pollution of air, land and water, instability of soil and rock masses, landscape degradation and radiation hazards (Aigbedion & Iyayi, 2007). Dust is the main source of air pollution in quarry industry. The extent of pollution by dust depends on the local microclimate conditions, the concentration of dust particles in the ambient air, the size of the dust particles and their chemistry (Hsin-Yi, 2012). Dust has effect both on human health and the natural environment. It can lead to chronic health effects for instance decreased lung capacity and lung cancer resulting from long-term exposure to toxic air pollutants (Sunyer, 2001). However, it blocks and damages the internal structure and abrasion of leaves and cuticles (Hsin-Yi, 2012).

Most of the Quarries in the Federal Capital Territory, Abuja are located in Mpape, Bwari Area Council. These quarries provide part of the raw materials used in developing the infrastructures in Abuja City and the adjourning Satellite towns. Unfortunately, these quarry industries cause significant negative impact on the

surrounding environment. The extraction process depends on the use of heavy machines and explosive, where both processes are associated with air, water, soil and noise pollution and causes damage to biodiversity and destruction to the habitat (Lameed and Ayodele,2010: Ogbonaya and Phi-Eze, 2020).

From agricultural view point, released dust from quarries does not only settle on land, plants and trees but also on surface waters and thus causing various negative impacts on ecosystem as a whole (Osha, 2006). Furthermore, fertile soil is dislocated and interrupted and after excavation, pits are left unfilled or abandoned leaving big gaping landscape. This is not only unsightly but poses danger to livestock, wildlife and humans as well (Mbuyi, 2017). Dust can also have physical effect on the surrounding plants, such as blocking and damaging their internal structure, abrasion of leaves and cuticle, as well as chemical effect which may affect long time survival (Gauch, 2001).

A notable negative impact of quarrying on the environment is also the damage to biodiversity (Anand, 2006), in which plants (vegetation cover) represent the main component of the ecosystem as they are playing a major role in maintaining the balance in the volume of oxygen and carbon dioxide through photosynthetic activities (Osha, 2006). Such vegetation changes are the main concern of environmental botanists and ecologists in recent years who have advocated the careful and cautious approach to activities promoting such changes (Wang, 2007).

Generally, air pollution especially dust from quarry site are known to be responsible for vegetation injury and crop yield lost. Thus, becomes a threat to the survival of plants in that environs (Igbal and shefig, 2001).

The main objective of this study was to assess the ecological implication of air pollution from quarrying and stone cutting industries on Agriculture and Plant biodiversity around quarry sites in Mpape, Bwari Area Council, FCT, Abuja.

Study Area

Mpape is approximately 10 minutes' drive from Abuja city centre (Jimoh, 2017). It is one of the districts in Bwari Area Council of the Federal Capital Territory (FCT), Abuja. It lies on the foothills and on the top of the famous Mpape Rocks that is easily sighted from the neighbouring Maitama District (Dawam, 2000). Geographically, Mpape lies between Latitudes 9.175699° and 9.113010° north of the equator and Longitudes 7.463892° and 7.524349° east of the Greenwich Meridian (Figure 1). It occupies a land area of 44.325 Ha, has the largest slum settlement in Abuja and densely

populated. With the rural-urban migration reportedly on the rise in Nigeria, the village has grown into an informal settlement with a population totaling over 1.1 million inhabitants without the commensurate infrastructure (Jimoh, 2017).

Mpape is almost predominantly underlain by high grade metamorphism and igneous rocks of Precambrian age generally trending, these rocks consist of gneiss, migmatites, granites and schist belt and outcrops along the eastern margin of the area (FCDA, 1979 and 1998). The rocky nature of Mpape makes it suitable for quarry business which thrives here (Jimoh, 2017 and Okeke, 2016).

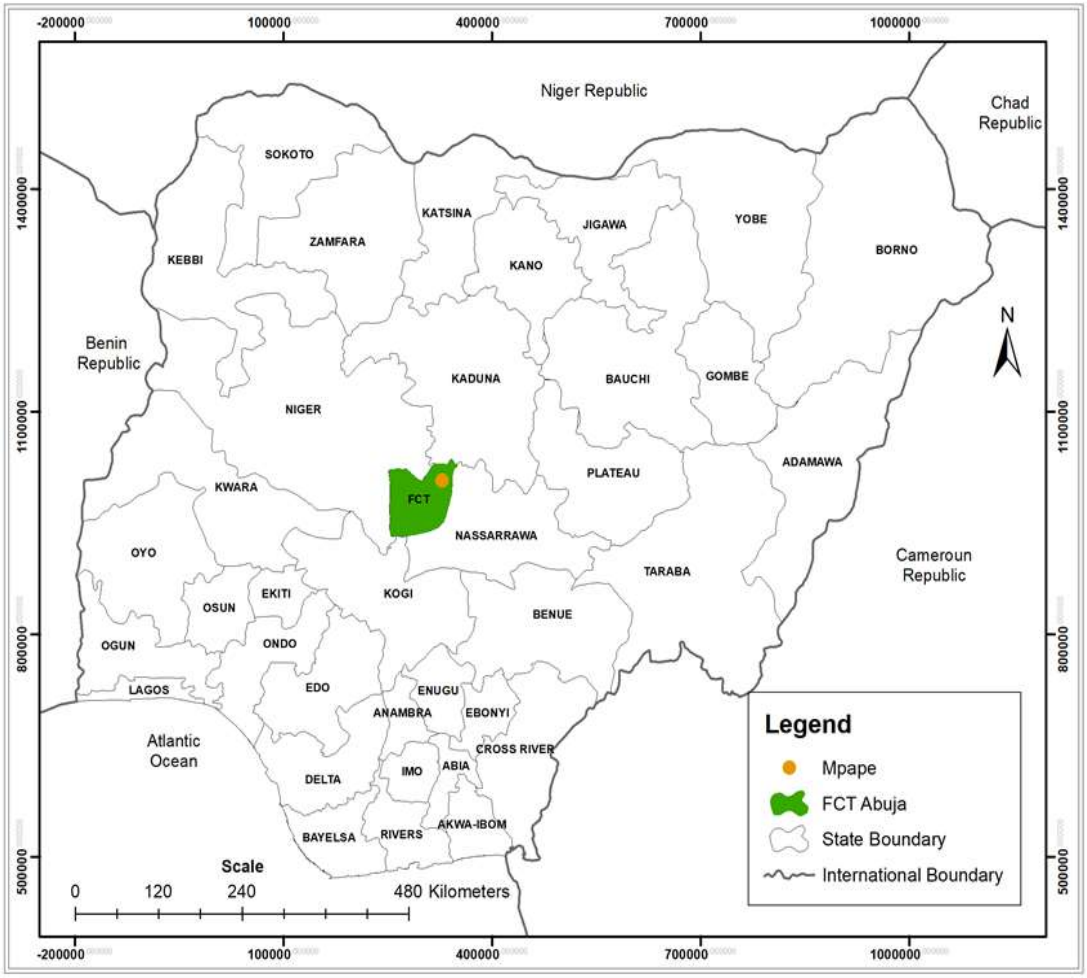

Figure 1: Showing FCT, Abuja

Source: Produced by Author on Arc GIS version 10.8

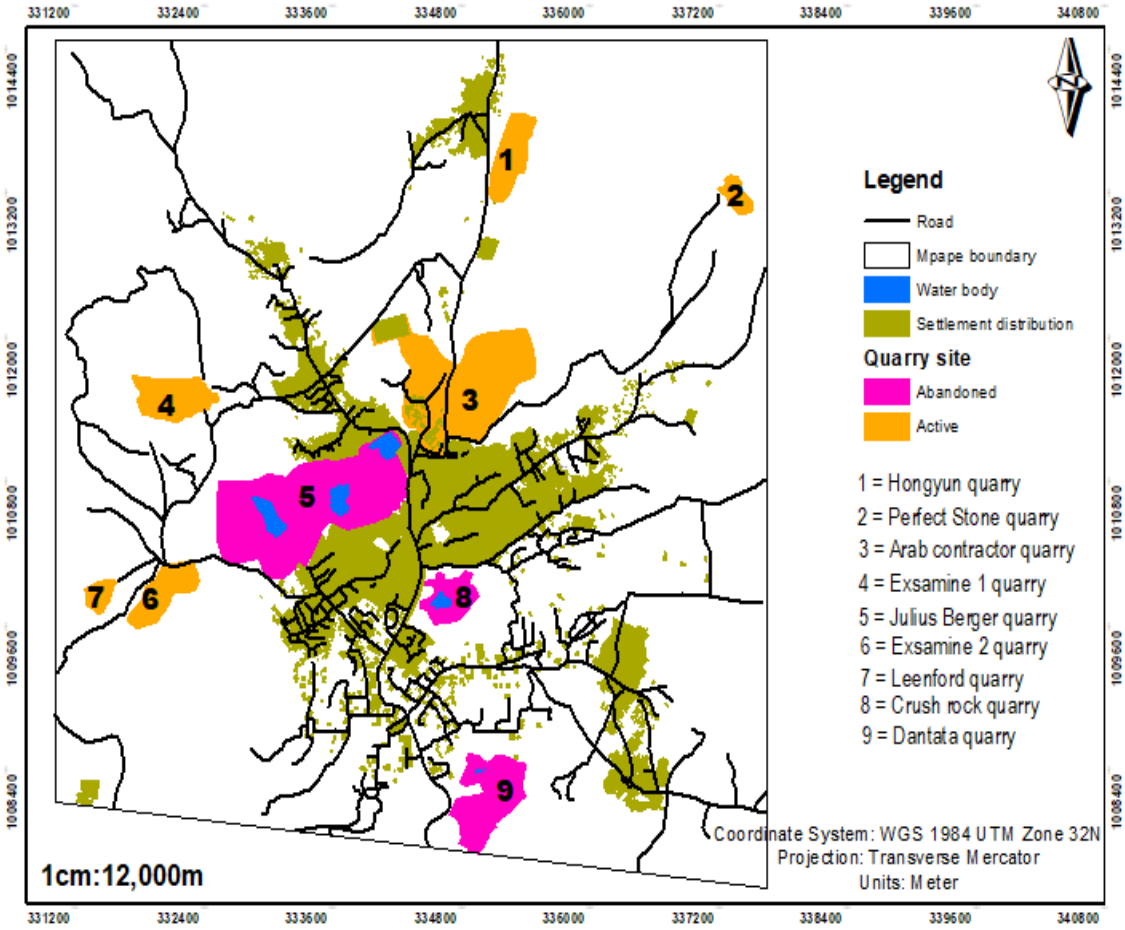

Figure 2: Map showing Quarry Sites in the study area.
Source: Produced by Author on Arc GIS version 10.8

The study area falls within the Guinea Savanna Vegetation Zone of Nigeria. Trees such as A*ntirisern africana, Anthocleistanoblis, Ceibapentandra, Cola gigantea, Celtis spp., Chtorophora excels, Piptadenianum africanum, Lophira on alata, Terminalia ivorensis, Triplochiton scleroxylon and Dracaena arborea* dominate the area (GEHS, 2014).

The soil in the study area shows high level of variability comprising mainly of sand, silt, clay and gravel. Alluvial soils are predominantly found in the valleys of the various Rivers within the area but highly concentrated at the valley of River Usuma. The water table around the area where this soil type dominates is usually very high. It

has well decomposed organic matter content in the surface layer; its texture is heavier with depth as the weathered parent material is approached (Balogun, 2001).

Materials and Methods

Sampling Procedure

The Julius Berger Quarry (9.13538N, 7.48658E) with close proximity to farmlands and settlements 1km away (9.13539N, 7.48659E) from the Quarry site was purposively selected for this study.

Particulate matters ($PM_{2.5}$ and PM_{10}), temperature, relative humidity and wind speed of the locations were all collected. The measurement was taken at the quarry site and one kilometer (1Km) away from the site for a period of 14 days. The 1km from the quarry location served as the base for the farmlands as there were several clusters of agricultural activities around these locations.

