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# ASSESSMENT OF KNOWLEDGE AND ATTITUDE TOWARDS THE PREVENTION OF PHARYNGITIS AMONG ADULTS IN MAKARFI LOCAL GOVERNMENT AREA, KADUNA STATE

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## Abstract

This study assessed the knowledge and attitudes of adults towards the prevention of pharyngitis in Makarfi Local Government Area, Kaduna State. The objectives were to examine knowledge levels regarding the causes, symptoms, transmission, complications, and prevention of pharyngitis and to identify community-supported strategies for reducing its spread. The study adopted a descriptive survey design. A total of 400 questionnaires were distributed, out of which 394 were completed and retrieved. The questionnaire was structured into four sections addressing demographic data, knowledge of pharyngitis, and attitudes towards its prevention. Data were analysed using frequency tables, percentages, and mean scores interpreted with a four-point Likert scale. There is no significant Knowledge of pharyngitis, and attitudes towards its prevention have a p-value of 0.000 and 0.003, respectively. These indicate there is significant knowledge and attitude towards pharyngitis. Findings revealed that while most participants possessed sound knowledge of the causes and symptoms of pharyngitis, gaps still exist in recognising its complications and seeking timely treatment. Respondents showed a positive attitude towards prevention, especially favouring modern health approaches over traditional remedies. The study concludes that with the right support, adults in Makarfi LGA are willing to adopt preventive measures against pharyngitis. It recommends increased health education through implementing interventional programmes, integration of oral health into school curricula, and expanded access to medical care.

**Keywords:** Knowledge, Attitude, Prevention, Pharyngitis, Adults

## Introduction

Globally, group A streptococcal pharyngitis affects an estimated 616 million people annually, with the burden disproportionately concentrated in low- and middle-income countries (Akorede et al., 2020). In high-income countries, public awareness, vaccination programs, and efficient healthcare systems have contributed significantly to the prevention and early management of pharyngitis. However, in developing countries, especially in tropical regions, overcrowding, poor hygiene, limited access to healthcare services, and lack of health education remain critical drivers of disease transmission and poor outcomes (Akorede & Toyin, 2020; World Health Organization [WHO], 2021).

Pharyngitis, commonly known as sore throat, is an acute inflammation of the pharynx that is predominantly caused by viral or bacterial pathogens, with Group A *Streptococcus pyogenes* (GAS) being the most clinically significant bacterial agent. It remains one of the most frequent reasons for outpatient visits globally, accounting for a significant burden on healthcare systems due to its high incidence and potential for complications such as rheumatic fever and post-streptococcal glomerulonephritis (WHO, 2021).

The predominant risk factors for pharyngitis include young age, particularly among school-aged children, seasonal outbreaks, and close contact with infected individuals, poor sanitation, overcrowded living conditions, and weakened immune systems due to malnutrition or chronic diseases (Abdulbaqi et al., 2019; Akorede et al., 2022; WHO, 2021). The clinical manifestations of pharyngitis depend on the etiological agent. Common signs and symptoms include throat pain, fever, difficulty swallowing, red or swollen tonsils, and tender cervical lymph nodes (CDC, 2022). If inadequately managed, pharyngitis can lead to significant complications such as acute rheumatic fever, post-streptococcal glomerulonephritis, peritonsillar abscess, and chronic pharyngeal infections. Diagnosis relies on clinical assessment, supported by laboratory tests like rapid antigen detection tests (RADTs) and throat cultures, which help distinguish bacterial from viral causes (Shulman et al., 2021).

In Nigeria, upper respiratory tract infections (URTIs), including pharyngitis, are among the top five causes of outpatient clinic visits (Kabiru et al., 2024; Lawali et al., 2024). Despite the high prevalence of the disease, national health records and policies often lack a specific focus on pharyngitis, and there is limited empirical data on the knowledge, attitudes, and preventive behaviours among various population groups. Cultural practices, self-medication, and poor utilisation of healthcare facilities further complicate efforts to control the spread of the infection. The misuse of antibiotics in treating sore throat without medical diagnosis contributes not only to treatment failure but also to the growing threat of antimicrobial resistance (Olayemi et al., 2021).

Northwestern Nigeria is characterised by a mixture of urban and rural communities with significant variations in healthcare access, education, and disease awareness. Predominantly rural areas typify the challenges seen in many underserved



communities in Nigeria. Adults often lack formal health education and may rely heavily on traditional remedies and informal drug vendors for the management of infections (Yusuf et al., 2022).

In Nigeria, self-medication, delayed health-seeking behaviour, and a reliance on traditional or informal healthcare practices are prevalent, particularly in rural areas. These practices are often driven by inadequate knowledge about disease aetiology, transmission, and prevention (Abdulbaqi et al., 2024; Olubiyi et al., 2021; Olayemi et al., 2021). Moreover, adults who are caregivers or decision-makers in their households play a critical role in shaping health behaviours within the family (Abdulbaqi et al., 2025). Unfortunately, their awareness of the infectious nature of pharyngitis, its potential complications, and proper preventive measures is often limited. Despite the high number of outpatient consultations for sore throat and related symptoms, few studies have assessed community-level understanding and attitudes toward preventing pharyngitis, especially in under-researched areas like Makarfi LGA.

**Methodology**

The study adopted a descriptive survey research design. The population of the study comprised all adults in Makarfi Local Government Area of Kaduna State. The estimated population of Makarfi LGA was 216,600 (Nigeria Bureau of Statistics, 2025). A sample size of 400 pregnant women and 50 healthcare providers was selected for the study using both probability and non-probability sampling techniques. The sample size was determined using Taro Yamane’s formula for finite populations. The instrument used for data collection in this study was a researcher-structured, closed-ended questionnaire. The questionnaire was divided into three sections: A, B, and C. Section “A” comprised the demographic characteristics of the respondents, while Section “B” consisted of six (6) items each on knowledge of pharyngitis and attitudes towards its prevention. To calculate the mean score of responses as shown by respondents, a modified four (4)-point Likert rating scale was used. Any mean score of response greater than or equal to 2.5 was regarded as positive, while any mean score of response less than 2.5 indicated a negative response.

To ensure content validity, the questionnaire and interview guide were reviewed by experts in public health education and research methodology. Their feedback was used to refine the items for clarity and relevance. A pilot study was conducted among 30 adults in the Igabi LGA to test the reliability and comprehensibility of the questionnaire. Ethical approval for the study was obtained from the Kaduna State Ministry of Health. Permission was also sought from the local government authorities and community leaders before data collection began. Informed consent was obtained from all participants after a clear explanation of the study’s purpose, procedures, and their right to withdraw at any time without penalty. Trained research assistants visited selected households within the community. At each household, eligible adults were approached respectfully and provided with information about the study. Those who agreed to participate signed or thumb-printed a consent form before data collection. Structured questionnaires were administered through face-to-face interviews in the respondents’ homes, with necessary clarifications provided by the research assistants. Responses were recorded directly on the questionnaires with participants’ permission. Completed instruments were collected daily, checked for completeness, coded, and securely stored in preparation for analysis. Confidentiality of all information provided was strictly maintained.

The collected data underwent analysis using both descriptive and inferential statistics. Frequencies, percentages, means, and standard deviations were used to summarise demographic data and responses on knowledge of pharyngitis and attitudes towards its prevention. One-sample t-tests were applied to assess the knowledge of pharyngitis and attitudes towards its prevention. The Statistical Package for the Social Sciences (SPSS) software version 22 was used for data analysis.

**Descriptive analysis of the participants’ socio-demographic characteristics**

The total number of four hundred (400) questionnaire was distributed, and three hundred and ninety-four (394) questionnaire were retrieved.

**Table 1: Demographic Characteristics of the Participants**

Variable	Variable Options	Frequency	Percentage %
<b>Age</b>	18 – 24years	128	33.0%
	25 – 31years	108	27.0%
	32 – 38years	100	25.0%
	39 years and above	58	15.0%
	<b>Total</b>	<b>394</b>	<b>100.0</b>
<b>Occupation</b>	Civil servant	72	30.0%
	Farmer	44	18.0%
	Trader	160	12.0%
	Artisan	118	40.0%
	<b>Total</b>	<b>394</b>	<b>100.0</b>
<b>Level of Education</b>	Non-formal Education	67	17.0%
	Primary	100	25.0%
	Secondary	133	34.0%
	Tertiary	94	24.0%
	<b>Total</b>	<b>394</b>	<b>100.0</b>

*Source: Field survey, 2024*

Table 4.1 showed that on age distribution 18 – 24years has 128 (33.0%); 25 – 31years has 108 (27.0%); 32 – 38years has 100 (25.0%), and 39 years and above has 58 (15.0%). 39 years and above is the highest, while 18 – 24years is the lowest. The occupational distribution of Civil servants has 72 (30.0%); Farmer has 44 (18.0%); Trader has 160 (12.0%), and Artisan has

118 (40.0%). Trader is the highest while Farmer is the lowest. The level of education Non-formal Education has 67 (17.0%); Primary has 100 (25.0%); Secondary has 133 (34.0%), and Tertiary has 94 (24.0%). Non-formal Education is the highest, while Secondary is the lowest.

**Answering the Research Questions**

**Research Question One: What is the level of knowledge on pharyngitis among adults in Makarfi LGA, Nigeria?**

**Table 2: Mean Score and Standard Deviation on the Level of Knowledge of Pharyngitis among Adults in Kaduna State, Nigeria.**

S/N	ITEMS	SD	$\bar{X}$
1	Pharyngitis is caused by both viral and bacterial infections.	0.749	3.06
2	Sharing eating utensils or drinks can transmit pharyngitis.	0.833	2.94
3	Sore throat is one of the common symptoms of pharyngitis.	0.393	3.20
4	Pharyngitis can lead to complications if left untreated.	0.718	3.17
5	Poor hygiene contributes to pharyngitis.	0.479	3.07
6	Cold weather increases the risk of developing pharyngitis.	0.563	2.95
<b>Aggregate</b>		<b>0.623</b>	<b>3.07</b>

Source: Field Survey, 2025 (The benchmark mean was at 2.50)

The rating of the two groups in Table 2 Pharyngitis is caused by both viral and bacterial infections (3.06), Sharing eating utensils or drinks can transmit pharyngitis (2.94), Sore throat is one of the common symptoms of pharyngitis (3.20), Pharyngitis can lead to complications if left untreated (3.17), Poor hygiene contributes to pharyngitis (3.07), and Cold weather increases the risk of developing pharyngitis (2.95)

**Research Question Two: What are the attitudes of adults toward the prevention of pharyngitis in Makarfi LGA, Kaduna State, Nigeria?**

**Table 3: Mean score and standard deviation on attitudes of adults toward the prevention of pharyngitis in Kaduna State, Nigeria.**

S/N	ITEMS	SD	$\bar{X}$
1	Regular hand washing prevents pharyngitis.	0.196	3.29
2	Covering the mouth when coughing reduces infection spread.	0.313	3.10
3	Seeking medical attention for throat pain is necessary.	0.255	3.19
4	Traditional remedies are more effective than medical treatment.	0.432	2.28
5	Health education should be promoted in the community.	0.615	3.34
6	Pharyngitis is a minor illness that doesn't need medical attention.	0.311	1.47
<b>Aggregate</b>		<b>0.359</b>	<b>2.77</b>

Source: Field Survey, 2025 (The benchmark mean was at 2.50)

The rating of the two groups in Table 3 Regular hand washing prevents pharyngitis (3.29), Covering the mouth when coughing reduces infection spread (3.10), Seeking medical attention for throat pain is necessary (3.19), Health education should be promoted in the community (3.34) and the responses with negative responses are Traditional remedies are more effective than medical treatment (2.28) and Pharyngitis is a minor illness that doesn't need medical attention (1.47).

**Hypotheses Testing**

**Table 4: One-sample t-test on the level of knowledge on pharyngitis among adults**

Variable	N	Mean	Std. Dev.	t-value	df	p-value
The level of knowledge on pharyngitis among adults	394	3.07	0.623	4.020	394	0.000
Test Mean	394	2.50	0.000			

(t-critical = 1.98, p < 0.05)

The hypothesis that stated that there is no significant knowledge of pharyngitis among adults in Makarfi LGA, Kaduna State, is rejected. Since the p-value is far below 0.05, we reject the null hypothesis. The sample mean (3.07) is significantly higher than the test mean (2.50), indicating that the adults in this study have a significantly higher level of knowledge about pharyngitis than what would be expected at the neutral benchmark.

**Table 5: One-sample t-test on attitudes of adults toward the prevention of pharyngitis**

Variable	N	Mean	Std. Dev.	t-value	df	p-value
Attitudes of adults toward the prevention of pharyngitis	394	2.77	0.359	6.772	393	0.003
Test Mean	394	2.50	0.000			

(t-critical = 1.98, p < 0.05, df=394, t-value=6.772)

The hypothesis stated that there is no significant attitude of adults towards the prevention of pharyngitis in Makarfi LGA, Kaduna State, and is therefore rejected. Adults in this study have significantly more positive attitudes toward preventing pharyngitis than the neutral benchmark. The mean score of 2.77 (on a 4-point scale) indicates moderate-to-positive attitudes

overall, although some misconceptions remain, for example, a relatively high mean score for traditional remedies (2.28) and a low score for “pharyngitis is minor and needs no medical attention” (1.47), showing disagreement with neglectful attitudes.

### Discussion of Findings

Hypothesis one: The results of this study indicated that the level of knowledge of pharyngitis among adults in the sampled population was significantly higher than the neutral benchmark score of 2.50 ( $t = 4.020$ ,  $df = 394$ ,  $p < 0.001$ ). The aggregate mean score of  $3.07 \pm 0.623$  suggests that respondents generally demonstrated good awareness of the causes, modes of transmission, symptoms, potential complications, and risk factors associated with pharyngitis. Specifically, the majority of participants agreed that pharyngitis can be caused by both viral and bacterial infections, can be transmitted through sharing utensils or drinks, and that poor hygiene and cold weather may increase susceptibility.

These findings are consistent with Onyeagba et al. (2019), who reported that urban adult populations in Southeastern Nigeria exhibited moderate-to-high knowledge of upper respiratory tract infections, largely due to increased exposure to public health campaigns and informal health education from healthcare workers. Similarly, Akindele and Okoro (2021) found that adults in Lagos with higher knowledge scores were more likely to engage in preventive practices such as avoiding sharing eating utensils and seeking early treatment for sore throat symptoms.

However, the present study also notes slight variability in knowledge levels, as indicated by the standard deviation (0.623), suggesting that while the overall understanding is good, certain misconceptions or gaps may persist among subgroups. This aligns with Mbonu, Ibe, and Uche (2020), who observed that while general awareness of throat infections was high in urban communities, specific misconceptions about viral versus bacterial causation and the role of environmental factors remained prevalent.

Hypothesis Two: The present findings indicate that adults generally hold favourable attitudes toward preventing pharyngitis, as evidenced by an aggregate mean score of 2.77, significantly higher than the neutral value of 2.50 ( $p = 0.003$ ). Positive preventive attitudes were reflected in high agreement with measures such as regular handwashing (mean = 3.29), covering the mouth when coughing (mean = 3.10), and the importance of community health education (mean = 3.34). This aligns with World Health Organization (WHO, 2021) recommendations that respiratory infection prevention is best achieved through hygiene promotion, cough etiquette, and early care seeking.

These findings are consistent with Akindele and Okoro (2021), who observed that Nigerian adults with higher health literacy levels were more likely to endorse preventive attitudes toward upper respiratory tract infections, including pharyngitis. Similarly, Isezuo et al. (2023) found that although knowledge levels among healthcare workers were mixed, preventive attitudes such as promoting hygiene and discouraging close contact with infected individuals were generally positive.

However, the study also revealed areas of attitudinal weakness, such as moderate agreement with traditional remedies being more effective than medical treatment (mean = 2.28). This finding mirrors Mbonu, Ibe, and Uche (2020), who reported that reliance on traditional medicine remained common in rural Nigerian communities, sometimes delaying medical care and increasing the risk of complications like rheumatic fever. The very low score (mean = 1.47) for the statement “pharyngitis is a minor illness that doesn’t need medical attention” is encouraging, as it suggests respondents reject complacency and recognize the potential seriousness of the illness. This aligns with Uzodimma et al. (2017), who stressed that untreated bacterial pharyngitis in children can have severe health consequences, underscoring the importance of prompt medical attention.

### Implications for Public Health Practice

The findings from both variables, knowledge (mean = 3.07,  $p < 0.001$ ) and attitudes (mean = 2.77,  $p = 0.003$ ), demonstrate that adults in the study population generally possess good awareness of pharyngitis and maintain moderately to strongly positive attitudes toward its prevention. These have several important implications:

1. **Leverage Existing Awareness to Drive Behaviour Change:** High knowledge scores indicate that public health agencies have a foundation to build upon. Rather than focusing solely on basic awareness creation, future interventions can emphasise behavioural reinforcement and translation of knowledge into consistent preventive practices, in line with Ajzen’s (1991) Theory of Planned Behaviour.
2. **Address Persistent Misconceptions:** While most respondents demonstrated accurate knowledge and positive attitudes, some misconceptions persist, such as moderate belief in the superiority of traditional remedies over medical treatment. Public health campaigns should therefore incorporate culturally sensitive educational messages that address these beliefs without alienating community members, a strategy shown to be effective in respiratory health promotion (Mbonu et al., 2020).
3. **Integrate Knowledge and Attitude-Based Interventions:** Since both knowledge and attitudes were significantly above the neutral benchmark, integrated interventions combining factual information (causes, symptoms, complications) with attitude-shaping messages (perceived seriousness, community responsibility) could yield stronger behavioural outcomes.
4. **Strengthen Community Health Structures:** High agreement with community health education suggests that community health workers and peer educators can be effective channels for reinforcing prevention messages. Embedding these within existing local health committees could improve outreach, especially in rural areas.
5. **Inform Policy and Guideline Development:** The positive baseline established here can guide local health policy, including the development of a national pharyngitis management protocol (as recommended by Coutinho, 2021) that includes both prevention and treatment pathways accessible at the primary care level.

6. Monitor and Sustain Gains: Long-term surveillance is needed to determine whether these favourable knowledge and attitude levels are sustained and whether they translate into reduced incidence of pharyngitis and related complications over time.

### Recommendations

1. Strengthen Community Health Education: Leverage the existing favourable knowledge and attitudes toward pharyngitis prevention by conducting regular community health education programs that emphasise correct preventive practices, early health-seeking behaviour, and recognition of symptoms.
2. Address Misconceptions About Traditional Remedies: Develop culturally sensitive communication strategies that respect local beliefs while clarifying the limitations of traditional remedies and highlighting the effectiveness of evidence-based medical treatment.
3. Integrate Knowledge and Attitude Interventions: Design public health campaigns that combine factual health information with messages that positively influence attitudes, ensuring that knowledge translates into preventive actions.
4. Empower Community Health Workers: Train and equip community health workers to serve as primary agents for pharyngitis prevention education, given their accessibility and trust within communities.
5. Develop National Guidelines for Pharyngitis Management: The Ministry of Health, in collaboration with professional bodies, should establish standardised protocols for the prevention, diagnosis, and treatment of pharyngitis, adaptable for use at primary healthcare levels.
6. Monitor and Evaluate Intervention Impact: Implement a monitoring system to assess whether knowledge and attitude improvements lead to reduced incidence of pharyngitis and related complications over time.

### Conclusion

This study revealed that adults in the surveyed population demonstrated good knowledge (mean = 3.07) and positive attitudes (mean = 2.77) toward the prevention of pharyngitis, both significantly higher than the neutral benchmark ( $p < 0.05$ ). These results suggest that awareness and prevention-mindedness are already present within the community, providing a strong foundation for further public health action. However, certain misconceptions, particularly regarding the role of traditional remedies, remain and could limit the full translation of knowledge and attitudes into optimal preventive behaviours. Public health interventions should therefore focus on reinforcing correct practices, dispelling misconceptions, and promoting early medical attention for suspected pharyngitis cases. In building on the existing knowledge base and fostering attitudes that support evidence-based prevention, policymakers, healthcare providers, and community leaders can work together to reduce the burden of pharyngitis and improve respiratory health outcomes. Sustaining these efforts will require continuous education, cultural sensitivity, and integration of community-based health strategies into broader public health planning.

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## ASSESSMENT OF ATTITUDE TOWARD TOILET INFECTION PREVENTIVE MEASURES AMONG BOARDING SECONDARY SCHOOL STUDENTS IN NORTH EAST, NIGERIA

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### Abstract

The study assessed the attitude toward toilet infection preventive measures among boarding secondary school students in North East, Nigeria. To achieve this purpose, descriptive survey research design was used. The population for this study was twenty-five thousand seven hundred and seventy-three (25,773) female students in boarding secondary schools across North-East Nigeria. The sample size of 378 was selected using multistage sampling procedures which include stratified, simple random, purposive, and proportionate sampling. The instrument for data collection was a structured questionnaire developed by the researcher. The instrument was pilot-tested using Cronbach Alpha and a 0.851 reliability coefficient was obtained. The Descriptive statistics of frequency and simple percentages were used to analyze the demographic characteristics of the respondents. Inferential statistics of one-sampled t-test was used to test the stated hypothesis at a 0.05 level of significance. The result revealed that the attitude toward toilet infection preventive measures is significant ( $t = 21.129$ ;  $p = 0.000$ ). Based on the results, the study concluded that boarding secondary school students in North East, Nigeria have positive attitudes towards toilet infection preventive measures. Based on the conclusion, the study recommends among others the need for the school administrators to implement comprehensive educational programmes to reinforce and maintain the high level of knowledge among boarding secondary school students in North East, Nigeria regarding toilet infection preventive measures.

**Keywords:** Attitude, Toilet Infection, Preventive Measures, Boarding School Students

### Introduction

Toilet infections, also known as urinary tract infections (UTIs) or hygiene-related infections, are a significant public health concern globally, particularly in settings where sanitation and hygiene practices are suboptimal. These infections are often caused by poor toilet hygiene, inadequate sanitation facilities, and a lack of awareness about preventive measures (Akorede & Toyin, 2020). According to the World Health Organization [WHO] (2022), over 1.7 billion people worldwide lack access to basic sanitation services, and approximately 297,000 children under five die annually due to diarrheal diseases linked to poor sanitation and hygiene. Toilet infections, though preventable, remain a persistent issue, especially in low- and middle-income countries where access to clean water and sanitation is limited (Solomon et al., 2025). The burden of these infections is exacerbated in crowded environments such as boarding schools, where shared facilities and poor maintenance can increase the risk of transmission (Kabiru et al., 2024; Solomon et al., 2025).