Also, a social survey was carried out specifically prepared for the farmers around these locations, the non-probability (Snowball or networking sampling) technique was employed to select the respondents for this study, on this basis 200 questionnaires were distributed to the farmers residing around these locations.

Table 1 List of Materials and Equipment's that were used in the Field

S/N	Name	Uses
1	Global Positioning System (GPS)	It was to take the locations of the sampling areas.
2	Digital Camera	It was used to take pictures during field exercise
3	Pen and recording sheets	These were used to record the data collected from the field
4	Gas Analyzer	was used to collect Particulate Matter (PM10 and PM2.5)
5	handheld thermometer	was used to measure temperatures

6	Multifunction Anemometer (PCE-EM 888)	was used to measure wind speed and relative humidity

Method of Data Analysis

The statistical analysis employed were descriptive statistics such as mean and standard deviation. The data were subjected to correlation coefficient (r) and coefficient of determination (r^2) using SPSS version 25.

Discussion of results

Figure 3 and 4 shows the mean concentration of $PM_{2.5}$ and PM_{10} at different times of the day. Figure 3 shows that the Julius Berger Quarry had the following mean concentration of $PM_{2.5}$; 10.1±1.2μg/m^3, 15.1±0.6μg/m^3 and 15.6±0.5μg/m^3 for morning, afternoon and evening respectively. Similarly, the figure indicates that the Farmlands had mean concentration of $PM_{2.5}$; 8.9±1.8μg/m^3, 15.01±0.8μg/m^3 and 15.05±0.8μg/m^3 for morning, afternoon and evening respectively. The figure reveals that the mean concentration for $PM_{2.5}$ during the morning times at both sites were within the threshold of World Health Organization (WHO) which is 15μg/m^3 for $PM_{2.5}$, while the mean values for afternoon and evening were all above the threshold of the WHO. Also, figure 4 shows that the mean concentration of PM_{10} at the Julius Berger Quarry at different times of the day include; 15.6±0.8μg/m^3, 41.9±5.5μg/m^3 and 44.85±2.1μg/m^3 for morning, afternoon and evening respectively. In the same vein the figure reveals that the mean concentration of PM_{10} at the farmlands include; 15.5±0.7μg/m^3, 41.8±6.4μg/m^3 and 42.8±4.3μg/m^3 for morning, afternoon and evening respectively. The figure revealed that these values are slightly below the threshold of the WHO which is 45μg/m^3.

This implies that the concentration of $PM_{2.5}$ and PM_{10} at different time of the day is highly influenced by the variation in the temperature of Abuja where the study area is located, this finding is in tandem with that of-support with a source from literature. The temperature at the time (September-October) when the field survey was carried out was between 28^0C-31^0C. Usually the mornings are characterized by low temperatures, which increases sharply as noon approaches and decreases slowly towards evening. As a result of this, mean values of $PM_{2.5}$ and PM_{10} are all in their lowest in the morning. This corroborates Magaji and Hassan, 2015 who found that temperature at different hours of the day affects the concentration of air quality of the

area. Also, is in consonance with Adelagun *et al*, *(*2012) in a similar work who found that concentration of PM in quarry areas is typically low in the morning and increase slightly as production activities kick off in the afternoon and evening. Using the WHO 2021 Air Quality Index of 15µg/m³ for $PM_{2.5}$ and 45µg/m³ for PM_{10} as the international standard (WHO AQI, 2021), it can be seen that the quarry and its environs were heavily polluted with the particulate matters. This also affected the various farmlands around the quarry locations used by local farmers for crop cultivation.

This finding is in tandem with (Saraya et al, 2016a and Okafor, 2006) who found that huge amount of air pollution from quarry causes significant effect on plants biodiversity, habitat destruction and possibility of the heavy dust particles blocking and damaging the stomata such that photosynthesis and respiration are affected. The implication of these is that some of the plants may have retarded growth while others may be eliminated.

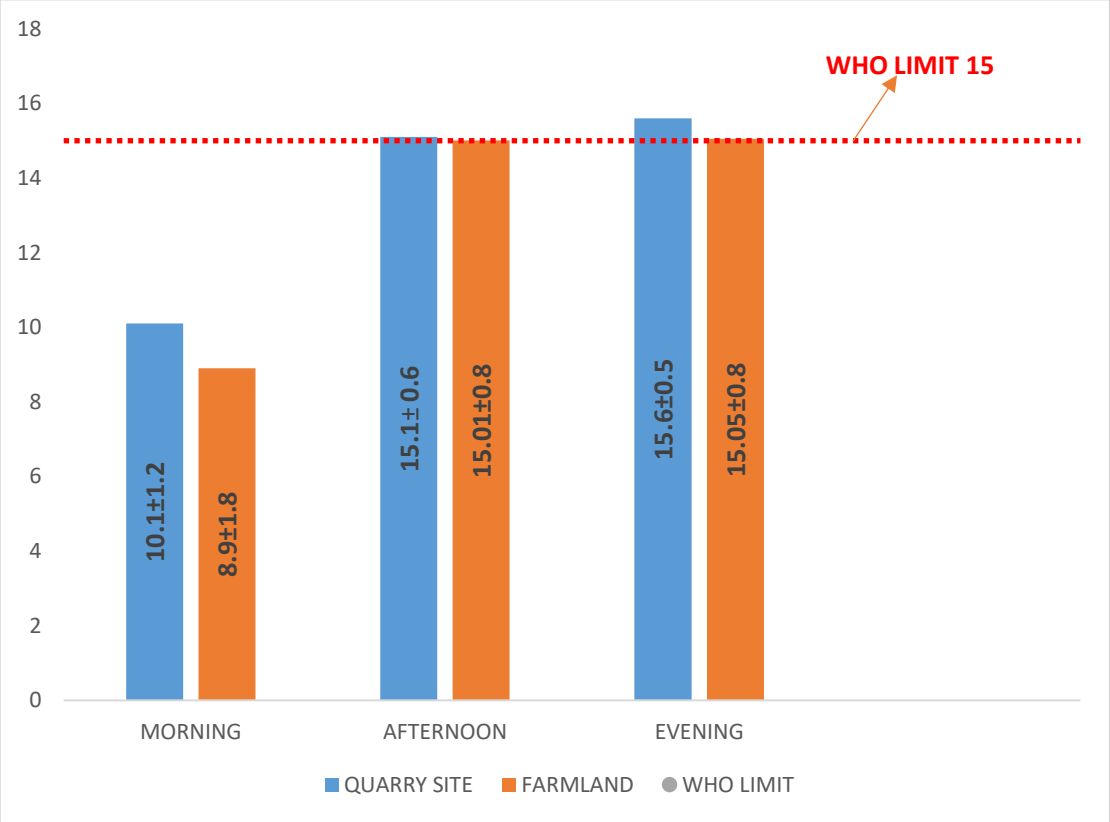

Figure 3: Mean Concentration of $PM_{2.5}$ at Different Time of the Day

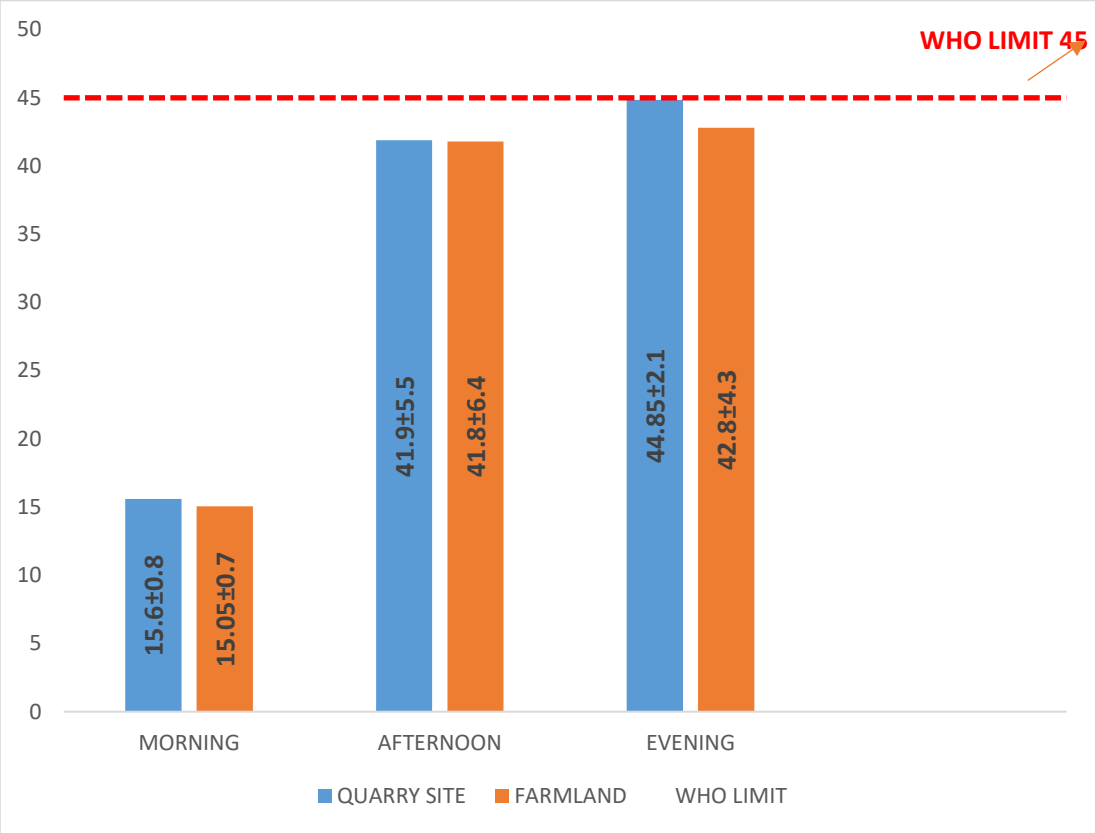

Figure 4: Mean Concentration of PM_{10} at Different Time of the Day

Test of Hypothesis

To determine the relationship between particulate matters and meteorological parameters (temperature, relative humidity and wind speed) the study utilized the Pearson Product Moment Correlation (PPMC) this is shown in table 2.

Table 2 shows the correlation coefficient (r) and coefficient of determination (r^2) between the particulate matters with the meteorological parameters (temperature, relative humidity and windspeed) of the locations. It can be seen that there is a strong correlation between $PM_{2.5}$ and the meteorological parameters with temperature having the strongest relationship of 0.952. Similarly, PM_{10} also recorded a positive relationship with the meteorological parameters with temperature recording the highest value of 0.931. The coefficient of determination (r^2) is a statistical measurement which determine the proportion of variance in the dependent variable

that can be explained by the independent variable and it is measured in percentage. Through r^2, the variation of particulate matters as caused by meteorological parameters were known. From the result, the r^2 between $PM_{2.5}$ with temperature, relative humidity and wind speed were 0.906, 0.273 and 0.450 respectively. This implies that 90.6% increase in $PM_{2.5}$ was caused by the variation in temperature of the study sites. Similarly, the highest r^2 with PM_{10} was temperature with 86.6%. Hence, an increase in temperature directly leads to an increase in $PM_{2.5}$ and PM_{10}. In other words, daily rise or fall in temperature has a resultant effect in the amount of particulate matters produced in these quarry locations and its environs.

Table 2: Correlation coefficient (r) and Coefficient of determination (r^2) between the particulate matters with the meteorological parameters of the locations

POLLUTANT WITH MET.	R	R^2
$PM_{2.5}$ WITH TEMP	0.952	0.906
$PM_{2.5}$ WITH RH	0.523	0.273
$PM_{2.5}$ WITH WSPEED	0.671	0.450
PM_{10} WITH TEMP	0.931	0.866
PM_{10} WITH RH	0.712	0.506
PM_{10} WITH WSPEED	0.631	0.398

Perceived Impact of Quarry Activities on Agriculture and Plant Biodiversity

To assess the effect of quarry dust on agriculture and plant biodiversity, 200 structured questionnaires and interview schedule were distributed to and used on local farmers respectively. The result obtained reveals different ranges of affected local farm crops due to quarry activities and these include; 15.50%, 31.50%, 28%, 14% and 13% for Millet, Maize, Vegetables, Beans and Others such as yam and sorghum respectively. The figure shows that Maize was the most affected crop with 31.50% (Figure 5) while concerning the effect on crop yield, majority of the respondents (83%) stated that crop yield decreases to about 30% annually (Figure 6).