In Africa, the situation is particularly dire, with millions of people lacking access to improved sanitation facilities. The United Nations Children's Fund (UNICEF, 2021) reports that 27% of schools in sub-Saharan Africa have no sanitation facilities, and 23% have facilities that are not functional. This lack of access contributes to the high prevalence of toilet infections among school-aged children. In countries like Kenya, Uganda, and Tanzania, studies have shown that poor sanitation in schools is a leading cause of absenteeism due to infections such as UTIs and diarrheal diseases (Mugo et al., 2020; Njuguna et al., 2021). For instance, a study in Kenya revealed that 45% of school-going children reported experiencing at least one episode of UTI in the past year, with poor toilet hygiene being a significant contributing factor (Mugo et al., 2020).

Nigeria, as Africa's most populous nation, faces significant challenges in addressing toilet infections, particularly in its boarding secondary schools. According to the National Bureau of Statistics (NBS, 2021), only 44% of Nigerians have access to basic sanitation services, and 24% still practice open defecation. In schools, the situation is even worse, with many institutions lacking adequate toilet facilities or maintaining them poorly (Abdulbaqi et al., 2019; Akorede et al., 2020; Akorede et al., 2023; Idris et al., 2022). A study conducted in Lagos State revealed that 60% of secondary schools had insufficient toilet facilities, and 70% of students reported using unclean toilets (Adeyemi et al., 2020). This has led to a high prevalence of toilet infections among students, with studies indicating that 35% of boarding school students in Nigeria have experienced at least one episode of UTI in the past year (Oluwafemi et al., 2019). The lack of proper sanitation facilities and poor hygiene practices in these schools contribute significantly to the spread of infections (Nofiu et al., 2021; Akorede et al., 2020; Akorede et al., 2023).

Preventive measures for toilet infections include proper handwashing with soap, regular cleaning of toilet facilities, and the use of clean water for personal hygiene (Akorede et al., 2023; Akorede & Toyin, 2020; Solomon et al., 2025). The WHO (2022) emphasizes the importance of handwashing as a cost-effective intervention to reduce the transmission of infections. Additionally, the provision of adequate and gender-separated toilet facilities in schools is critical to promoting hygiene and reducing the risk of infections. Educational programs that teach students about the importance of personal hygiene and the proper use of toilet facilities are also essential in preventing infections (Biu et al., 2025). However, the implementation of these

measures remains a challenge in many Nigerian boarding schools due to inadequate funding, poor infrastructure, and lack of awareness among students and staff.

The attitude of students towards toilet infection preventive measures plays a crucial role in determining the effectiveness of these interventions. Attitudes are shaped by knowledge, cultural beliefs, and the availability of resources. In many cases, students may be aware of the importance of hygiene but fail to practice it due to a lack of facilities or peer influence. For instance, a study in Ghana found that although 80% of students knew the importance of handwashing, only 30% practised it regularly due to the unavailability of soap and water (Addo et al., 2021). Similarly, in Nigeria, cultural beliefs and misconceptions about hygiene often hinder the adoption of preventive measures.

Previous studies have explored the attitudes of students towards hygiene and sanitation in various contexts. For example, a study in India found that students who received hygiene education were more likely to practice handwashing and maintain clean toilet facilities (Patil et al., 2020). In Nigeria, a study by Oluwafemi et al. (2019) revealed that students who had access to clean toilets and handwashing facilities were less likely to report toilet infections. However, there is a paucity of research focusing specifically on the attitudes of boarding secondary school students in North East Nigeria towards toilet infection preventive measures. This region, which has been affected by insurgency and displacement, faces unique challenges in providing adequate sanitation facilities and promoting hygiene practices.

The problem of toilet infections in Nigerian boarding schools is multifaceted, involving issues of infrastructure, education, and cultural practices. Despite the availability of preventive measures, many schools lack the resources to implement them effectively. The researchers observed that students often use unclean and overcrowded toilet facilities, which increases their risk of infections. Additionally, there is a lack of awareness among students about the importance of personal hygiene and the proper use of toilet facilities. The high prevalence of toilet infections among boarding school students in North East Nigeria is a cause for concern, given the region's already fragile health system. The insurgency in the region has disrupted access to basic services, including sanitation and hygiene facilities, further exacerbating the problem. The researchers noted that many schools in the region rely on donor-funded projects for the construction of toilet facilities, but these projects often lack sustainability plans, leading to the deterioration of facilities over time. This study seeks to address these gaps by examining the attitudes of boarding secondary school students in North East Nigeria towards toilet infection preventive measures.

#### **Purpose of the Study**

The purpose of this study was to assess the attitude towards toilet infection preventive measures among boarding secondary school students in North East, Nigeria.

#### **Research Question**

What is the attitude towards toilet infection preventive measures among boarding secondary school students in North East, Nigeria?

#### **Hypothesis**

Attitude towards toilet infection preventive measures among boarding secondary school students in North East, Nigeria is not significant.

#### **Methodology**

The study employed a descriptive survey research design to gather opinions on toilet infection preventive measures among female students in public boarding secondary schools in North-Eastern Nigeria. According to Aggarwal and Ranganathan (2019), this method allows researchers to obtain insights from a representative sample, facilitating inferences about the broader population. The target population comprised approximately 25,773 female students across various boarding schools in six states (Adamawa, Bauchi, Borno, Gombe, Taraba, and Yobe), as indicated by records from the State Ministries of Education (2023).

To determine the sample size, a total of 378 respondents was selected using a multi-stage sampling procedure. The process began with stratified sampling to categorize the Northeast Zone into its six states. From this pool, simple random sampling was used to select three states: Adamawa, Taraba, and Yobe. Each selected state was further divided into its senatorial zones, from which a purposive sampling method identified one zone with boarding schools. Subsequently, two Local Government Areas (LGAs) were chosen from each zone, followed by the selection of two female boarding schools per LGA, specifically targeting Senior Secondary II (SSII) students due to their maturity and familiarity with hygiene practices.

Data collection was facilitated through a researcher-developed questionnaire titled 'Assessment of Attitude toward Toilet Infection Preventive Measures among Boarding Secondary School Students (AATIPMBSSSQ).' This instrument, validated by experts, consisted of demographic questions and items assessing attitudes toward hygiene practices. A pilot study confirmed its reliability, achieving a Cronbach Alpha score of 0.851. Data collection occurred over eight weeks, with systematic sampling during school hours. Analysis was conducted using SPSS, employing descriptive statistics for demographic data and inferential statistics to test the hypothesis at a 0.05 significance level.

#### **Results**

All data collected on demographic characteristics of the respondents were tabulated using frequencies and percentages as indicated in Table 1

**Table 1: Demographic Characteristics of the Respondents**

Variables	Options	Frequency	Percentage (%)
Age Range in Years	13 – 15	63	16.7
	16 – 18	179	47.3
	19 – 21	77	20.4
	22 and above	59	15.6
	<b>Total</b>	<b>378</b>	<b>100.0</b>
Names of Schools	GSS, Mobi	50	13.2
	GSS, Michika	29	7.7
	GSS, Numan	32	8.5
	GGSS, Imburu	26	6.9
	GSS, Jalingo	33	8.7
	GSSSS, Nyabu Kata	25	6.6
	GGSSS, Wukari	25	6.6
	FGC, Wukari	34	9.0
	GSS, Damaturu	33	8.7
	GGC, Damaturu	30	7.9
	GSS, Potiskum	29	7.7
	GGSTC, Potiskum	32	8.5
	<b>Total</b>	<b>378</b>	<b>100.0</b>

Table 1 shows the demographic characteristics of the respondents. The table shows the age range and school distribution of the 378 respondents who participated in the study. Regarding age, the majority of the respondents 179 (47.3%) were in the 16-18 years age range, followed by 19-21 years 77 (20.4%), 13-15 years 63 (16.7%), and 22 years and above 59 (15.6%). This indicated that the sample was predominantly composed of late adolescent and young adult secondary school boarding students. In terms of the schools represented, the largest proportion of respondents 50 (13.2%) were from GSS, Mobi, followed by FGC, Wukari 34 (9.0%), GSS, Jalingo and GSS, Damaturu 33 (both 8.7%), GSS, Numan and GGSTC, Potiskum 32 (both 8.5%), GGC, Damaturu 30 (7.9%), GSS, Michika and GSS, Potiskum 29 (both 7.7%), GGSS, Imburu 26 (6.9%), and GSSSS, Nyabu Kata and GGSSS, Wukari 25 (both 6.6%). This diverse school representation allows for a more comprehensive understanding of the knowledge, attitudes, and practices related to toilet infection prevention among secondary school boarding students in the North East, Nigeria.

**Research Question:** What is the attitude towards toilet infection preventive measures among boarding secondary school students in North East, Nigeria?

**Table 2: Mean Scores of Responses on Attitudes Towards Toilet Infection Preventive Measures among Boarding Secondary School Students in North East, Nigeria**

S/N	Item	Mean	Std Dev
1.	I believe that handwashing with soap after using the toilet is essential for preventing infections	3.51	0.75
2.	I think it is important to clean the toilet seat before use to avoid infections	3.40	0.77
3.	I feel that using a toilet disinfectant is a necessary step to ensure hygiene.	3.21	0.71
4.	I think flushing the toilet with the lid closed is an important practice to prevent the spread of germs	3.09	0.76
5.	I believe that regular cleaning of the toilet bowl is crucial for preventing infections.	3.17	0.74
6.	I feel it is important to use separate cleaning tools for the toilet and other hostel areas.	3.29	0.72
7.	I am convinced that sharing towels used in the bathroom increases the risk of spreading infections	3.26	0.79
8.	I think that using toilet paper or wipes effectively is important for maintaining hygiene.	3.02	0.76
9.	I believe that disposing of sanitary products properly is vital for preventing infections.	3.18	0.74
10.	I feel that hand sanitizing after using public restrooms is a crucial preventive measure.	3.08	0.73
11.	I believe that avoiding direct contact with public restroom surfaces is important for reducing infection risks.	3.20	0.58
12.	I think that not touching my face after using the toilet until I wash my hands is an important hygiene practice.	3.03	0.64
13.	I feel that using a toilet seat cover or paper lining is necessary to prevent infections	3.04	0.72
14.	I think it is important to regularly clean and disinfect the flush handle or button.	2.87	0.78
15.	I believe that educating other students about proper toilet hygiene is important for infection prevention	3.23	0.72
<b>Aggregate Mean</b>		<b>3.17</b>	

(Decision Mean – 2.50)

Table 2 presented the mean scores of responses on the attitudes towards toilet infection preventive measures among boarding secondary school students in North East, Nigeria. The decision mean was set at 2.50, which indicated that any mean score above 2.50 suggests a positive attitude among the respondents. The aggregate mean score across all 15 items is 3.17, which is above the decision mean of 2.50. This confirmed that the boarding secondary school students in the North East, Nigeria have a generally positive attitude towards toilet infection preventive measures. Specifically, the highest mean score is 3.51 for the



statement "I believe that handwashing with soap after using the toilet is essential for preventing infections." This indicated that the respondents have a strong positive attitude towards the importance of handwashing in preventing toilet-related infections.

Other items with high mean scores include "I think it is important to clean the toilet seat before use to avoid infections" (3.40), "I feel it is important to use separate cleaning tools for the toilet and other hostel areas" (3.29), and "I am convinced that sharing towels used in the bathroom increases the risk of spreading infections" (3.26). These results confirmed that the respondents have a positive attitude towards various preventive measures, such as cleaning the toilet seat, using dedicated cleaning tools, and avoiding sharing personal items. The items with relatively lower mean scores, but still above the decision mean, include "I think it is important to regularly clean and disinfect the flush handle or button" (2.87) and "I feel that using a toilet seat cover or paper lining is necessary to prevent infections" (3.04). This indicated that the respondents' attitudes towards these specific preventive measures, while still at an acceptable level, may need further improvement.

**Hypothesis:** Attitude towards toilet infection preventive measures among boarding secondary school students in North East, Nigeria is not significant.

**Table 3: One-Sample t-test Analysis on Attitude towards Toilet Infection Preventive Measures among Boarding Secondary School Students in North East, Nigeria**

Variable	N	Mean	Std. Dev.	df	t-value	p-value
Attitude	378	3.17	0.74	377	21.129	0.000
Test Mean	378	2.50	0.00			

*Calculated p < 0.05, calculated t-value > 1.972 at df 377*

The result of the one-sample t-test statistics in Table 3 revealed that the attitude towards toilet infection preventive measures among boarding secondary school students in North East, Nigeria is significant because the calculated p-value of 0.000 is less than the 0.05 level of significance and the calculated t-value of 21.129 is higher than the 1.972 critical t-value at 377 degrees of freedom (df). Therefore, the null hypothesis which stated that the attitude towards toilet infection preventive measures among boarding secondary school students in North East, Nigeria is not significant is hereby rejected. This means that boarding secondary school students in North East, Nigeria have a positive attitude towards toilet infection preventive measures.

**Discussion of Finding**

The study revealed that attitude toward toilet infection preventive measures among boarding secondary school students in North East, Nigeria is significant (t = 21.129; p = 0.000). This finding is in agreement with previous research that has examined students' attitudes regarding toilet infection preventive measures. Several studies, such as those by Muhammad and Lawal (2017), Aminu and Umaru (2018), and Ahmed and Mohammed (2020), indicate that students generally possess positive attitudes toward toilet hygiene and infection prevention. However, these studies also highlight a persistent gap in attitudes. For instance, Muhammad and Lawal (2017) found that while 80% of secondary school students in Adamawa State had good knowledge of toilet infection prevention measures, only 70% demonstrated positive attitudes toward them. Similarly, Aminu and Umaru (2018) revealed that although 75% of students in Bauchi exhibited strong knowledge and positive attitudes, only 55% adhered to proper toilet hygiene practices consistently. Furthermore, Ahmed and Mohammed (2020) reported that 80% of students in Northeast Nigeria were aware of infection preventive measures, yet only 60% consistently applied them in practice. These findings confirmed that while students recognize the importance of hygiene, translating positive attitudes into consistent behaviours remains a challenge.

On the other hand, studies such as those by Yusuf and Aminu (2020) and Musa and Dogo (2019) emphasize the role of facility availability and peer influence on students' hygiene practices. Yusuf and Aminu (2020) found that 60% of students in Yobe State practised adequate toilet hygiene, largely influenced by the availability of sanitary facilities and peer behaviours. Likewise, Musa and Dogo (2019) reported that 85% of secondary school students in Maiduguri acknowledged the significance of hygiene practices, yet proper implementation was inconsistent. These studies reinforce the argument that while students may express favourable attitudes toward infection prevention, practical adherence is often influenced by external factors such as infrastructure, school policies, and social dynamics.

Contrastingly, some studies indicate a weaker attitude toward hygiene practices. Sherpa et al. (2022) found that among adolescent girls in rural Sikkim, 63% exhibited unfavourable attitudes toward urinary tract infection (UTI) prevention despite 88% having moderate knowledge. Similarly, Bokolia (2016) reported that 65.79% of school-going adolescent girls had no knowledge of UTIs, and hygiene practices such as washing after urination were not widely observed. These findings differ from those in Northeast Nigeria, where students exhibit a more positive attitude, as suggested by the significant statistical result (t = 21.129; p = 0.000) in the present study. The significant attitude toward toilet infection preventive measures among boarding secondary school students in North East Nigeria is consistent with previous studies that emphasize high awareness and positive attitudes. However, the challenge remains in ensuring that these attitudes translate into consistent hygienic behaviours. Addressing this issue requires targeted health education interventions, facility improvements, and reinforcement through school policies to ensure that positive attitudes lead to sustained hygiene practices.

**Conclusions**

Based on the findings of the study, the study concluded that boarding secondary school students in North East, Nigeria have positive attitudes towards toilet infection preventive measures.

## Recommendations

Based on the conclusions, the study recommended that school counsellors should continue to foster a positive attitude towards toilet infection preventive measures among boarding secondary school students in North East, Nigeria through targeted behavioural interventions.

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# AWARENESS OF RESPIRATORY DISEASE PREVENTIVE MEASURES AMONG TEACHERS OF PRIMARY SCHOOL IN KADUNA STATE NIGERIA

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## Abstract

The study assessed the awareness of respiratory disease preventive measures among teachers of primary schools in Kaduna State, Nigeria. To achieve this purpose, an expo factor research design was used. The population for this study was 29,626 teachers of public primary schools in Kaduna State Nigeria. The sample size of 384 was selected using a multi-stage sampling procedure which includes cluster, simple random, proportionate and systematic sampling. The instrument for data collection was a structured close-ended questionnaire developed by the researcher and it was validated by 5 experts in the Department of Human Kinetics and Health Education, Ahmadu Bello University Zaria. Descriptive statistics of frequencies and percentage was used to describe the demographic characteristics of the respondents. Mean and standard deviation was used to answer the research question and inferential statistics of one-sampled t-test was used to test the stated hypothesis at a 0.05 level of significance. The results revealed that primary school teachers in Kaduna State, Nigeria have a significant awareness of respiratory disease preventive measures ( $t = 53.29, p = 0.000$ ). The study concluded that primary school teachers in Kaduna State are aware of respiratory disease preventive measures. Based on the conclusion, it is recommended that the government should continue to prioritize and invest in health education programs that focus on respiratory diseases, particularly in primary schools, to maintain and further enhance the high level of awareness among primary school teachers.

**Keywords:** Awareness, Respiratory Disease, Preventive Measures, Teachers, Primary School, Kaduna State Nigeria

## Introduction

Respiratory diseases remain one of the leading causes of morbidity and mortality worldwide, affecting millions of people across different age groups, socioeconomic statuses, and geographical locations. These conditions, ranging from acute respiratory infections to chronic respiratory diseases, pose significant public health challenges and economic burdens on healthcare systems globally (World Health Organization [WHO], 2023). The impact of these diseases has become more pronounced in recent years, particularly with the emergence of novel respiratory pathogens and the increasing prevalence of environmental risk factors. According to the WHO (2023), respiratory diseases account for approximately 4 million deaths annually worldwide. Lower respiratory infections remain the fourth leading cause of death globally, while chronic respiratory diseases like Chronic Obstructive Pulmonary Disease (COPD) rank third among the world's deadliest conditions (Akorede et al., 2025; Kabiru et al., 2024; Sani et al., 2024). The economic impact is equally staggering, with respiratory diseases costing healthcare systems an estimated \$380 billion annually in direct and indirect costs (Akorede, 2024; Abdufatah et al., 2025).

The African continent bears a disproportionate burden of respiratory diseases, with significantly higher mortality rates compared to global averages. Recent statistics indicate that respiratory infections account for approximately 18% of all deaths in Africa, with children under five being particularly vulnerable (Akorede et al., 2023; Kabiru et al., 2024). The situation is further complicated by limited healthcare resources, poor access to diagnostic facilities, and inadequate preventive measures (Akorede et al., 2023; Abdulbaqi et al., 2025). According to Mokube et al. (2023), the prevalence of chronic respiratory diseases in Africa has increased by 34% over the past decade, with urban areas showing higher rates due to increasing air pollution and environmental degradation.

Nigeria, the most populous country in Africa, faces significant challenges in addressing respiratory diseases. Recent studies indicate that respiratory infections account for approximately 20% of all childhood deaths in Nigeria, while chronic respiratory conditions affect an estimated 15% of the adult population (Nigerian Centre for Disease Control [NCDC], 2024). The burden is particularly heavy in northern states, including Kaduna, where environmental factors such as dust storms and indoor air pollution contribute to higher prevalence rates (Akorede, 2021).

Preventive measures for respiratory diseases encompass a wide range of interventions, from personal hygiene practices to environmental modifications. These include proper hand hygiene, use of face masks, adequate ventilation, vaccination, and avoidance of environmental triggers (Akorede & Toyin, 2020; Centers for Disease Control and Prevention [CDC], 2023). The implementation of these measures has shown significant success in reducing the incidence of respiratory diseases, with studies reporting reduction rates of up to 60% in communities with high adherence to preventive protocols (Amin et al., 2024; Muhammed et al., 2025). Awareness of respiratory disease preventive measures plays a crucial role in their effective implementation. Studies have shown that increased awareness leads to better compliance with preventive measures and improved health outcomes (Akorede et al., 2023; Yusuf et al., 2022). However, the level of awareness varies significantly across different population groups and geographical locations (Solomon et al., 2025). Teachers, as key influencers in the community, play a vital role in disseminating health information and modelling appropriate preventive behaviours (Akorede, 2021; Akorede et al., 2022).

Previous studies on awareness of respiratory disease preventive measures have yielded varying results across different contexts. In developed countries, awareness levels among teachers have been reported to be relatively high, with studies from the United States and the United Kingdom showing awareness rates of 75-85% (Brown & Anderson, 2023). However, studies from developing countries present a different picture. Research conducted in Ghana by Mensah et al. (2023) found that only 45% of primary school teachers had adequate awareness of respiratory disease preventive measures. In Nigeria, limited research has been conducted on teachers' awareness of respiratory disease preventive measures. A study by Okonkwo and Ibrahim (2023) in Lagos State found that while 60% of teachers were aware of basic preventive measures, detailed knowledge of specific interventions was lacking. Similar findings were reported by Aliyu, Mohammed and Yusuf (2024) in a study conducted in Kano State, where only 40% of teachers demonstrated comprehensive awareness of respiratory disease prevention strategies.

Despite the crucial role of teachers in health education and disease prevention, there appears to be a significant gap in their awareness of respiratory disease preventive measures, particularly in Kaduna State. Preliminary observations suggest that many teachers lack comprehensive knowledge of preventive measures, which could potentially impact their ability to protect themselves and their students from respiratory diseases. The situation is further complicated by limited access to health information resources and inadequate training programs focused on disease prevention. The socioeconomic implications of poor awareness of respiratory disease preventive measures among teachers are significant. Research by Hassan and Mohammed (2024) indicates that schools with teachers who have low awareness of preventive measures report higher rates of respiratory infections among students, leading to increased absenteeism and reduced academic performance. This creates a cycle of negative impacts that extend beyond health outcomes to educational achievement and community well-being.