Physiological mechanism behind these could be attributed to one or combination of the following factors; that dust might cover the leaves with white layer resulting to decrease in chlorophyll cells exposure to light thus, reducing the total photosynthesis activities (Missanjo et al 2014: Raina et al, 2008); dust also reduces plant growth (number of leaves, leaves surface and size) therefore affecting photosynthesis,

respiration and transpiration, (Prajapati and Tripathi 2008); Some release toxic compounds (fluoride, magnesium, zinc, lead, copper, sulphuric acid and hydrochloride acid) that are damaging to vegetation (Iqbal and Shafig 2001). Leaf trichomes (hair) are affected by dust thereby decreasing the natural defense mechanism against pest and diseases (Missanjo et al 2014).

Concerning the effect of quarry activities on biodiversity; the respondents claimed the following plants have gone into extinction in the study area and these include; *Parkia biglobosa* (Locust tree), *Azadiracta indica* (Neem), *Vitellaria paradoxa* (Sheanut), *Prosopis Africana* (False locust), *Daniella oliveri* (Copaiba balsam) and *Gmelina arborea* (Gmelina) accounting for 19.5%, 27.5%, 23%, 8.5%, 7% and 14.5% respectively ((Figure 7). This finding is also in agreement with the work of Sayara et al (2016) in his study of the Impact of Air Pollution from Quarrying and Stone Cutting Industries on Agriculture and Plant Biodiversity in Palestine.

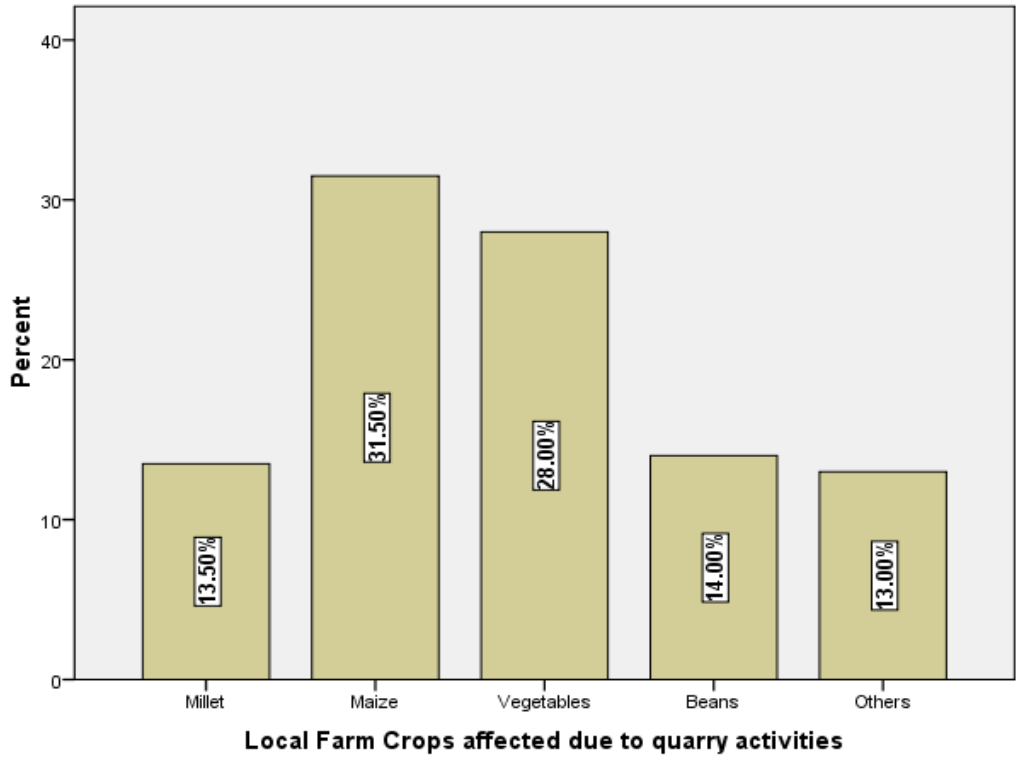

Figure 5: Local Farm Crops affected due to quarry activities

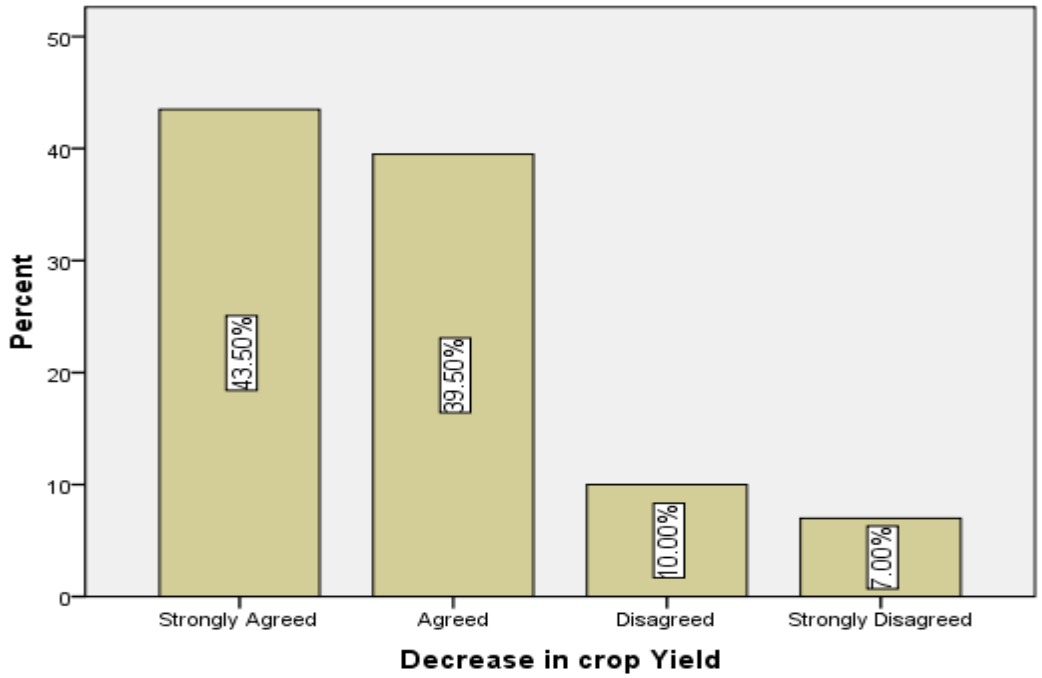

Figure 6: Decrease in crop yield due to quarry activities

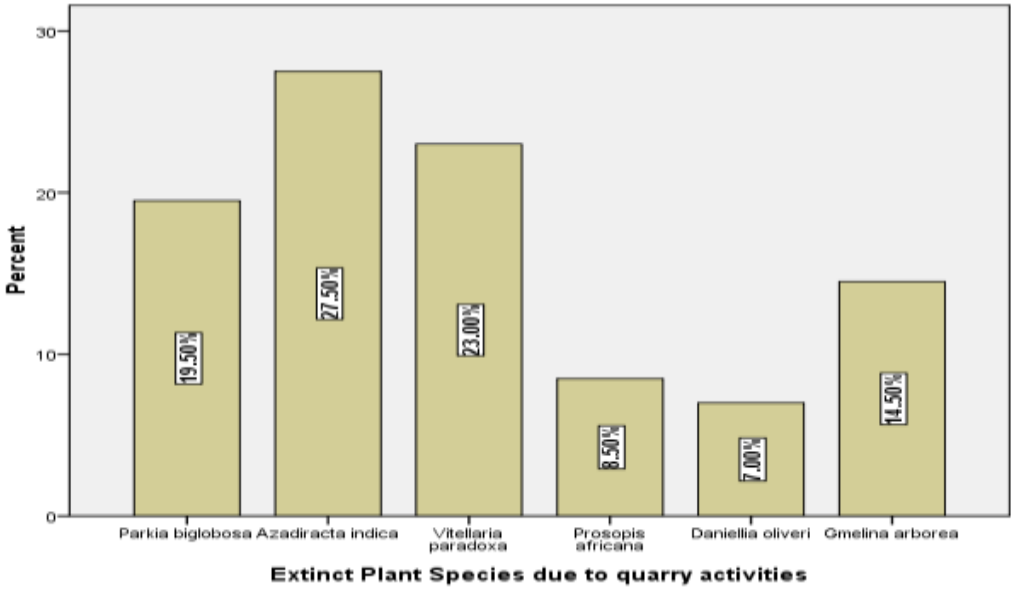

Figure 7: Extinct Plant Species due to quarry activities

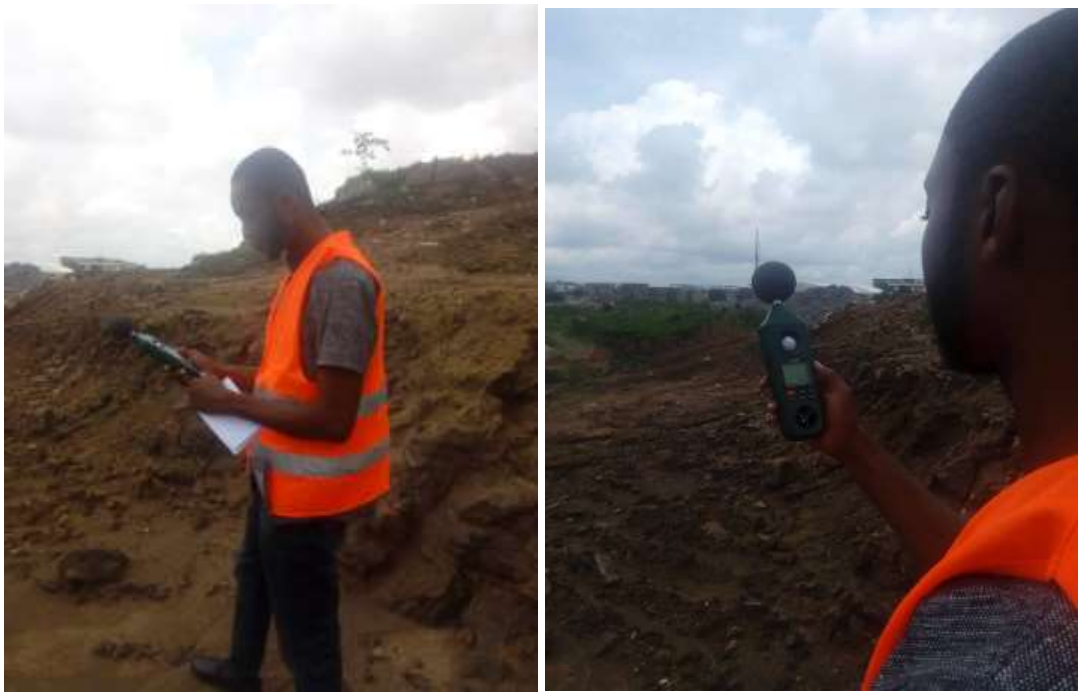

Plate 1: Air quality sampling at the Study Area

Plate 2: Samples of Plants covered with dust particles near a quarry site.

Conclusion

Quarry and stone cutting industries produce high concentrations of particulate matter (dust), which negatively affected agriculture in the study area. The deposition of dust resulted in the extinction of different types of trees and vegetation cover along with reduction in crop yields. However, future studies are needed to investigate the impact of such industries on Physiological mechanisms of the plants and the physico-chemical properties of soil and water.

Recommendations

Based on the foregoing, it is highly recommended to develop green belt surrounding the quarrying using pollutant-tolerant trees (usually with broad leaves) in order to restrict spreading of quarrying dust via intercepting, filtering and absorbing pollutants.