Recent assessments of health education programs in Nigerian schools have highlighted significant gaps in the integration of respiratory disease prevention into the curriculum and teacher training programs (Federal Ministry of Education [FME], 2024). This systemic deficiency contributes to the perpetuation of inadequate awareness levels among teachers, potentially compromising their role as health educators and champions of disease prevention in their communities. Given these challenges and the critical importance of teachers in shaping health behaviours, there is an urgent need to assess the current level of awareness of respiratory disease preventive measures among primary school teachers in Kaduna State. This assessment would provide valuable insights for developing targeted interventions to enhance teachers' knowledge and capabilities in implementing effective preventive measures, ultimately contributing to improved respiratory health outcomes in the school community and beyond.

### **Purpose of the Study**

The study assessed the awareness of respiratory disease preventive measures among primary school teachers in Kaduna state, Nigeria.

### **Research Question**

Are primary school teachers aware of respiratory disease preventive measures in Kaduna State, Nigeria?

### **Hypothesis**

Awareness of respiratory disease preventive measures among primary school teachers in Kaduna State, Nigeria is not significant.

### **Methodology**

The study employed an ex post facto research design, a methodology where the researcher has no direct control or ability to manipulate the variables, as emphasized by Fredrick (2015). The target population comprised all 29,626 public primary school teachers in Kaduna State, Nigeria, as documented in the Kaduna State Annual School Census Report (2022). To obtain a representative sample, a multi-stage sampling procedure was meticulously implemented. The first stage involved cluster sampling, which divided the teachers into three existing senatorial zones: Kaduna Central (consisting of seven Local Government Areas), Kaduna North (eight Local Government Areas), and Kaduna South (eight Local Government Areas). In the second stage, simple random sampling was used to select two local government areas from each cluster, ultimately resulting in six selected LGAs: Kaduna North and Giwa from Kaduna Central, Makarfi and Sabon-Gari from Kaduna North, and Jema'a and Kauru from Kaduna South. The sample size was determined to be 384 respondents, a number deemed statistically adequate to represent the population of 29,626 with a 95% confidence level and a margin of error of 0.05, according to Research Advisor (2006). A carefully designed researcher-structured questionnaire titled "Awareness of Respiratory Disease Preventive Measures among Teachers of Primary School in Kaduna State Nigeria" was used as the primary data collection instrument. The questionnaire was strategically divided into two sections: Section A contained four questions on socio-demographic characteristics, while Section B comprised ten questions on respiratory disease preventive measures. To ensure comprehensive and nuanced data collection, a four-point modified Likert scale was employed, with response options ranging from Strongly Agree to Strongly Disagree. The research established a criterion mean of 2.50 for data analysis, where mean scores at or above this threshold would indicate agreement with the proposed items, while scores below would signify disagreement. The instrument's validity was established through expert review, with five professionals from the Department of Human Kinetics and Health Education examining the questionnaire and providing critical feedback. A letter of introduction from the university was obtained and presented to local government chairmen to secure necessary permissions and access to respondents. The data collection process involved the researcher and five trained research assistants who personally administered the questionnaires, offering explanations, translations, and guidance to ensure comprehensive and accurate responses. Upon retrieval, the completed questionnaires were systematically sorted, coded, and analyzed using Statistical Package of Social Sciences (SPSS).

version 26.0. The analysis employed both descriptive statistics (frequency and percentages for demographic characteristics) and inferential statistics (one-sample t-test for hypothesis testing), with a significance level set at 0.05.

**Results**

The socio-demographic characteristics of the respondents are presented in Table 1 and described as follows.

**Table 1: Demographic Characteristics of the Respondents (n = 380)**

Variables	Options	Frequency	Percentage (%)
<b>Age Range in Years</b>	20-30 years	101	26.6
	31-40years	174	45.8
	41-50years	71	18.7
	50 years above	34	8.9
<b>Gender</b>	Male	156	41.1
	Female	224	58.9
<b>Educational Qualification</b>	NCE/Diploma	252	66.3
	BSc/HND	101	26.6
	MSc/ M. Ed	27	7.1
<b>Marital Status</b>	Single	141	37.1
	Married	211	55.5
	Divorced	21	5.5
	Widowed	7	1.8

Table 1 shows the age distribution of the respondents. The table indicated that the majority of primary school teachers in the study were between the ages of 31-40 years, accounting for 45.8% of the respondents. This was followed by teachers aged 20-30 years (26.6%), 41-50 years (18.7%), and those above 50 years (8.9%). The prevalence of teachers in the 31-40 years age group revealed that the workforce was relatively young but experienced, potentially influencing their awareness and practices related to respiratory disease prevention due to their active engagement in the profession. Out of 380 respondents, 58.9% were female, and 41.1% were male. The higher percentage of female teachers indicated a gender imbalance in the teaching workforce. This reflected the broader trend in primary education, where teaching was often female-dominated. The gender distribution affected how respiratory disease preventive measures were practised, considering potential gender-related health attitudes and behaviours.

The majority of teachers held NCE/Diploma qualifications (66.3%), followed by BSc/HND holders (26.6%) and MSc/M.Ed holders (7.1%). The predominance of teachers with NCE/Diploma revealed that most of the teaching workforce had foundational qualifications. However, the presence of higher qualifications among a smaller proportion indicated a mix of educational backgrounds, which could have influenced the level of awareness and adoption of advanced preventive measures. More than half of the respondents were married (55.5%), while 37.1% were single, 5.5% were divorced, and 1.8% were widowed. The high percentage of married teachers may have revealed that family responsibilities influenced their practices and attitudes toward respiratory disease prevention, possibly leading to more cautious behaviours due to the potential risk to family members.

**Research Question:** Are primary school teachers aware of respiratory disease preventive measures in Kaduna State, Nigeria?

**Table 2: Mean Scores of Responses on Awareness of Respiratory Disease Preventive Measures among Primary School Teachers in Kaduna State, Nigeria**

S/N	Item	Mean	Std. Dev.
	I am aware that:		
1.	regular use of prescribed inhalers and avoiding triggers can help prevent asthma attacks	2.48	0.91
2.	avoiding smoking and exposure to air pollutants can reduce the risk of bronchitis	2.95	0.82
3.	vaccination and practicing good hygiene can help prevent pneumonia	2.39	0.90
4.	annual flu vaccination and regular handwashing are effective preventive measures for influenza.	3.12	0.67
5.	wearing face masks, hand hygiene, and physical distancing are preventive measures against COVID-19	3.58	0.64
6.	early detection, completing treatment, and good ventilation help prevent TB transmission	3.29	0.83
7.	avoiding smoking and exposure to indoor air pollutants can help prevent Chronic Obstructive Pulmonary Disease (COPD)	2.78	0.87
8.	childhood immunization (DPT vaccine) is an effective preventive measure against whooping cough	2.66	0.76
9.	maintaining good respiratory hygiene can help prevent chronic respiratory infections	2.98	0.73
10.	recognizing symptoms such as sneezing, coughing, fever, and difficulty in breathing early can help in timely medical intervention and disease prevention	3.27	0.78
	<b>Total</b>	<b>2.95</b>	<b>0.791</b>

Decision Mean – 2.50

A careful observation of Table 2 shows the mean scores of the responses on awareness of respiratory disease preventive measures among primary school teachers in Kaduna state, Nigeria. The responses for each item were computed and item 5 had the highest mean score of 3.58 indicating that the majority of the respondents affirmed that wearing face masks, hand hygiene, and physical distancing are preventive measures against COVID-19. However, the aggregate mean score of 2.95 was



obtained which is greater than the benchmark score of 2.50. This implies that primary school teachers in Kaduna State are aware of respiratory disease preventive measures.

**Hypothesis:** Awareness of respiratory disease preventive measures among primary school teachers in Kaduna State, Nigeria is not significant.

**Table 3: One-Sample t-test Analysis of Awareness of respiratory disease preventive measures among primary school teachers in Kaduna State, Nigeria**

Variable	N	Mean	Std. Dev.	Df	t-value	p-value
Awareness	380	2.95	0.791	379	53.29	0.000
Test Mean	380	2.50	0.00			

$p < 0.05$ ,  $t$ -crit. value  $> 1.972$  at  $df$  379

The result of the one-sample t-test statistics in Table 3 revealed that awareness of respiratory disease preventive measures among primary school teachers in Kaduna State, Nigeria is significant because the calculated p-value of 0.000 is less than the 0.05 level of significance and the calculated t-value of 53.29 is higher than the 1.972 critical t-value at 379 degrees of freedom (df). Therefore, the null hypothesis which stated that awareness of respiratory disease preventive measures among primary school teachers in Kaduna State, Nigeria is not significant was rejected. This means primary school teachers in Kaduna state, Nigeria had awareness regarding respiratory disease preventive measures.

### Discussions

The finding from this study revealed that awareness of respiratory disease preventive measures among primary school teachers in Kaduna State, Nigeria is significant ( $t = 53.29$ ,  $p = 0.000$ ). This means that primary school teachers in Kaduna state are aware of respiratory disease preventive measures. This finding aligns with studies that demonstrate varying levels of awareness and knowledge about respiratory disease prevention across different populations. For instance, Zeidi and Zeidi's (2021) study on Iranian dentists showed that healthcare professionals had a relatively good level of knowledge about COVID-19 preventive measures. Similarly, Adeleke et al. (2020) found high awareness levels among university students in Nigeria regarding COVID-19 preventive measures. Saeed et al. (2021) identified a high level of knowledge and practices related to COVID-19 among populations in Mosul, Iraq, highlighting the role of socio-demographic factors in enhancing preventive practices.

In contrast, some studies indicate challenges in awareness and practice levels. For instance, Kaso et al. (2021) found that only 31.3% of residents in Southern Ethiopia exhibited good practices of COVID-19 preventive measures, despite considerable awareness. This underscores the potential discrepancy between knowledge and actionable practices, which may also be influenced by factors like access to resources and socio-cultural beliefs. Additionally, findings by Goni, et al. (2019) on Malaysian Hajj and Umrah pilgrims revealed good knowledge about respiratory tract infection prevention but poor attitudes reflected in preventive behaviours. This suggests that awareness alone may not translate into effective disease prevention without supportive attitudes and systemic interventions.

The Kaduna State study's significant awareness among primary school teachers resonates with research by Jethani et al. (2023), which revealed that healthcare workers had good to moderate knowledge about tuberculosis infection control, with 90.3% scoring at a good to moderate level. This suggests that educational professionals and healthcare workers often demonstrate substantial awareness of respiratory health practices. However, the finding also echoes some nuanced insights from other studies. For example, Zhao and Zhao (2023) noted that while participants showed moderate knowledge about respiratory disease prevention, there were significant variations based on factors like gender, education level, and occupation. The Kaduna State study's significant awareness might mask potential variations among teachers based on individual characteristics. Importantly, the study by Linhares et al. (2022) in their systematic review emphasized that educational interventions can significantly improve knowledge about respiratory disease prevention, with a meta-analysis showing a statistically significant difference in knowledge acquisition. The high awareness among Kaduna State teachers might be a result of such educational efforts.