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EVALUATION OF THE FOOD OF RED-BILLED QUELEA *(Quelea quelea)* DURING CROPPING SEASON IN GYAWANA AND ENVIRONS, ADAMAWA STATE, NIGERIA

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Abstract:

Evaluation of the food of red-billed quelea (Quelea quelea) during cropping season in Gyawana and environs, Adamawa State, Nigeria, was carried out to identify the food of Quelea quelea during the cropping season. A total of one hundred and fifty (150) male and female birds were captured in the wild; using black nylon mist nets with dimensions of 7 x 2.5m and mesh size of 16 mm. Subtotals of fifty birds were captured per month. The crop contents of the Q. quelea sampled for this research work reveals a total number of twelve taxonomically different food items. In terms of frequency and magnitude of occurrence in the food items, Dactyloctenium aegyptium appears to be the most consumed food of Red-billed Quelea with mean of 161.24± 2.16 and 157.33± 2.14 in male and female respectively. This was followed by Oryza barthi 63.25± 4.26 in male and 61.23± 1.61in female, then Oryza sativa 42.16 ±1.21in both male and female, while Digitaria iburua has the mean of

27.16±2.46 and 31.14 ±0.37 in male and female respectively. Roetboellia exaltata was 36.11 ±1.23 in male and 37.13 ±4.33 in female. Soghum bicolor with mean value of 28.08 ±1.43 in male and 26.13 ±2.21 in female. Setaria pallidofusca was 26.08 ±3.22 in male and 24.06 ±3.3 in female; Echinochloa colonum has 18.741±1.47 and15.43±1.27 mean in male and female respectively. Brachiaria mutica has 09.21 ±0.27 and male and 11.04 ± 1.63 in female, this was followed by the least seed consumed Digitaria ciliaris with a mean of 3.44 ± 1.09 in both male and female Q. quelea. The mean value of grits in the crop contents of male Q. quelea was 04.21 ±2.06 and in female was 04.73 ±3.03. Some quantities of insect remains were observed in the crop contents of female Q. quelea, with the highest mean value of 07.13 ±05.01. Analysis of variance was used to compare the mean value of various seeds consumed by the Q. quelea during the period of study. The result shows there was significant difference in the food items consumed by Q. quelea during cropping season. In conclusion, for this period of study September to November, it was observed that Q. quelea is euryphagous, Dactyloctenium aegyptium was the most preferred seed foraged upon, although it varied in quantity, while the least preferred seed was found to be Digitaria ciliaris. Insects remains were found in the diet of female Q. quelea, while grits was found in small quantities in both male and female Q. quelea. The researchers therefore, recommend that further studies should be carried out on biological control on Quelea birds, by the reintroduction of their predators such as the red-necked falcon falco chicquera into the area.

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Key words = Food, Evaluation, Red-Billed Quelea, Gyawana ecosystem, Environs, Cropping Season,

INTRODUCTION

Red-billed Quelea *(Quelea quelea)* is the world's most abundant wild bird with an estimated adult population of 1.5 billion (Oschadleus, 2000; BirdLife international, 2004). *Quelea quelea* is native to sub-Saharan Africa. They are small, highly gregarious birds with average length of 12.5cm and weight of between 15-20 grammes. Apart from their deep red bills, non-breeding males and females have a drab non-descript plumage at which stage they resemble sparrows (Burrow and Demey,

2001). During breeding the male *Quelea quelea* is distinguished by its more colorful plumage and red bill. In some areas the male may possess a facial mask, which ranges from black to white in colour as well as a breast and crown plumage which vary from yellowish to bright red. During the non-breeding period, male plumage resembles that of the female, which is a cryptic beige coloration. The female's bill is yellow during breeding and red during the non-breeding season. Breeding season begins with the seasonal rains which come at different times in different parts of their distribution range starting at the north western edge around the beginning of September (GTZ, 1987; Borello and Cheke 2011; Oschadleus, 2000). Red- billed *Quelea* usually moves in flocks of several hundreds and has a capacity for long distance migration (Bernitz, 2010).

There are three Species of *Quelea quelea* with little or no genetic variation that occurs over areas in Africa. *Quelea quelea* occurs mainly in West Africa, *Q.aethiopica* in Sudan, Ethiopia and northern Somalia, while *Q. lathamii* is found in Somalia, Kenya, Tanzania, South Africa and Angola (BirdLife international, 2004). In Nigeria the areas fitting the above descriptions and most suited therefore for Quelea bird are Borno, Yobe, Adamawa, Jigawa, Kano, Kaduna, Sokoto, Zamfara and Bauchi states (Jones *et al.*, 2001; Dallimer *et al.*, 2003).The Lake Chad region is home to a hybrid population of *Quelea quelea quelea* and *Quelea quelea aethiopica*. The hybrid population of *Quelea quelea aethiopica* and *Quelea quelea lathami* occurs in east Africa (Ward 1965; GTZ, 1987).

The food of the Red- billed Quelea consists of grass seeds and grain (cultivated cereals). As soon as the sun comes up the birds come together in their huge flocks and cooperate in finding a suitable feeding place. After a successful search, they settle rapidly and often cause serious damage to crops. In the middle part of the day they rest in shady areas near water and spend the time preening. In the evening they once again fly in search of food and drink water before returning to their roosting site. (Bernitz, 2010). Although quelea birds often ignore crops and feed on the seeds of wild grasses, they are a constant threat and at times when their natural food is scarce they may cause spectacular damage to cultivated grains (Jackson, 1973).

Many species of grainvorous birds more especially Red-billed Quelea (*Quelea quelea)* cause damage to crop plants. Alarming damage to cereal crops caused by Red-billed Quelea led to control measures against this pest being introduced in many countries throughout Africa during 1945-1955. National control teams were set up and a variety

of control techniques tested. Although the fight against the Red-billed Quelea (*Quelea quelea)* as a major pest has now been going on for several decades, no satisfactory solution to this problem has so far been found and the constant danger to cereal crops still remains (Yusuf *et al*., 2004b). In Nigeria, especially where cereal farmers are many, there occur also high losses due to Quelea birds. In Kano State, were devastated by *Quelea quelea* invasion which reduced the annual crop yield of the area by 60%. This translated to a monetary value of several millions of naira (Anonymous, 2001). In the year 2017, Federal Government of Nigeria, spend two hundred and twenty six million naira to forestall quelea birds' epidemic in the north eastern part of Nigeria (Audu, 2017). In Adamawa State, results of investigations carried out showed that, Red-billed Quelea cause significant losses in yield and sometimes total crop loss owing to their fast destructive feeding habit. In the year 2019, eight (8) Local Government Areas (Yola north and south, Girei, Guyuk, Lamurde, Numan, Demsa and Shelleng) were affected in Adamawa State whereby additional flight hours, pesticides and logistics were assisted to supplement Federal Government to control quelea birds in the state (Kazaure 2019). Strategies adopted so far to control Red-billed Quelea have been chemical. Perhaps biological mitigation measures that divert the birds' attention from cultivated cereals may present a better alternative. So far only few have been reported in the area of "lure food items and their effect in mitigating *Quelea quelea* damages on crop feeds.'' This research will be another step in that direction. This research work aimed at identifying the food of the Red-billed quelea (*Quelea quelea*) during cropping season in Gyawana and environs, Lamurde Local Government Area of Adamawa State, Nigeria.

MATERIALS AND METHOD

The study was carried out in Gyawana ecosystem, Lamurde Local Government Area, Adamawa State of Nigeria. Gyawana is located at latitude 9˚.35' N and longitude 11˚.55' E; and is 135 meters above Sea level. Lamurde Local Government Area lies between longitude 9˚.36' 03.92"N and latitude 11˚.47' 36.25"E at an elevation of 137 meters above sea level and has a population of 77,522 people (Adebayo *et al*. 2012). Adamawa State is located in the North Eastern part of Nigeria, and lies between latitudes 7˚ and 11˚ N and between longitudes 11˚ and 14˚ E. It is on an altitude of 185 meters above Sea level and covers a land area of about 39,741km^2. The State shares boundaries with Taraba State in the south and west, Gombe State in the northwest,

Borno State in the north and an international boundary with the Republic of Cameroon along its Eastern border (Fig.1). The Benue River, which transects the State, rises from the highlands of Cameroon and flows southwards to join the River Niger at Lokoja in Nigeria. Two seasons are obtainable in the State; the wet (rainy) and dry seasons. The months of May to October constitute the wet season, during which no place receives less than 600mm of rainfall. The months of November to April constitute the dry season, during which the dry wind (harmattan) period is experienced between the months of November and February. The months of March and April are the hottest with an average temperature of 42˚C, while November, December and January are the coolest months with an average temperature of 11˚C (Adebayo *et al*. 2012).

SAMPLE COLLECTION

Trapping of the birds

A total of one hundred and fifty (150) male and female birds were captured in the wild; using black nylon mist nets with dimensions of 7 x 2.5m and mesh size of 16 mm. Subtotals of fifty birds were captured per month. The birds were captured at their night roosts and water drinking points. The mist nets were set between 9:00a.m and 11:00 a.m to catch the birds that went to drink after morning feeding and 5:00pm and 6:00pm to catch those that went to drink before going to their night roosts as in (Kirkpatric *et al.* 1969; Jonathan and Frederich, 1994; Cheke, 2011; Buij, 2012;).

Birds were trapped fortnightly for a period of three months September to November, 2022. Two days were spent collecting samples at each site. Eight (8) birds each were collected at Gokumbo and Nguro Bemun Rivers sampling sites. Nine (9) birds were collected at Italiah Canal River, making a total of twenty five quelea birds in the first phase of trapping. The same numbers of quelea birds were collected in the second phase of trapping, making total of fifty (50) quelea birds in each month. Twenty birds of either sex with full or partially full crops were collected and used for the crop contents analysis.

Sacrificing Birds To Obtain Crop Contents

Netted *Quelea* birds were carefully removed from the mist net and immediately killed by suffocation with chloroform in air tight transparent plastic containers for about ten (10) minutes as in Yusufu *et al.,* (2004b). The dead birds were dissected as in (Kirkpatric *et al.*, 1969; 1994; Carina *et al.*, 2013). The crops were cut open with a

pair of scissors and the contents put into a fine sieve, washed with cold water and air dried on Petri-dishes for about three hours at $40^{\circ}C - 43^{\circ}C$. Each dried crop content of a bird was put in small envelop and labeled according to the date the bird was caught, site where bird was caught and sex of the bird. The samples were then transported to the Department of Zoology laboratory, Adamawa State University, Mubi for analysis.

Analysis Of The Crop Contents.

Following the method of Buba *et al.* 20013, in the laboratory the crop contents (seeds of different grasses, insects and grit) were sorted out based on their physical characteristics using visual observation with the aid of magnifying lens. These seeds, insects and grits were counted and recorded. Some of the physically unidentifiable foods items especially seeds were sown in sterilized soil in a germinating tray placed in a glass house and watered daily to enable them germinate. Where germination occurred, the plants were nursed to flowering for further identification. The germinated plants and the food items found in the birds' crops were identified with the help of preserved specimens in the herbarium in the Department of Plant Science, Ahmadu Bello University, Zaria and Department of Botany, Adamawa State University Mubi,

Vegetation And Soil Analysis

A random survey of seed plants was made particularly around the vicinity of areas where the birds foraged. Seeds of the plants within the vicinity were compared with those present in the crops of the birds; this was done particularly for grass seeds. The top soil in the foraging habitat was collected from fifteen different sites using a quadrant of 30 x 30 cm, thrown randomly, five times at each site of the study area. The soil was irrigated in a germinating tray, to determine plants represented in the soil seed reserves. The seeds were also compared with the seeds in the crops of dissected birds.

Statistical Analysis

Data obtained was analyzed by one way analysis of variance (ANOVA) followed by Duncan's Multiple Range Test (DMRT) for means separation. Student t-test was used to test for difference between the male and female food items consumed by the birds. Using a statistical software package (SPSS for Windows). The results were presented as mean±standard error and $P > 0.05$ will be regarded as not statistically different.

RESULTS

Crop contents of Red-billed Quelea

The result of this study revealed that *Q. quelea* is euryphagous during cropping season (September to November). Several seeds of different plants, insects and grits were recovered from the crops contents of *Q. quelea* making a total of twelve taxonomically different food items during the study period and these were presented in Tables 1- 3.

Crop contents of male red-billed quelea (*Q. quelea*) for the month of September to November, 2022

In the month of September, the most consumed seed by males red-billed Quelea (*Q. quelea*) is *Dactyloctenium aegyptium* with mean of 161.24± 2.16, followed by *Digitaria iburua* with 27.16±2.46 and the least seed consumed by the *Q. quelea* during the period of study is *Brachiaria mutica* (0.08 ±0.14). The most preferred food item in the month of October by males red-billed Quelea (*Q. quelea*) was *Oryza barthi* with a mean of 63.25± 4.26; this was followed by *Oryza sativa* with the mean value of 40.38±2.17, then the least seed foraged on was *Brachiaria mutica* with a mean of 09.18 ± 2.71 as shown in table 1.

It was observed that in the month of November, the most consumed seed by male *Q. quelea* is still *Oryza barthi* with a mean value of 63.14± 2.31, followed by *Oryza sativa* (42.16 ±1.21), while the least was also *Brachiaria mutica* (09.21 ±0.27) as presented in table 1. There was small quantity of grit in the crop contents of male red-billed Quelea (*Q. quelea*) and insects remained was totally absent in the crop contents of male *Q. quelea* sampled for this study.

Crop contents of female red-billed quelea (*Q. quelea*) for the month of September to November, 2022

Nine different food items including grits and insect remains were recovered from the crop contents of female red-billed quelea (*Q. quelea*) sampled for the month of September, the crop contents reveals *Dactyloctenium aegyptium* was the most consumed food item with a mean of 157.33± 2.14. This was followed by *Digitaria iburua* with a mean of 31.14 ±0.37 and the least consumed seed for the month of September by the females *Q. quelea* was *Digitaria ciliaris* with a mean of 0.04 ±1.09. *Oryza barthi* (59.57± 3.51) has the highest mean value, followed by *Oryza sativa* (42.16±1.19) and the least mean value was *Digitaria ciliaris* (1.01 ±0.06) in the crop

contents of female *Q. quelea* sampled in the month of October 2022 as shown in table 2. There were twelve different food items including grits and insects remain in the crop contents of female sampled in October.

The most consumed food items in the month of November by female *Q. quelea* was *Oryza barthi* with the highest mean of 61.23± 1.61, followed by *Oryza sativa* with a mean of 41.27 ±0.23 and the least seed consumed for this month was *Brachiaria mutica* with a mean of 08.33 ±1.34 as shown in table 2

Table 1: The mean food items recovered from the crop of male *Quelea quelea* from the Months of September to November

Months	Bm Mean S.E	Da Mean S.E	Dc Mean S.E	Di Mean S.E	Ec Mean S.E	Ob Mean S.E
September	0.08 ±0.14	161.24±2.16	3.44 ± 1.09	27.16±2.46	15.12 ±2.01	00.00 ±00.00
October	09.18 ± 2.71	19.08 ±2.43	1.04 ±0.06	14.09 ±1.32	18.741±1.47	63.25± 4.26
November	09.21 ±0.27	10.02 ±0.37	1.13 ±1.46	23.16 ±1.17	17.36 ±3.11	63.14± 2.31

P >0.05

Table 1 Cont: The mean food items recovered from the crop of male *Quelea quelea* from the Months of September to November

Months	Os Mean S.E	Re Mean S.E	Sb Mean S.E	Sp Mean S.E	Gr Mean S.E	In Mean S.E
September	00.00 ±00.00	21.11 ±0.38	00.00 ±00.00	19.13 ±0.29	04.21 ±2.06	00.00 ±00.00
October	40.38±2.17	36.11 ±1.23	13.47 ±2.14	26.08 ±3.22	03.05 ±1.13	00.00 ±00.00
November	42.16 ±1.21	11.04 ±0.25	28.08 ±1.43	21.37 ±0.13	04.07 ±1.04	00.00 ±00.00

P >0.05

Key: Bm= *Brachiaria mutica*, Da= *Dactyloctenium aegyptium* Dc= *Digitaria ciliaris*, Di= *Digitaria iburua*, Ec= *Echinochloa colonum*, Ob= *Oryza barthi*, Or = *Oryza sativa* Re= *Roetboellia exaltata*, Sb= *Soghum bicolor* Sp= *Setaria pallido-fusca*, Gr= Grit, In= Insect

Table 2: The mean food items recovered from the crop of female *Quelea quelea* from the Months of September to November

Months	Bm Mean S.E	Da Mean S.E	Dc Mean S.E	Di Mean S.E	Ec Mean S.E	Ob Mean S.E
September	2.79 ± 0.09	157.33± 2.14	3.44 ± 1.09	31.14 ±0.37	09.71 ±2.11	00.00 ±00.00
October	11.04 ± 1.63	19.11 ±3.02	1.01 ±0.06	10.27 ±2.06	15.43±1.27	59.57± 3.51
November	08.33 ±1.34	09.74 ±1.33	0.93 ±03.07	19.57 ±1.13	11.33 ±2.13	61.23± 1.61

P >0.05

Table 2 Cont: The mean food items recovered from the crop of female *Quelea quelea* from the Months of September to November

Months	Os Mean S.E	Re Mean S.E	Sb Mean S.E	Sp Mean S.E	Gr Mean S.E	In Mean S.E
September	00.00 ±00.00	20.21±3.35	00.00 ±00.00	17.61 ±0.09	04.73 ±3.03	06.26 ±10.03
October	42.16±1.21	37.13 ±4.33	14.33 ±1.14	24.06 ±3.31	03.02 ±1.41	07.13 ±05.01
November	41.27 ±0.23	09.07 ±0.32	26.13 ±2.21	19.19 ±0.13	03.03 ±1.07	03.28 ±06.07

P >0.05

Table 4: Comparison of Grass Seeds in the Vicinity of the birds' feeding area, the top soil of birds' habitat, and birds' crops.

Grass (seeds)	Vicinity of birds feeding area	Top soil of the birds' habitat	Birds' crops
Brachiaria mutica	+	+	+
Cenchrus biflorus	+	+	-
Chloris pilosa	+	+	-
Dactyloctenium egyptium	+	+	+
Digitaria ciliaris	+	+	+
Digitaria iburua	+	+	+
Echinochloa colonum	+	+	+
Eragorastis tremula	+	+	-
Eragorastis gangetica	+	-	-
Oryza barthi	+	+	+
Oryza sativa	+	+	+
Panicum sp	+	+	-
Roetboellia exaltata	+	+	+
Sacciolepis Africana	+	+	-
Setaria pallidofusca	+	+	+
Schoenefeldia gracilis	-	+	-
Soghum bicolor	+	-	+

Key + = Positive, - = Absent

Comparison of Grass Seeds in the Vicinity of the birds' feeding area, the top soil of birds' habitat, and birds' crops.

Brachiaria mutica, Cenchrus biflorus, Chloris pilosa, Dactyloctenium aegyptium, Digitaria ciliaris, Digitaria iburua, Echinochloa colonum, Eragrostis tremula, Oryza barthi, Oryza sativa, Panicum sp, *Roetboellia exaltata, Setaria pallidofusca, Schoenefeldia gracilis, Sacciolepis Africana* and *Soghum bicolor* were found in the *Quelea quelea*'s feeding area, top soil of the *Quelea quelea*'s habitat and in the crop of birds. It was observed in this study that most of the soil seeds reserved and grass seeds within the birds' vicinity were also found in the Quelea birds' crops. While

Eragorastis gangetica is absent in both the birds' vicinity and crop of the *Quelea quelea* sampled for this study. *Schoenefeldia gracilis* was present only in the top soil (soil seed reserves) of the *Quelea quelea*'s habitat.

Discussion

The result of this study on evaluation of the food of *Quelea quelea* in Gyawana ecosystem and environs revealed that *Q. quelea* is euryphagous during cropping season (September to November, 2022). Several seeds of different plants, insects and grits were recovered from the crops contents of *Q. quelea* making a total of twelve taxonomically different food items during the study period and these were presented in Tables 1- 3. In the month of September, the most consumed seed by *Q. quelea* is *Dactyloctenium aegyptium* with mean of 161.24± 2.16 in male and 157.33± 2.14 in female, followed by *Digitaria iburua* with 27.16±2.46 and 31.14 ±0.37 in male and female respectively, and the least seed consumed by the *Q. quelea* in the month of September is *Brachiaria mutica* (0.08 ±0.14) in male and *Echinochloa colonum* 09.71 ±2.11in female *Q. quelea*. Eight different food items were found in the male crop contents of *Q. quelea,* while in female crop contents there were nine different food items recovered including insect's remained. The findings of this research is in line with (GTZ, 1978; Buba *et al*, 2013), who reported several food items recovered in the crop contents of Red –billed quelea birds (*Q. quelea*) in Sambisa Game Reserve and environs.

The most preferred food item in the month of October by males *Q. quelea* was *Oryza barthi* with a mean of 63.25± 4.26 and 59.57± 3.51 in male and female respectively; this was followed by *Oryza sativa* with the mean value of 40.38±2.17 in male and 42.16±1.21 in female. Then the least seed foraged on by male *Q. quelea* was *Brachiaria mutica* with a mean of 09.18 ± 2.71 and in female *Q. quelea* was 1.01 ±0.06 *Digitaria ciliaris* as shown in table 1 and 2. In male crop contents of *Q. quelea,* eleven different food items were recovered, while the female *Q. quelea* foraged on twelve different food items including grits and insects remains. The result of this study concur with the findings of Ozolua (1986), who reported that grainvorous birds generally prefer wild seeds and tend to go for cultivated cereal crops when the grass seeds are in short supply.

It was observed that in the month of November, the most consumed seed by male *Q. quelea* is still *Oryza barthi* with a mean value of 63.14± 2.31 and 61.23± 1.61 in male

and female respectively. This was followed by *Oryza sativa* male (42.16 ±1.21) and female (41.27 ±0.23), while the least seed consumed was *Brachiaria mutica* 09.21 ±0.27 in male and 08.33 ±1.34 in female, as presented in table 1 and 2. There was small quantity of grit in the crop contents of both male and female *Q. quelea,* insect's remains was totally absent in the crop contents of male *Q. quelea* but present in the crop contents of female *Q. quelea* sampled for this study. The result of this present study is not in line with the results of Yusuf and Bello (2004), who reported that food of Quelea birds during the early dry season in the months of November – December in Borno State include*; Pennisettum glaucum, Tetrapogan aestevum, Echnochloa colonum, Schoenefeldia vulgare, Oryza. barthi* and sand. Furthermore, in their work, they reported the consumption of uncultivated food types as significantly higher than cultivated food types. This means that cultivated crop would be less vulnerable when uncultivated grass seed are available. The differences in the food items observed in this study with those reported by other researchers may be as a result of the different crops cultivated in which the studies were carried out. During the period of November – December, cultivated crops such as *Pennesetum glaucum* were abundantly available to the birds since harvesting was still on in Borno State, while in Gyawana, Adamawa State, *Oryza sativa* and *Soghum bicolor* were also abundantly available in the vicinity of the birds since harvesting was on. It may also be due to the geographical location and the few numbers of birds the researchers used in Borno State.

The finding of this study reveals that only female crop contents of *Q. quelea* contained insect's remains. This result agree with the findings of (Welty and Baptista 1990; Buba *et al*, 2013), who stated that relatively larger amounts of animal materials consumed by females' birds are vital to egg formation as well as the accumulation of body fats that are metabolized during incubation and chick rearing. Yusuf *et al.*, (2004b), reported that female birds consumed more animal food than males during pre-breeding times, for egg-making and during breeding to withstand the stress of brooding and for feeding their nestlings.