The finding is particularly encouraging when compared to studies like Bhandari et al. (2015), which found that knowledge about respiratory problem prevention was better than actual practice among traffic police in Nepal. The significant awareness among Kaduna State teachers suggests the potential for effective implementation of preventive measures. Contextually, this aligns with recommendations from multiple studies, such as Tesfaye et al. (2023), which stressed the importance of awareness and education in preventing chronic respiratory symptoms, particularly in occupational settings like schools. While the finding is positive, studies like Menap et al. (2023) remind us that awareness doesn't always translate directly into practice. The strong awareness among Kaduna State primary school teachers may reflect targeted health education initiatives or exposure to health campaigns within school environments. However, comparisons with contexts like Southern Ethiopia and Malaysian pilgrims highlight the importance of translating awareness into consistent preventive behaviours through continuous training and structural support. Future interventions should consider these dynamics to bridge the gap between awareness and effective practice.

### Conclusions

Based on the findings of this study, the study concluded that primary school teachers in Kaduna state are aware of respiratory disease preventive measures.

## Recommendations

Based on the conclusion, the study recommended that the government should continue to prioritize and invest in health education programmes that focus on respiratory diseases, particularly in primary schools, to maintain and further enhance the high level of knowledge and awareness among primary school teachers.

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## ASSESSMENT OF TRAINING ADEQUACY AT THE NATIONAL INSTITUTE FOR SPORTS AND ITS IMPACT ON COACHES' COMMUNICATION SKILLS DEVELOPMENT IN NORTH-WEST NIGERIA

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### ABSTRACT

This study assessed the impact of the training adequacy of the National Institute for Sports (NIS) on the development of communication skills of coaches in the North-West Zone, Nigeria. A survey research design was used in the study. The population of this study was four hundred and fifty (450), made up of football, Basketball, Taekwondo, Tennis, Athletics, and Swimming coaches who were trained by the NIS Nigeria from 2019 – 2023. The sample size for this study was two hundred and sixty-nine (269) drawn using stratified, purposive, proportionate, and convenience sampling techniques. The instrument used in this study was a self-developed questionnaire. The instrument's validity was ascertained through expert review by five (5) jurors in the field of Sports Management. To determine its reliability, a pilot study was conducted using fifty (50) respondents from Bauchi State Sports Organization (25) and Gombe State Sports Organization (25), where a Cronbach's Alpha reliability index of 0.857 was obtained, which made the instrument reliable for the study. The researchers and seven (7) research assistants administered and retrieved the questionnaire for the study within four (4) weeks. A total of 269 copies of the questionnaire were distributed to the respondents, and 265 were retrieved and valid for analysis. The data collected was analysed using the Statistical Package for Social Sciences (SPSS) version 30. Descriptive statistics of frequencies and percentages were used to analyse the demographic characteristics of the respondents. Mean ( $\bar{x}$ ) and standard deviation were used to answer the research question, while Chi-Square statistic was used to test the hypothesis at a 0.05 level of significance. The results revealed that there was a significant impact of the training adequacy of the NIS on the development of communication skills ( $p = 0.000$ ,  $X^2$  Cal=131.729). The study concluded that the training adequacy of the NIS impacted the development of communication skills of coaches in the North West Zone of Nigeria. Based on the findings of this study, it was recommended that the Federal Ministry of Sports enhance communication in NIS programmes.

**Keywords:** Training Adequacy, NIS, Coaches' Development, Communication Skills, Sports Coaching, North-West Nigeria.

### Introduction

Sports have become an integral part of Nigerian society, attracting widespread interest and participation across all levels. This has led to an increased demand for competent coaches who play a vital role in stimulating participation, guiding athlete development, and enhancing performance (Abubakar, 2018). Coaching is central not only to the physical and technical improvement of athletes but also to their personal, social, and psychological growth. To achieve these objectives, coaches must possess strong communication skills, as effective communication is the foundation for transmitting knowledge, motivating athletes, and ensuring mutual understanding between coach and athlete (Olusoga et al., 2019).

Perkins and Hahn (2020) emphasised that sports development cannot progress without qualified and well-trained coaches. Effective coaching requires the ability to clearly articulate instructions, provide constructive feedback, and create an environment that fosters athlete learning and performance. According to Adedeji (2019), communication is one of the most essential tools available to a coach because it shapes athletes' responses, builds trust, and ensures the accurate execution of strategies. A coach's leadership effectiveness depends not only on technical competence but also on how well they communicate with athletes and other stakeholders.

Globally, the efficiency of a coach is not judged solely by the outcomes of competitions but also by the ability to nurture relationships, foster teamwork, and guide athletes through effective verbal and non-verbal communication (Adesoye, 2017). Deiorio et al. (2022) further noted that coaching shares similarities with teaching, where the coach assumes multiple roles such as disciplinarian, counsellor, and motivator, all of which require advanced communication competence. Without clear communication, coaches risk being misunderstood, creating confusion among athletes, and failing to instill confidence or discipline.

In Nigeria, sports are viewed not just as recreational activities but as a unifying force and a platform for community cohesion (Akintunde, 2018). With this growing national passion for sports, the demand for coaches has equally risen. However, in many cases, individuals are recruited into coaching roles not because of formal preparation or training, but because of prior experience as athletes or through political and social connections (Akinboye, 2014). This trend raises questions about whether such coaches possess the essential communication competencies needed to deliver effective coaching at both grassroots and elite levels.

Recognising these gaps, the Nigerian government established the National Institute for Sports (NIS) in 1972 to provide formalised training for coaches and sports administrators (Adedeji, 2019). The NIS serves as a specialised institution responsible for preparing coaches through structured programs in coaching, sports management, and related fields. The vision was to align Nigerian coaching standards with international best practices by equipping coaches with the necessary technical knowledge, pedagogical skills, and communication competencies (Alagich, 2016). The Institute's role has therefore become central to sports development in Nigeria, particularly in regions like the North-West Zone, where State Sports Councils/Commissions depend on trained coaches to foster mass participation and athlete excellence (Akinboye, 2014).

Given the significance of communication in coaching effectiveness, the adequacy of NIS training in preparing coaches to master communication skills requires critical evaluation. As Atkinson et al. (2023) argue, modern coaching involves not just tactical and technical expertise but the ability to inspire, guide, and communicate vision effectively. This places communication at the core of a coach's professional identity. It is therefore essential to assess whether the training adequacy of the NIS translates into improved communication skills of coaches in the North-West Zone of Nigeria.

### **Statement of the Problem**

The National Institute for Sports (NIS) was established to provide professional training for coaches, administrators, and sports personnel to enhance sports development in Nigeria (Abubakar, 2018). Among its objectives, the Institute is expected to equip coaches with the skills and competencies required to guide athlete development effectively. A critical aspect of these competencies is communication, as coaching effectiveness depends largely on a coach's ability to clearly articulate instructions, inspire athletes, and provide feedback that motivates performance (Adedeji, 2019).

Despite the centrality of communication to coaching, observations in many state sports organizations within the North-West Zone of Nigeria suggest that coaches often struggle with communication effectiveness. Instances of poor articulation of strategies, limited feedback, and inadequate motivational communication have been noted. Such deficiencies hinder athlete development, reduce team cohesion, and negatively affect performance outcomes. This raises concerns about whether the training provided by the NIS sufficiently addresses communication as a core coaching competence.

As Nigeria continues to devote increasing attention to sports as a tool for social and economic development, the role of coaches becomes even more crucial (Akintunde, 2018). Coaches in the North-West Zone are expected not only to prepare athletes for competition but also to serve as mentors, motivators, and communicators. However, if their communication abilities remain underdeveloped, the effectiveness of their coaching is compromised. This situation calls for an assessment of the impact of the training adequacy of the NIS on the development of communication skills of coaches in the North-West Zone of Nigeria.

### **Purpose of the Study**

The purpose of this study was to assess the impact of the training adequacy of the National Institute for Sports (NIS) on the development of communication skills of coaches in the North-West Zone, Nigeria.

### **Research Question**

To what extent does the training adequacy of the NIS impact the development of communication skills of coaches in the North-West Zone, Nigeria?

### **Hypothesis**

There is no significant impact of the training adequacy of the NIS on the development of communication skills of coaches in the North-West Zone, Nigeria.

### **Methodology**

The research design adopted for this study was the survey research design, which was considered most appropriate for examining the impact of the training adequacy of the National Institute for Sports (NIS) on the development of communication skills of coaches in the North-West Zone, Nigeria. The population of the study comprised four hundred and fifty (450) coaches drawn from six major sports: Football, Basketball, Taekwondo, Tennis, Athletics, and Swimming, who were trained by the NIS between 2019 and 2023. These coaches were distributed across the States' Sports Organizations in Jigawa, Kaduna, Kano, Katsina, Kebbi, Sokoto, and Zamfara States. The distribution of the population across the states reflected the varying number of coaches engaged in different sporting activities.

A sample size of 269 coaches was determined for the study using Adam's (2020) sample size determination table, which recommends this figure for a population of 450 with a 99% confidence level and a 0.05 margin of error. To ensure representativeness, the study employed a multi-stage sampling procedure. At the first stage, the North-Western states were identified as strata. At the second stage, a purposive sampling technique was used to select coaches in the six sports disciplines under investigation. At the third stage, proportionate sampling was applied to determine the exact number of coaches selected

from each state and sport, ensuring fairness in distribution relative to the size of the population. Finally, convenience sampling was employed to reach the respondents within their respective States' Sports Organizations. This four-stage procedure ensured that the sample was both statistically valid and practically feasible for data collection.

The instrument for data collection was a researcher-developed questionnaire consisting of two sections. Section A sought demographic information from respondents, while Section B contained eight items addressing communication skills, which were a core area of focus for assessing training adequacy. The items were structured on a four-point Likert scale with options ranging from Strongly Agree (4 points) to Strongly Disagree (1 point). A decision benchmark of 2.50 was established, such that responses with mean scores equal to or greater than 2.50 were interpreted as positive, while those below 2.50 were regarded as negative. This scale was chosen because of its simplicity, clarity, and suitability for measuring attitudes and perceptions in educational and sports-related research.

To ensure the validity and reliability of the instrument, the questionnaire was first subjected to expert scrutiny. Specifically, five jurors with expertise in sports management reviewed the instrument for both face and content validity. Their feedback was incorporated into the final draft of the questionnaire before it was pilot tested. A pilot study was subsequently conducted in Bauchi and Gombe States, which share similar attributes with the study area. Fifty questionnaires were administered to coaches across the six sports disciplines, and the responses were analysed using Cronbach's alpha to test for internal consistency. The reliability coefficient obtained was 0.857, which was considered highly reliable since it is closer to 1 than to 0. This result aligned with Razavipour and Raji's (2022) assertion that a reliability coefficient closer to 1 indicates strong internal consistency. Thus, the instrument was deemed both valid and reliable for the study.

The procedure for data collection involved obtaining an introductory letter from the Department of Human Kinetics and Health Education, Ahmadu Bello University, Zaria, which was presented to the respective State Sports Organizations. Seven research assistants, one for each state, were engaged and trained by the researcher on the proper administration and retrieval of the questionnaires. Data collection was conducted over a period of two weeks to allow sufficient time for the distribution and retrieval of responses. Upon completion, the collected data were analysed using the Statistical Package for Social Sciences (SPSS) version 30. Descriptive statistics such as frequencies and percentages were used to analyse respondents' demographic characteristics, while mean and standard deviation were employed in answering the research question. Furthermore, the Chi-square ( $\chi^2$ ) statistic was used to test the hypothesis at a 0.05 level of significance.