In comparison of the grass Seeds in the *Q. quelea*'s crops, grass plants in the habitat of the *Q. quelea* and seed reserved in the top soil of the *Q. queleas*' habitat, reveals that *Brachiaria mutica, Cenchrus biflorus, Chloris pilosa, Dactyloctenium aegyptium, Digitaria ciliaris, Digitaria iburua, Echinochloa colonum, Eragrostis tremula, Roetboellia exaltata, Sacciolepis Africana, Schoenefeldia gracilis* and *Setaria pallido-fusca,* were found in the top soil of the *Q. quelea*' habitat when cultured for

seeds reserved. It was also reveals that, most of the soil seeds reserved and grass seeds within the *Q. quelea*' habitat were also found in the *Q. quelea*' crops. While *Digitaria acuminatissima, Echinochloa obtusiflora* and *Echinochloa pyramidalis* were present in the top soil of *Q. queleas*' habitat (soil seed reserves) but absent in both the *Q. queleas* crops and their habitat. The result of this present study is in line with other researchers like Ward (1965); Erickson, (1979); GTZ (1987), Yusuf *et al.,* (2004a) and Buba *et al*., 2022). This implies that Quelea birds foraged within their vicinity if there is abundance of wild grass seeds, but in the absence of their preferred grass seeds, they may travel to distant places of about 10km – 20km away from their night roost to forage.

In conclusion, for this period of study September to November 2022, it was observed that *Q. quelea* is euryphagous. *Dactyloctenium aegyptium* was the most preferred seed foraged upon by *Quelea quelea* during cropping season in Gyawana ecosystem and its environs, Adamawa State, Nigeria. This might be due to the fact that it was found throughout the bird's vicinity, although it varied in quantity, while the least preferred food items was found to be *Digitaria ciliaris.* The rest of the Quelea food items observed in this study are; *Brachiaria mutica*, *Digitaria iburua*, *Echinochloa colonum*, *Oryza barthi, Oryza sativa Roetboellia exaltata*, *Soghum bicolor*, *Setaria pallido-fusca*, Grits and Insect. The most consumed seed of them on field was *Dactyloctenium aegyptium* which was also found to be the most abundant in the top soil seed reserve after cultivation. The least in the field was *Sacciolepis Africana* and the least in the top soil was *Chloris pilosa*. The presence of insects in the diet of only females is an indication of the importance of protein-rich food in the life of female birds, especially with regard to the demands and stress of egg production. Grit was found in small quantities in both male and female *Q. quelea,* which aid in seed grinding.

From the outcome of this study, the researchers, therefore suggests the following recommendation: That further studies should be carried out on biological control on Quelea birds, by the reintroduction of their predators such as the red-necked falcon *falco chicquera* into the area, since there were cultivated crops found in the crop of *Quelea quelea* such as *Oryza sativa* and *Soghum bicolor*

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ASSESSING THE CHALLENGES OF COMPULSORY LAND ACQUISITION AND COMPENSATION IN OYO STATE, NIGERIA

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Abstract

This study asess the challenges of compulsory land acquisition and compensation in Oyo State, Nigeria with the aim of identifying the major challenges affecting the affected interest holders. Survey- research design was adopted using questionnaire to collect primary data from 515 respondents. The target population were expropriated interest holders, estate surveyors and valuers and staff of the state Ministry of Lands and Water Resources. Descriptive statistics which included percentage, frequency and mean, and inferential statistical tools which include Analysis of Variance (ANOVA) were used to analyze the data collected. The findings showed that the top 5 challenges in order of RII were inadequacy of compensation, lack of transparency in the process, non-payment of accrued interest, delayed payment of compensation and fraudulent claimants as they had mean scores of 4.45, 3.56, 3.52, 3.5 and 3.34 respectively. The study also revealed significant differences in the ranking of the challenges among the different age groups as

it had a P-value of 0.0133. It was common across the age groups that inadequacy of compensation was the leading problems. There was no significant difference in the responses between gender. By these findings, we recommend that the Land Use Act, 1978 (Cap 202 LFN, 1990) should be reviewed to make provision for adequate compensation by adopting open market value as the basis of valuation as contained in Public Lands Acquisition Act, 1958. Acquiring authority should create more public awareness to ensure transparency in the process; accrued interest should be paid to claimants. and a clear time frame should be set to complete the acquisition and compensation payment.

Keywords: Challenges, Compensation, Compulsory land acquisition, Affected interest holders.

Introduction

Nigeria is a developing country where government is making efforts to provide some public facilities like roads, public schools, markets, stadia, hospitals, public parks, etc. As government makes effort to provide these facilities, government requires land to carry out these developments. In order to acquire the required hand, government do exercise her power of eminent domain to compulsorily acquire land for overriding public interest. In Nigeria, exercising the power of eminent domain is guided by the Land Use Act, 1978 (Cap 202 LFN, 1990) which Section 28 empowers government to revoke any right of occupancy for overriding public interest and Section 29 directs the acquiring authority to pay compensation to the expropriated interest holder(s). Section 44 of the Nigeria Constitution further supports the payment of compensation to the affected interest holder(s).

With the provisions of the laws in place, one could say that compulsory land acquisition in Nigeria should be carried out without challenges. Unfortunately, the reverse seems to be the case as Obineme, Udobi and Ifediora (2021) opined that compulsory land acquisition is the most challenging aspect in land management as it affects both government and the citizens. They further stated that this challenge is rooted in the fact that land means different things to different people so letting go of land is not easy. It is true that land means different things to different people as some people see it as investment, store of value, prestige, source of political power, source of wealth, spirit, etc but by the provisions of Section 29 of the Land Use Act, 1978

which provide for payment of compensation, the expropriated interest holder is expected to be put in a state not worse off nor better off than the state he or she was before the acquisition. Kakulu (2007) stated that the major issue of contention between the acquiring authority and the expropriated interest holders is the adequacy of compensation payable for the acquired properties. Deeyah and Akujuru (2016) concluded that lack of transparency, unfairness, inconsistencies in the assessment of property values are the common problems of compulsory land acquisition and compensation in Nigeria.

Oyo State is one of the developing states in Nigeria where there is urgent need for infrastructural developments like roads, flyovers, housing estates, hospitals, airport, stadia, etc to compliment the new developments in the state. Unfortunately, it is observed that while government is making efforts to acquire land for these infrastructural developments, such acquisitions encounter a lot of hiccups which affect the projects.

Some studies have been carried out in other part of the country to identify the challenges affecting compulsory land acquisition as seen in the studies of Kakalu (2007), Deeyah and Akujuru (2016), Udoekanem (2013), Nuhu (2008). It is therefore necessary to carry out such study in Oyo State where there is need to compulsorily acquire land for infrastructural development. Apart from the geographic gap identified in the previous studies on subject area, no much attention has been given to how the challenges impact on the gender and age of the affected interest holders. This study aims at closing the geographic, gender and age gaps identified in the previous studies.

Reviews of Literature

The issue of compulsory land acquisition and compensation is one of the topical areas that has attracted many studies because of how important land has been to man.

Nuhu (2008) asserted that apart from delayed payment of compensation, current provisions of the law cannot adequately compensate dispossessed owners. This is to say that compensation is usually inadequate.

Obineme et al (2021) concluded that delay in payment of compensation was the most challenging problem in compulsory land acquisition and compensation. Other problems identified were lack of resettlement plan, insufficient compensation award, demand of building plan as a criterion for payment, omission of claimants' names, locating the payment address were the problems that trigger resistance by claimants.

Kakulu (2007) stated that the key issue of contention between the acquiring authority and the dispossessed person is the issue of adequacy of compensation paid for the expropriated interest.

Deeyah and Akujuru (2016) opined that lack of transparency, unfairness, inconsistencies in the assessment of property values for compensation were the common problems affecting compulsory land acquisition and compensation.

Udoekanem (2013) stated that the claims computed on behalf of the acquiring authorities were abysmally low obviously putting claimants in a worse position as a result of the acquisition.

Akpan (2012) concluded that the quantum of compensation paid to the affected interest holders was inadequate as it was far less than the open market value of the expropriated interest.

Ige, Akintomide and Adeola (2016) concluded that cessation of income generating activities (traditional jobs and productive skills), decline in living standard, and weakened community institutions and social networks were the major perspectives of coastal communal to land acquisition in coastal communities.

Larbi (2008) stated that compulsory acquisition of land usually comes with some sort of discomforts, as it often results in either displacing people economically or physically.

Famuyiwa (2011) as cited in Ige et al (2016) observed that communities appear not to be thoroughly satisfied because the Land Use Act, 1978 seems not to have directly addressed the issue of compensation for the land itself and this has contributed to community dissatisfaction and disputes over land acquisition.

Grover, Mikahail and Zlatina (1999) stated that even if compulsory land acquisition has no direct benefit in terms of cash in the short-run, it has subsidiary benefit which comes over the years.

Shehu and Nuhu (2022) asserted that there is a wide gap between compensation paid and the worth of the acquired property resulting to a widespread dissatisfaction with compensation paid to the claimants.

Materials and Method

This study adopted survey research design. The claimants who were the holders of the expropriated interests, the estate surveyors and valuers practicing in Oyo State who were involved in the assessment and valuation of the expropriated interest and the staff of the State Ministry of Lands and Water Resources who were involved in the

acquisition of the affected interest were the target population for this study. A total of 600 respondents were involved in the survey, where twenty (20) were staff of the State Ministry of Lands and Water Resources, 80 were estate surveyors and valuers while 500 were owners of the expropriated interest spread across the three (3) senatorial districts of the State. The source of the data was primary as we used copies of questionnaires to obtain the required data. The questions were set using 5- likert scale which respondents were to choose from.

Descriptive statistical tools like mean, relative importance index (RII), parentage and frequency were used to analyze the data. Inferential statistical tools such as analysis of variance (ANOVA) were also used to analyse the data.

The Study Area

The study was carried out in Oyo State. Oyo State is located within the South-West Geo-political Zone of Nigeria. The State was created on the 3rd day of February, 1976 with Ibadan being the State Capital. Oyo State is the largest city in Africa south of the Sahara. The State has a land size of about 28,454 square kilometers. The State is bounded on the North by Kwara State, on the East by Osun River State, on the West by Republic of Benin and on the South by the Ogun State. The State has 33 local government areas and three (3) senatorial districts of Oyo North, Oyo Central and Oyo South. The State has some major infrastructures like Ibadan Inland Dry Port, Oyo Industrial Park Food/Export Processing, Eleyele Workshop, Oyo Specialist Hospital, Ibadan Airport (Aerotropolis) Lite Industries & Hospitality, Housing Estate, Minor Vehicular Park, Mega Vehicular Park, Oyo State Expo/Trade Fair, Ibadan Building Material Market, Ibadan Medical District, OFTZ-Free Trade Zone, Cyber-Ile IT/IM/Financial Zone etc. All these infrastructures and many more are what the State government compulsorily acquire the land for the infrastructural development.

Data Analysis and Discussion of Findings

Distribution of respondents by gender

Table 1: **Distribution of Respondents by Gender**

Factors	Mean	Frequency	Percent
GENDER			
Male	3.19	289	56
Female	3.23	226	44

This section presents the categorization of the respondents based on gender. From the result in table 1, we had a total of 515 respondents, out of which 289 of the respondents were male. This represented 56% of the respondents. The female respondents were 226 which represented 44% of the respondents. Analysis of the respondents by gender became necessary to ensure that all gender's views were sought on matters of compulsory land acquisition and compensation. The mean response of the male on the parameters used to seek their views on compulsory land acquisition and compensation was 3.19 while that of the female respondents was 3.23. This result shows that both the male and the female respondents agree with the parameters as it is above the expected means score of 3.0. However, the female relatively agreed stronger that the male as the female had a higher mean score of 3.23.

Distribution of Respondents by Age

Table 2: Distribution of Respondents by Age

Factors	**Mean**	**Frequency**	**Percent**
AGE GROUP			
26-30	3.10	41	8
31-35	3.20	76	15
36-40	3.22	398	77

Table 2 shows the distribution of the respondents by age. The respondents were grouped into the age range of 25-44 years, 45-64 years and 65 years and above. By age categorization, 108 respondents were within the age bracket of 25-44 years which represented 21%. 176 respondents were within the age range of 45-64 years which represented 34% while 231 respondents were aged 65 years and above which represented 45% of the respondents. Respondents within the age bracket of 25 and 44 years had mean score of 3.10. Respondents within the age range of 45 and 64 years had means score of 3.20% while those aged 65 years and above had mean score of 3.22.

Based on this result, respondents within all the age brackets agree with the parameters used to seek their views on compulsory land acquisition and compensation as all their mean scores were above 3.0. It is note those aged 65 years and above agreed the most as their mean score was the highest (3.22).

Evaluation of the challenges of respondents on compulsory land acquisition and compensation

Table 3: Challenges of Respondents on Compulsory Land Acquisition and Compensation

	Claimant	Estate Surveyor & Valuer	Ministry of Lands	P value
Q1	3.4791	3.5896	3.3636	0.362
Q2	4.4596	4.4403	4.4545	0.955
Q3	2.7883	2.7836	3.4091	0.134
Q4	3.3733	3.0746	4.4091	<0.001
Q5	2.7437	3.3358	1.3636	<0.001
Q6	3.3677	3.2612	3.3636	0.636
Q7	3.5237	3.4552	3.7727	0.598
Q8	1.61	1.7463	1.2727	0.029
Q9	3.0752	3.0896	3.0455	0.949
Q10	3.5237	3.7015	3.2727	0.094

The result of the analysis as presented in Table 3 shows that based on the Relative Importance Index (RII) of the respondent, inadequacy of compensation paid by the acquiring authority is the 1st challenge of the respondents. This challenge had RII of 4.45. This result is in line with the conclusion of many studies like Kakulu (2007), Nuhu (2008), Akpan (2012), Obineme et al (2021) and Shedu and Nuhu (2022). This is because the provisions of the Land Use Act, 1978 in Section 29(4a,b and c) only provide for three (3) heads of claims which are land (only ground rent payable on the year of acquisition), buildings and installations (using cost method of valuation only) and economic and economic trees/crops.

The major flaws in these provisions are that cost is usually historic while value is present and future so if we are looking at the value of an asset to be compulsorily acquired, there is need to look at the future benefits and discount it to the present so that the interest of the owner(s) can be well taken care of. On crops /economic trees, fixing the rates to be adopted in paying for it is not appropriate as it does not reflect value. Some economic trees/crops have longer life span and better productive capacity which generate a lot of economic benefits to the owner. In fact on many occasions, the owners rely on them as their means of livelihood and even when these economic trees have exhausted their productive life, the timber products fetch the owners so much money yet when these trees are to be compulsorily acquired, the owners are paid as

low as one thousand naira (₦1,000) only for a mature economic tree. To make it worse, these rates adopted by the acquiring authority may have been set close to a decade ago without any review to bring it close to economic realities. For instance, as at today, 2 x 3 wood (purlin) is sold as high as six hundred naira (₦600) and timber from a mature economic tree can produce up to 500 pieces of purlins yet acquiring authority pays only N1,000 for the tree.

The 2nd challenge which had RII score of 3.56 is lack of transparency in compulsory land acquisition and compensation process. The respondents stated that they were not always well informed on the acquisition process, how the compensation is paid and how long it would take before their money is paid. By this challenge, they usually had a lot of confusion giving opportunity for people to fraudulently claim the properties of other people. This finding aligns with the position of Deeyah and Akujuru (2016) who opined that lack of transparency is the common problem of compulsory land acquisition and compensation.

The 3rd challenge which had RII score of 3.52 was non-payment of accrued interest on the compensation amount. The provision of the Land Use Act, 1978 allows for payment of accrued interest at the bank's rate on the compensation sum for the period it is delayed. It is unfortunate that the acquiring authority does not pay the accrued interest to the claimants.

The 4th challenge which had RII score of 3.5 was delayed payment of compensation. The process of compulsory land acquisition and compensation usually takes some time depending on the priority of government. In some cases, it takes as long as 5 years before the process is completed. The problem here is that once the acquiring authority has express interest in the acquisition, the affected interest holders cannot fully make use of the place because of the fear of not knowing when they will be disposed yet within this period of work in progress for the acquisition, government does not consider paying interest on the compensation sum.

The 5th challenge which had RII score of 3.34 was fraudulent claimants. This challenge is as a result of lack of transparency in the process which create opportunity for people to fraudulently claim the properties of others since there may be no proper circulation of information.

Multiple distribution of the power of attorney (POA) was the 6th challenge as it had RII of 3.32. This is caused by the professionals like estate surveyors and valuers, lawyers who struggle to represent the interest of the claimants. Some of these claimants are not well educate so they can sign multiple POA without keeping track

of them nor knowing the implications. At the point of making claims, it may be confusing on who should make claims for the claimant. This may equally cause delay in payment of compensation.

The 7th challenge which had RII score of 3.08 was non-recognition of communal interest. This refers to the common interest of the community which the land is compulsorily acquired. In each community, there exists usufructuary right which though the land belongs to someone else but others have the privilege of entering such land to pick firewood, mushrooms, snails and hunt bushmeat which in a way can sustain their means of livelihood. When such land is acquired, the community expects that such rights should be considered by compensating for it.

The 8th challenge which had RII score of 2.83 was omission of claimants' names from the payment list. There are some instances when claimants' names may be mistakenly omitted from the payment list. Once this happens, there is usually chaos as the claimants' thought might be that his/her name has been substituted to deny them of compensation. This could also cause some delays because it takes additional time to make the corrections.

The 9th challenge was inaccurate enumeration of the assets which had RII score of 2.31. During fieldwork and enumeration, there may be some inherent errors. These errors may affect the quantum of compensation due to the claimants.

The 10th challenge was proof of ownership of the acquired assets with supporting documents like building plan, certificate of occupancy, etc. One some occasions, some of the claimants do not have these documents to easily proof their ownership of the affected interest.

From the findings, the top five challenges affecting compulsory land acquisition and compensation are inadequate compensation, lack of transparency in the process, non-payment of accrued interest, delayed payment of compensation and fraudulent claimants.

Analysis of Variance (ANOVA) of the Mean Responses by Groups

Table 4: ANOVA of the Mean Response by Groups

Factors	Df	Sun Sq	Mean Sq	F value	P value
RESPONDENT	2	0.305	0.15257	2.580	0.0768
AGE GROUP	2	0.515	0.25774	4.360	0.0133*
GENDER	1	0.113	0.11251	1.903	0.1684
Residuals	509	30.099	0.05913		

Analysis of the result as presented in Table 4 revealed that there was no significant difference in the responses of the respondent based on their role as the p-value was 0.0.768. The ANOVA result did not show any significant mean difference in the responses based on gender as the p-value was 0.1684. The ANOVA result revealed a significant difference in the mean responses based on age of the respondents. This analysis revealed a p-value of 0.0133 which was less than the 5% level of significance. This shows that the challenges of compulsory land acquisition and compensation have. More effect on age than gender. Therefore, age of the affected interest holders should be considered when land is to be compulsorily acquired. This is because some people store their wealth in land as they invest in landed properties to provide them with source of livelihood at old age so when such land is compulsorily acquired from the aged, it means his 'life' is almost taken from him unlike a young person who may not care much about it because he is still hopeful of many years to work and reacquire equivalent of the asset.

ANOVA of the Mean Responses by Age

Table 5: ANOVA of the Mean Responses by Age

25-44	3.10a
45-64	3.20ab
65 and Above	3.22b

From the result in table 5, the mean response of the age group of ≥ 65 years was significantly higher than that of group 25-44 years. The mean score of age ≥ 65 years was 3.22b while the mean score of those aged 25-44 years was 3.10a. The means responses of 24-44 years and 45-64 years was not significantly different as it had a mean score of 3.20ab. This was not significantly different from the mean responses of ≥ 65 years.

Analysis of the Challenges of the Respondents by Age

Table 6: Challenges of the Respondents by Age

	25-44	45-64	≥ 65	P value
Q1	3.0732	3.6053	3.5276	0.005
Q2	4.6098	4.5263	4.4246	0.109
Q3	2.8293	2.8553	2.804	0.957
Q4	3	3.3816	3.3668	0.154

Q5	2.6341	3.0658	2.8166	0.191
Q6	3.439	3.1579	3.3643	0.278
Q7	3.3171	3.4868	3.5427	0.597
Q8	1.6585	1.5263	1.6482	0.485
Q9	2.6341	2.8684	3.1633	<.001
Q10	3.8049	3.5	3.5452	0.263

Table 6 presents the Relative Importance Index (RII) of the challenges of compulsory land acquisition and compensation of the respondents based on their age groups. The result showed significant differences in the RII of the challenges by the different age groups. It was common across all the age groups that inadequacy of compensation paid was the 1st challenge to the respondents in the age groups of 25 – 45 years and ≥ 65 years lack of transparency in the process was the 2nd challenge. To them while delayed payment of compensation was the 2nd challenge to the age group of 45 – 64 years.

To the age group of 25 – 44 years, the 3rd challenge was multiplicity of power of attorney while this was the 7th challenge to the age group of 45 -64 years and the 6th challenge to the age group of ≥ 65 years. Non-payment of accrued interest was more challenging to the age group of ≥ 65 years than the other age groups.

To the age group of 25-44 years, the top 5 challenges by RII order were inadequacy of compensation, lack of transparency, multiplicity of POA, non-payment of accrued interest, delayed payment of compensation. To the age group of 45-64 years, their top 5 challenges by RII order were inadequacy of compensation, delayed payment of compensation, lack of transparency, non-payment of accrued interest and fraudulent claimants while to the age group of ≥ 65 years, their top 5 challenges by order of RII were inadequacy of compensation, lack of transparency, non-payment of accrued interest, delayed payment of compensation and fraudulent claimants.

Conclusion and Recommendations

The study examined the challenges of compulsory land acquisition and compensation in Oyo State. The study showed that the top 5 challenges in order of RII were inadequacy of compensation, lack of transparency in the process, non-payment of accrued interest, delayed payment of compensation and fraudulent claimants. The study also revealed significant differences in the ranking of the challenges among the different age groups.

However, it was common across the age groups that inadequacy of compensation was the leading problems. There was no significant difference in the responses between gender. By these findings, we recommend that the Land Use Act, 1978 (Cap 202 LFN, 1990) should be reviewed to make provision for adequate compensation by adopting open market value as the basis of valuation as contained in Public Lands Acquisition Act, 1958. Acquiring authority should create more public awareness to ensure transparency in the process; accrued interest should be paid to claimants and a clear time frame should be set to complete the acquisition and compensation payment against the current practice which is usually open-ended which takes years. The Nigerian Institution of Estate Surveyors and Valuers (NIESV) should investigate the complaint of multiple distribution of POA, set a framework on it and sanction erring members.

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THE USE OF TRADITIONAL MEDICINE IN THE TREATMENT OF MALARIA AMONG PREGNANT WOMEN IN BOSSO LGA, NIGER STATE, NIGERIA

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Abstract

The aim of this study is to examine the use of traditional medicine in the treatment of malaria among pregnant women in Bosso LGA, Niger State. This descriptive crosssectional study included 48 pregnant women, selected by multistage sampling. Data were collected using an interviewer-administered questionnaire and analyzed using SPSS statistical software. The results of descriptive analysis were presented in tables and charts. This study shows that those respondents who agreed that have knowledge about treatment of malaria using traditional herbs in pregnancy ranked the highest with 32

respondents while those respondents who strongly disagreed ranked the least with one respondent. This revealed that majority of respondents affirmed that they have knowledge about treatment of malaria using traditional herbs during pregnancy. The result also revealed that age of pregnant women determine the use of traditional herbs for treatment of malaria because 43 respondents affirmed the statement while 5 respondents disagreed and said that age of pregnant women do not determine the use of traditional herbs for treatment of malaria. The study also shows that the level of education of pregnant women determine the use of traditional herbs for treatment of malaria since 42 respondents affirmed it while 6 respondents disagreed. It can be concluded that majority of the pregnant women in the study area use traditional medicine to treat malaria and majority affirmed that traditional medicines used in treating malaria was effective. Also, the perceived reasons for the use of traditional medicine include traditional medicine being more accessible than orthodox medicine, less expensive than orthodox medicine, the belief that traditional medicine will treat the malaria. Therefore, policies and intervention strategies by policymakers should be aimed at addressing the issues of use of traditional medicine in pregnancy by organizing enlightenment programmes that will enhance the attitudes of pregnant women to frequent health centres and clinics for appropriate treatment during antenatal and treatment of any ailment during pregnancy.