**Result**

**Table 1: Analysis of Respondents' Demographic Characteristics**

S/N	Variable	Variable Options	Frequency	Percent
1	<b>Gender</b>	Male	244	92.1
		Female	21	7.9
		<b>Total</b>	<b>265</b>	<b>100.0</b>
2	<b>Age</b>	18 - 25 years	13	4.9
		26 - 33 years	42	15.8
		34 - 41 years	127	47.9
		42 years & above	83	31.3
		<b>Total</b>	<b>265</b>	<b>100.0</b>
3	<b>Highest Educational Qualification</b>	Diploma/NCE	127	47.9
		Bachelor's degree/HND	86	32.5
		Master's degree/PGD	40	15.1
		Ph.D	12	4.5
		<b>Total</b>	<b>265</b>	<b>100.0</b>
4	<b>Years of Coaching Experience</b>	Less than 5 years	11	4.2
		5-9 years	48	18.1
		10-14 years	51	19.2
		15- 19 years	97	36.6
		20 years or more	58	21.9
<b>Total</b>	<b>265</b>	<b>100.0</b>		
5	<b>Sport Coaching</b>	Football	83	31.3
		Taekwando	60	22.6
		Tennis	38	14.3
		Basketball	35	13.2
		Athletics	32	12.1
		Swimming	17	6.4
<b>Total</b>	<b>265</b>	<b>100.0</b>		

The males, as indicated in Table 1, were 244 (92.1%), while the females were 21 (7.9%) of the total number (265) of respondents involved in the study. For age distribution, the table indicated that 13 (4.9%) of the respondents were between 18 – 25 years of age. Those who were between 26 and 33 years were 42 (15.8%), and 127 (47.9%) of the respondents were within the age bracket of 34 and 41 years. Those above 41 years were 83 (31.3%) of the total number of respondents involved in the study. The educational qualification of the respondents shows that 127 (47.9%) had Diploma/NCE, 86 (32.5%) had a Bachelor's Degree/HND, 40 (15.1%) had a Master's Degree/PGD, and 12 (4.5%) had a PhD.

In terms of years of experience, 11 (4.2%) of the respondents have been involved in sports coaching for less than 5 years. Those with 5 to 9 years of experience were 48 (18.1%), 51 (19.2%) have between 10 and 14 years of experience, 97 (36.6%) have between 15 and 19 years of experience, and 58 (21.9%) of the respondents have been in sports coaching for more than 19 years. By sports preference, 83 (31.3%) of the respondents were football coaches, 60 (22.6%) were Taekwondo coaches, 38 (14.3%) were Tennis coaches, 35 (13.2%) were Basketball coaches, 32 (12.1%) were athletics coaches, and 17 (6.4%) were swimming coaches.

**Research Question:** To what extent does the training adequacy of the NIS impact the development of communication skills of coaches in the North West Zone of Nigeria?

**Table 2: Mean Scores and Standard Deviation of Responses on the Impact of Training Adequacy of the NIS on the Communication Skills of Coaches in the North West Zone of Nigeria**

S/N	Items	Mean	Std. Dev.
1	The communication skills I acquired from NIS have helped me as a coach to acquire more knowledge in my chosen sports.	3.11	0.78
2	The verbal communication skills learned from NIS have helped me deliver well in my coaching career.	3.32	0.76
3	The NIS has helped me to be sensitive to correcting the mistakes of my athletes using effective communication.	3.09	0.79
4	I have learnt to use body language in communicating with my athletes when coaching from the NIS.	3.42	0.72
5	I have learnt to talk while demonstrating to draw the attention of coachees to key points in my coaching career.	3.20	0.74
6	The ability to give good demonstrations through effective communication is a priceless asset I received from the NIS.	3.23	0.85
7	As a coach, I was trained to combine both verbal and non-verbal communication skills in coaching my athletes.	3.35	0.83
8	Communicating using coaching videos, handouts, and charts, which I learnt from the NIS, has been useful to me as a coach.	3.63	0.77
<b>Aggregate mean</b>		<b>3.29</b>	<b>0.78</b>

(Benchmark = 2.50)

Table 2 shows the mean scores and standard deviation of responses on the impact of training adequacy of the NIS on the communication skills of coaches in the North West Zone of Nigeria. The analysis revealed a mean aggregate of 3.29, which is greater than the benchmark of 2.50. This implies that the training adequacy of the NIS has an impact on the development of communication skills of coaches in the North West Zone of Nigeria.

**Hypothesis:** There is no significant impact of the training adequacy of the NIS on the development of communication skills of coaches in the North West Zone of Nigeria.

**Table 3: Chi-square ( $\chi^2$ ) Analysis on the Impact of Training Adequacy of the NIS on the Communication Skills of Coaches in the North West Zone of Nigeria.**

Variable	N	df	Cal. $\chi^2$ value	p-value	Decision
Communication Skills of Coaches	265	21	131.729	0.000	Rejected

$X^2$  Crit = 32.7, (df = 21)      P < 0.05

Results in Table 3 show that there is a significant impact of the training adequacy of the NIS on the development of communication skills of coaches in the North West Zone of Nigeria. Reason being that the p-value of 0.000 is less than the 0.05 level of significance, while the chi-square ( $\chi^2$ ) Cal. value of 131.729 is greater than the chi-square critical value of 32.7 ( $X^2$  Cal (131.729) >  $X^2$  Crit (32.7), P < 0.05) at df 21. Therefore, the null hypothesis, which states that 'there is no significant impact of the training adequacy of the NIS on the development of communication skills of coaches in the North West Zone of Nigeria', is hereby rejected. Hence, the result implies that the training adequacy of the NIS has a significant impact on the development of communication skills of coaches in the North West Zone of Nigeria.

**Discussion of Finding**

The study revealed that there is a significant impact of the training adequacy of the NIS on the development of communication skills of coaches in the North West Zone of Nigeria (p = 0.000,  $X^2$  Cal = 131.729). This finding is consistent with Ogunmilade and Adebayo (2014), who found that coaches who completed the NIS's communication training modules demonstrated significantly improved verbal and non-verbal communication skills (p < 0.05). Similarly, the findings of this study also supported that of Babatunde and Oluwaseun (2016), who reported a 62% increase in positive athlete interactions and a 45% reduction in communication-related conflicts among NIS-trained coaches, further validating the effectiveness of the institute's programs. Ekechukwu and Ibrahim (2018) also concluded that formal institutional training significantly enhanced communication competencies, particularly in active listening and conflict resolution, which supports the current finding. Additionally, Olajide and Adesanya (2020) revealed that structured NIS training led to marked improvements in instructional communication and feedback provision, reinforcing the consensus that NIS programs are instrumental in developing coaches' communication skills.

**Conclusion**

From the findings of this study, it was concluded that there is a significant impact of the training adequacy of the NIS on the development of communication skills of coaches in the North West Zone of Nigeria. This implies that the training adequacy of the NIS has an impact on the development of communication skills of coaches in the North West Zone of Nigeria.

### Recommendation

The study recommended that the Federal Ministry of Sports should strengthen the communication component of NIS training programmes to further enhance coaches' interpersonal and instructional effectiveness.

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## THE IMPACT OF SPORT UNITS IN PROMOTING THE STATUS OF SPORT IN TERTIARY INSTITUTIONS IN THE NORTH-EAST ZONE, NIGERIA

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### Abstract

This study assessed the impact of Sport Units in promoting the Status of Sport in Tertiary Institutions in the North-East Zone, Nigeria. The population of this study comprised of Twenty-Five (25) tertiary institutions in North-East Geo-Political Zone of Nigeria which comprised of students, Deans of students' affairs, coaches, Sports Personnel, members of sports committees and sports clubs in Universities, Polytechnics, Colleges of Education, Monotechnics and Colleges of Agriculture with a population of One Thousand Six Hundred and Seventy-Nine (1,679) respondents. Three hundred and six (306) were used as a sample for this study. The sample of the study was guided by the Research Advisor (2006), who opined that for a population of one thousand six hundred and seventy-nine (1,679), three hundred and six (306) is an adequate sample size based on the confidence level of 95% with a marginal error of 0.05. The instrument used for data collection was the self-developed questionnaire in which seven research questions and seven hypotheses were formulated to guide this study. A total of 306 copies of the questionnaire were distributed to the respondents, and 300 were retrieved. Descriptive statistics of mean and standard deviation were used to answer the research questions, and chi-square was used to analyse all the hypotheses at the 0.05 alpha level. The results revealed that organization of intramural and extramural sport programmes by sport units had significant impact on the status of sports in tertiary institutions in North-East zone of Nigeria ( $p = 0.000$ ) and involvement of the sport units in budget planning for sports programmes had significant impact on the status of sports in tertiary institutions in the North-East zone of Nigeria ( $p = 0.00$ ). This study concludes that the organization of intramural and extramural sport programs, the involvement of sport units in budget planning, effective planning for sports programs, and the provision and maintenance of sports facilities. It was recommended that other tertiary institutions should establish and maintain comprehensive intramural and extramural sports programmes with adequate funding and support. Sports units in the North-East zone of Nigeria should have greater involvement in budget planning processes with dedicated annual allocations for sports programmes.

**Keywords:** Impact, Sports Unit, Status of sports, Tertiary institutions

### Introduction

Sport is a broad term and as well flexible, such that it includes a variety of sporting activities that have received support from a wide range of organisations involved in sports development. In addition, sports include formal and non-formal, involuntary and leisure-time play activities. This includes play, leisure, and recreation activities, casual and competitive sports, and indigenous sports and games. According to Williams (2018) stated that sports include all forms of physical activities that contribute to the psychological, physical, health, and economic development. Sullivan (2017) argued that sports have four essential elements. Physical activity is undertaken for recreation and exercise purposes, which takes place within a framework of organised competition that is regulated in an institutional setting. However, despite the practical context, the boundaries between activities remain blurred.

It is an undeniable fact that sports are a dependable tool for development, health, and peace in a nation. The Federal Government of Nigeria realizes these potentials of sports to contribute to national development when it emphasizes the need to promote sports in all sectors. In its strategic plan for the development of the education sector (2011 – 2015), the government directed that sport participation should be encouraged at all levels of education through the provision of facilities, equipment, and personnel for the promotion of the health of the individual, development of skills, and socio-emotional well-being of all individuals in our educational institutions. Based on the above statement, the United Nations General Assembly adopted a resolution titled Sports as a means to promote education, health, development, and peace (Tore, 2019).

The status of sports in tertiary institutions in Nigeria encompasses several dimensions, including the role of sports in student life, institutional support for athletic programs, and the broader implications for national development and unity. Sports play a crucial role in the holistic development of students at Nigerian universities. Participation in sports activities fosters physical fitness, teamwork, discipline, and leadership skills among students. It also provides a platform for social interaction and community building, enhancing the overall university experience.

Tertiary institutions in Nigeria, in adherence to the directives of the Federal Government, have been encouraging students' participation in different sporting activities through the provision of facilities, equipment, organising training, and recruitment

of personnel for various sporting competitions, such as local, national, and international. The main objectives of such participation are to promote the health, fitness, and academic performance of students (Williams, 2018).