Keywords: Traditional Medicine, Malaria and Pregnant Women

Introduction

Malaria is an infectious disease caused by *Plasmodium Falciparum*, transmitted by the female anopheles mosquito (World Health Organisation, 2022). This disease which has been a major health concern globally is a leading cause of morbidity and mortality in many tropical countries and is prevalent mostly among pregnant women and children

(Fakeye, Adisa & Musa, 2019). According to the 2020 World Malaria Report, of the 87 malaria-endemic countries in 2019, 29 countries accounted for 95% of malaria cases globally, of which have constitute more than half (51%) of all the cases. These countries with the highest burden of malaria were Nigeria (27%), the Democratic

Republic of Congo (12%), Mozambique (4%), Niger (3%), and Uganda (5%) (World Health Organisation, 2022). According to WHO's latest World Malaria Report, there were an estimated 241 million malaria cases and 627 000 malaria deaths worldwide in 2020. This represents about 14 million more cases in 2020 compared to 2019, and 69 000 more deaths. There is an extensive economic burden associated with malaria with an impact in Africa estimated at 12 billion dollars per year (World Health Organisation,
2022).

Herbal medicines are defined as plant-derived material or preparations perceived to have therapeutic benefits; they often contain raw or processed ingredients from one or more plants (WHO, 2010). Herbal medicines include herbs, herbal materials, herbal preparations, and finished herbal products that contain parts of plants or other plant materials as active ingredients (WHO, 2018). Herbal drugs have been used for thousands of years to treat malaria and some classes of orthodox anti-malarial including artemisinin and quinine derivatives are sourced from them. Traditional herbal medicines are plant-derived preparations with minimal or no industrial processing claimed to have therapeutic benefits, found in a particular geographic location, or used by people of a particular culture. They can be in the form of liquids, powders, capsules, tablets, or ointments. Some are pre-packaged while others are prepared when needed and are used not only to cure illness but as health maintenance or boosters (Agono, 2018). There is a general belief that these medicines are 'natural', 'safe' and easily accessible compared to the more orthodox forms of medicines, a belief often propagated to those who are unwell by close relatives, neighbours, friends, traditional medicine dealers and sometimes even the media (Agono, 2018).
In a study in an obstetrics and gynecology unit in a tertiary hospital in Ghana, about 50% of patients had used herbal medicine prior to admission, and the authors recommended that healthcare professionals should determine herbal medicine use among patients. It was found that use of herbal medicine was associated with low education and skill levels (Addo, 2017). In a Nigerian city, researchers reported that pregnant women used both traditional herbal medicine and pharmaceutical drugs, with the highest prevalence of concomitant use among nulliparous mothers (Gharoro, 2015). Social demographic factors, such as geopolitical zones and educational attainment, had an effect on the views of women on the safety of herbal medicine for the foetus, and side effects of herbal medicines (Fakeye, Adisa and Musa, 2019). A

study in largely rural districts of Kenya found widespread use of herbal medicine among women cared for by traditional birth attendants during pregnancy, labour and the postpartum period (Family Care International, 2018).

Traditional Medicine (TM) can boost the health and economies of many SSA countries, especially if regulatory mechanisms are deployed to govern their protection and utilization (Nergard, Ho, Diallo, Ballo, Paulsen & Nordeng, 2015). To reduce maternal deaths and pregnancy-related complications, TMs used during pregnancy need to be better known and thoroughly researched regarding their safety. Research into the TMs used will aid women in receiving adequate treatment, to identify potentially unsafe use, and also preserve valuable information about medicinal in the future as well as declare the different types of TMs they would have used in their health facilities to aid complementarity and better management of the pregnancies. Therefore, this study examined the use of traditional medicine in the treatment of malaria among pregnant women in Bosso LGA, Niger State.

There is limited knowledge on potential side effects of many herbal medicines in pregnancy. Some constituents in some herbal products might have teratogenic effects in either or both human and animal models. Documentation on the extent of women's use of herbal medicines during pregnancy is insufficient especially in Nigeria, where the legislation for distribution and purchase of herbal medicines is weak as compared to that of conventional medicines. This has created paucity of knowledge which this study has examined. The aim of this study was to examined the use of traditional medicine in the treatment of malaria among pregnant women in Bosso LGA, Niger State. The specific objectives will includes: to determine the trimester which the pregnant women use traditional herbs in the treatment of malaria in the study area; to find out the extent to which the age of pregnant women determine the use of traditional herbs for treatment of malaria and to find out the extent to which the level of education of pregnant women determine the use of traditional herbs for the treatment of malaria.

Materials and Methods

The study adopt a sequential explanatory mixed methods (MM) research design. It was inspired by the aspiration that sequential explanatory MM is the most straightforward among the mixed methods to explore the use of traditional medicine in the treatment of malaria among pregnant women in Bosso LGA, Niger State. The purpose of this design is to use qualitative results in explaining and interpreting the

findings of the quantitative phase (Creswell, 2014). The target population, therefore, for this study were 40 pregnant women and ten health practitioners (50) within the study area. The method of data collection for this study include primary and secondary. Primary data for this study include administration of questionnaire and oral interview. The secondary data for this study include published theses, journals and articles related to the study. The information and results generated from questionnaire and oral interview were subjected to statistical treatment using descriptive statistics (frequency-percentage) and presented in figures with analyzing comments so as to demonstrate the effectiveness of the responses. Statistical Package for the Social Sciences (SPSS 19.0) software was used in analyzing the descriptive statistical technique (frequency percentage) adopted in this study.

Results and Discussion

Table 1 revealed the trimester which pregnant women use traditional herbs for treatment of malaria in the study area. As shown in Table 1 of the study, those respondents who agreed that have knowledge about treatment of malaria using traditional herbs in pregnancy ranked the highest with 32 respondents while those respondents who strongly disagreed ranked the least with one respondent. This revealed that majority of respondents affirmed that they have knowledge about treatment of malaria using traditional herbs during pregnancy. As shown in Table 1 of the study, third trimester ranked the highest period of pregnancy where they use traditional herbs for treatment of malaria with 46 respondents while first trimester ranked the least with 21 respondents affirming the usage of traditional herbs for treatment of malaria during pregnancy.

Table 1: Trimester which the pregnant women use traditional herbs in the treatment of malaria in the study area

S/N	ITEMS	SA	A	D	SD
	I have knowledge about treatment of malaria using traditional herbs in pregnancy	11	32	4	1
i	Do you use traditional herbs in treatment of malaria in first trimester?	15	06	21	6
ii	Do you use traditional herbs in treatment of malaria in second trimester?	11	30	6	1
iii	Do you use traditional herbs in treatment of malaria in third trimester?	22	24	2	0

iv	Does traditional herbs help in treating malaria during pregnancy?	17	28	3	0

Key: Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD)

This revealed that majority of the pregnant women use traditional herbs for treatment of malaria and this finding agreed with the findings of Kanma-Okafor *et al.* (2023); Cecilie *et al.* (2015); and Erhun & John, (2014).

As indicated in Table 2 of the study, age of pregnant women determine the use of traditional herbs for treatment of malaria because 43 respondents affirmed the statement while 5 respondents disagreed and said that age of pregnant women do not determine the use of traditional herbs for treatment of malaria. As shown in Table 2 of the study, respondents with age range of 31 - 40 years ranked the highest with 41 affirmation and 7 respondents not affirming the usage of traditional herbs for treatment of malaria; respondents within the age range of 26 - 30 years ranked second with 38 affirmation and respondents within the age of 18 - 25 years ranked the least with 31 affirmation. This revealed that age of pregnant women determine the use of traditional herbs for treatment of malaria. In this study, older women used traditional herbs significantly and more frequently. This could be because younger respondents are more likely to be influenced by the west and neglect traditional herbs. A systematic review of studies conducted in sub-Saharan Africa corroborates the finding that pregnant women's use of herbal medications tended to rise with age (El Hajj and Holst, 2020).

Table 2: Find out the extent to which the age of pregnant women determine the use of traditional herbs for treatment of malaria

S/N	ITEMS	SA	A	D	SD
	Does the age of pregnant women determine the use of traditional herbs for treatment of malaria?	21	32	4	1
i	18-25 years	14	17	15	2
ii	26-30 years	18	20	7	3
iii	31-40 years	25	16	6	1
iv	41 years and above	17	15	10	6

Key: Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD)

The reasons for usage of these traditional herbs at ages indicated in Table 2 were herbal remedies are natural and safer, herbal remedies cost less than orthodox treatment, herbal remedies are more effective, herbal treatments are promoted by traditional beliefs, herbal treatments are holistic, herbal treatments are easily available and accessible, outcomes of orthodox drugs are dis-satisfactory, herbal treatments give a sense of active participation and orthodox treatments have worse side effects as indicated in Table 3 of the study. As indicated in Table 3 of the study, respondents who choose herbal remedies cost less than orthodox treatment and are easily available and accessible ranked the highest with 16 responses, herbal remedies are natural and safer ranked second with 11 responses and outcomes of orthodox drugs are dis-satisfactory ranked the least with 2 responses. This revealed that the major reason for using traditional herbs during pregnancy across the selected ages in Table 2 was herbal remedies cost less than orthodox treatment and are easily available and accessible.

Table 3: Reason for using traditional herbs to treat malaria

Options	Frequency	Percentage (%)
Herbal remedies are natural and safer	11	22.9
Herbal remedies cost less than orthodox treatment and are easily available and accessible	16	33.3
Herbal remedies are more effective	08	16.7
Herbal treatments are promoted by traditional beliefs	05	14.4
Orthodox treatments have worse side effects	06	12.5
Outcomes of orthodox drugs are dis-satisfactory	02	4.2
Total	48	100

Source: Field Survey (2023)

As shown in Table 4 of the study, the level of education of pregnant women determine the use of traditional herbs for treatment of malaria since 42 respondents affirmed it while 6 respondents disagreed. Respondents without western education has 45 responses of affirmation, respondents with Primary certificate has 41 responses of affirmation, secondary certificate has 32 responses of affirmation and tertiary has the least with 28 responses of affirmation. This revealed that the higher the level of western education acquired by the respondents, the lower the usage of traditional herbs for treatment of malaria during pregnancy.

Table 4: Extent to which the level of education of pregnant women determine the use of traditional herbs for the treatment of malaria

S/N	ITEMS	SA	A	D	SD
	Does the level of education of pregnant women determine the use of traditional herbs for treatment of malaria?	15	27	5	1
i	Primary	18	23	6	1
ii	Secondary	15	17	10	6
iii	Tertiary	13	15	17	3
iv	None	24	21	3	0

Key: Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD)

Conclusion

The health-seeking behaviour of women who use herbal medicine during pregnancy suggests that they rely on it as a resource even if public health facilities are available. Thus, there is an opportunity for the involvement of healthcare providers in patient education about the appropriate use of herbal medicine and pharmaceuticals. There is inadequate knowledge among respondents about the safety of both herbal and Western medicine during pregnancy. This study indicates that there is a necessity for women to be adequately informed of the potential risks of concomitant use of herbal medicine during pregnancy.

The majority of pregnant women who utilized traditional herbs did so only occasionally for the prevention and treatment of malaria. The perceptions of using herbal remedies to treat malaria during pregnancy were largely supportive of this practice. As vital as it is to inform pregnant women about the risks of utilizing herbs to treat malaria during pregnancy, consideration must also be given to regulating

usage to ensure safety. It can be concluded that majority of the pregnant women in the study area use traditional medicine to treat malaria and majority affirmed that traditional medicines used in treating malaria was effective. Also, the perceived reasons for the use of traditional medicine include traditional medicine being more accessible than orthodox medicine, less expensive than orthodox medicine, the belief that traditional medicine will treat the malaria. Therefore, policies and intervention strategies by policymakers should be aimed at addressing the issues of use of traditional medicine in pregnancy by organizing enlightenment programmes that will enhance the attitudes of pregnant women to frequent health centres and clinics for appropriate treatment during antenatal and treatment of any ailment during pregnancy.

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