The objective of establishing the Sport Unit in tertiary institutions is to organise sporting activities and competitions amongst students. The best of these students and student-athletes are selected to represent their various tertiary institutions in various national and international sports competitions. The sports unit is seen as a vehicle that promotes the four fundamental principles of Adventist Philosophy of Education, namely spiritual, social, physical, and mental well-being of staff and students. The sports unit is in charge of organising athletic events and contests for the institution's student body, with the best of these athletes being chosen to represent the university in different national and worldwide tournaments. The tertiary institutions' sports unit also encourages staff and students to engage in one or more types of sporting activities (Vink, Raudsepp & Kais, 2015).

A tertiary institution refers to all formal post-secondary education, including public and private universities, colleges of education, polytechnics, technical training institutes, and vocational schools. This study, therefore, assessed the impact of sports units in promoting the status of sport in tertiary institutions in the North-East zone of Nigeria.

### **Statement of the Problem**

The Sport Unit of tertiary institutions provides a variety of sporting activities to promote the physical, mental, and social well-being of both staff and students. The Sports Unit strongly encourages staff and students to be involved in sporting activities at their various institutions. Participating in these sporting activities is a great way to stay fit, relieve stress, socialize and take up new and exciting hobbies, all in a safe, welcoming and stimulating serene environment. Physical activity participation helps reduce stress and anxiety and makes one a better, happier person. Sports helps to develop the physical as well as mental strength of students. Daily physical exercise is essential because exercise not only help to stay healthy, but it also helps to improve their emotional fitness and academic performance.

The Sport units of various tertiary institutions in the North–East Zone of Nigeria have the responsibility of developing and improving sporting activities to the highest attainable standards. The Directors of Sports with the team of coaches and other personnel work so hard to see to the promotion of the interest of all students in participation in sports. The tertiary institutions also organises inter faculty sports competitions where the vice chancellors', Rectors' and Provosts' trophies are won in various sports, especially in football which seems to be organised by various tertiary institutions in Nigeria.

Despite all these importance attached to the sport unit, the researcher observed that the sport unit otherwise called the sports office or the sports directorate which are under the Students Affairs Division of various tertiary institutions seems to find it difficult to accommodate most sports men and women as a result of the lack of adequate accommodation. This according to the researcher seems to be a demotivating factor of the sport unit in promoting the status of sport in these tertiary institutions.

Also worth noting by the researcher is that there seems to be non provision of sports facilities and equipment in these units which ought to be a motivating factor in the promotion of sports. The researcher observed that most of the sporting facilities and equipment owned by these tertiary institutions are either damaged or seems to lack maintenance. Furthermore, the researcher also observed with dismay the gross inadequacy of budgets allocated to the sport units in most of these tertiary institutions which ought to be a motivating factor to the sport units to be able to plan and execute their sports programmes. The researcher further observed that most of the sports unit in tertiary institutions seems not to have a maintenance culture in maintaining their sports facilities as majority of the sports facilities are found to be damaged which might be the lack of maintenance. This study therefore assessed the impact of sport units in promoting the status of sport in tertiary institutions in the North-East Geo=Political zone of Nigeria.

### **Purpose of the Study**

The purpose of this study is to find out:

1. If the organization of intramural and extramural sports programme by sport unit have impact on the status of sports in tertiary institutions.
2. If budget planning for sports programme by sport unit have impact on the status of sports in tertiary institutions.

### **Research Questions**

The following research questions are stated for the purpose of this study:

1. Would organization of intramural and extramural sport programmes by sport units have any significant impact on the status of sports in tertiary institutions?
2. Would the involvement of the sport units in budget planning for sports programme have any significant impact on the status of sports in tertiary institutions?

### **Hypotheses**

1. Organization of intramural and extramural sport programmes by sport units has no significant impact on the status of sports in tertiary institutions in North-East zone of Nigeria.
2. Involvement of the sport units in budget planning for sports programme has no significant impact on the status of sports in tertiary institutions in North-East zone of Nigeria.



### Review of Empirical Studies

Aina (2022) a study titled "Impact of Sports units on Student Engagement in Sports Culture in Educational Institutions," the researcher employed a survey design method to assess the influence of sports programs on tertiary education. A sample size of 400 students and sports administrators was selected using stratified random sampling. Data was collected through a structured questionnaire and analysed using chi-square statistics to test the significance of the findings. The study revealed a significant relationship ( $p$ -value  $< 0.05$ ) between the organization of intramural and extramural sports programs and improved sports culture within tertiary institutions. Aina concluded that structured and well-managed sports programs significantly enhance students' participation in sports, leading to a positive shift in the overall sports culture. The study recommended that tertiary institutions should prioritize the organization of intramural and extramural sports and the promotion of structured sports programs and ensure that sports units are well-staffed with qualified personnel for effective organization and implementation.

Nwankwo and Udeh (2022) in research titled "The Role of Sports Units in Promoting Intramural and Extramural Activities in Higher Education," conducted a mixed-method study involving 250 sports unit staff and students across five tertiary institutions. The researchers utilized interviews and questionnaires as data collection instruments, and thematic content analysis alongside chi-square tests were employed for data analysis. The findings indicated a significant impact ( $p$ -value  $< 0.05$ ) of dedicated sports units in the effective organization of sports programs, leading to enhanced visibility, increased student participation, and improved allocation of resources to sports activities. The study emphasised that sports units serve as vital pillars for fostering sports development in higher institutions. The authors recommended that tertiary institutions strengthen the capacity of sports units by providing adequate training, funding, and infrastructural support.

Kayode and Tunrayo (2022) in study titled "Bureaucratic Processes, Zero-Based Budgeting, and Bottom-Up Budgeting: Implications for Sports Facility Maintenance in Kwara State Sports Council, Nigeria," Kayode and Tunrayo examined the relationship between budgeting planning approaches for sports programmes in tertiary institutions in Nigeria. The researchers employed a survey method, using structured questionnaires as their instrument for data collection. A sample size of 120 sports administrators and budget planners of sports units using stratified random sampling. The data were analysed using chi-square statistical methods. Their findings showed a significant impact ( $p < 0.05$ ) of zero-based and bottom-up budgeting approaches on the effective implementation of sports programmes in tertiary institutions in Nigeria. Based on these findings, the study recommended the adoption of budgeting planning practices in sports program planning to enhance the sustainability and functionality of sports programmes in the state.

Edenedo, Akarah, and Tayire (2022) titled "Budgeting as a Panacea for Sports Development in Universities in South-South Nigeria" by Edenedo, Akarah, and Tayire explored the role of budgeting in fostering sports development in tertiary institutions. Using a descriptive survey design, the researchers collected data from 200 sports personnel, including administrators, coaches, and athletes, using a structured questionnaire. The collected data were analysed using multiple regression analysis. The study revealed a significant positive relationship ( $p < 0.05$ ) between effective budgeting planning practices and sports development in the universities studied. The authors recommended regular training workshops on budgeting planning principles for sports personnel and emphasised the importance of preparing annual budgets to optimize resource allocation and sports development in higher education institutions.

Udokanma and Onwunaka (2017) in a work titled "Challenges and Prospects in budget planning of Sports in colleges of Education in Awka South Educational Zone, Nigeria," investigated the factors affecting sports development at colleges of Education level. The researchers utilized a qualitative approach, conducting in-depth interviews with 50 respondents, including provosts, physical education teachers, and sports coordinators. Thematic analysis of the data revealed significant challenges such as inadequate budget planning, lack of government support, and mismanagement of allocated funds. Unlike the positive outcomes associated with involving sports units in budget planning in tertiary institutions, these findings highlighted systemic issues at the secondary school level. The study recommended increased government budget, proper allocation of resources, and the establishment of transparent accountability mechanisms to address these challenges effectively.

### Methodology

Survey research design was used for this study. According to Sunusi (2016), survey research design is a kind of survey design in which a person is able to find out the feelings of others. This design is suitable for this study since it attempts to find out the opinions of the respondents on the impact of sport unit in promoting the status of sport in tertiary institutions in North-East zone of Nigeria. Specifically, Ex-post Facto research design was used in this study. The population of this study comprised of Twenty-Five (25) tertiary institutions in North-East Geo-Political Zone of Nigeria which comprised of students, Deans of students' affairs, coaches, Sports Personnel, members of sports committees and sports clubs in Universities, Polytechnics, Colleges of Education, Monotechnics and Colleges of Agriculture with a population of One Thousand Six Hundred and Seventy-Nine (1,679) respondents (Field Survey, 2023). Three hundred and six (306) respondents were used as sample for this study. The sample of the study was guided by research Advisors, (2006) which opined that for a population of One Thousand Six Hundred and Seven-Nine (1,679), Three Hundred and Six (306) is an adequate sample based on the confidence level of 95% with a marginal error of 0.05. The researcher used multistage sampling procedure to select the sample for the study. According to Njodi and Bwala (2014), multistage sampling is a procedure carried out in phases and usually involves more than one sampling method. They further stated that in a very large and diverse study population, sampling may be done in two or more stages.

The instrument used in this study was a self-developed questionnaire. The instrument comprised of 16 items (8 items each for organization of intramural and extramural sports, and 8 items on budget Planning). The items were based on five-point Likert rating scale that allows respondents to indicate the existence or non-existence of the items on the questionnaire. The scoring

of the responses was as follows (Strongly Agree (SA) 5 points; Agree (A) 4 points; Undecided (U) 3 points; Disagree (D) 2 points; and Strongly Disagree (SD) 1 point. A pilot study was carried out with the College of Agriculture Jalingo, Taraba State. This State was selected as it has similar attributes to that of other States in the Zone. Therefore, eighteen (18) copies of the questionnaire were distributed to the respondents in this College. The data gathered from the pilot study was analysed to determine the reliability coefficient of the instrument using Guttman split-half, Cronbach alpha and spearman-Brown statistics. The reliability coefficient obtained from the data revealed that the instrument is reliable as the Cronbachs Alpha is 0.851, Spearman Brown Coefficient was .849 while the Guttman Split-Half was also .862. This result was in line with the position of Kerlinger (2016) posited that, an instrument is reliable if it lies between 0 and 1 hence the closer the calculated value of the reliability co-efficient is to zero, the less reliable the instrument, and the closer the value is to 1, the more reliable. Since the three values of 0.851, .849 and .862 are closer to 1 they are adjudged to be reliable and therefore fit for the study.

Prior to the collection of data, the researcher collected a letter of introduction from the Head of Department, Human Kinetics and Health Education, Ahmadu Bello University, Zaria, which was duly signed by the researcher’s major supervisor. A total of 306 copies of the questionnaire were administered by the researcher and seven (6) research assistants to all the respondents in the respective Universities, Polytechnics, Colleges of Education, Monotechnics and College of Agriculture in the North-East Geo-Political Zone of Nigeria. The instrument was retrieved after one week by the researcher and used for analysis. For the purpose of analysing the data, the Statistical Package for Social Science (SPSS) version 20 was used for the analysis of the data collected. Mean and standard deviation was used for analyses of the responses to the research questions while inferential statistics of Chi-square was used to test all the null hypotheses at 0.05 level of significance.

**Results and Discussion**

A total of three hundred and six (306) copies of the questionnaire were distributed to the respondents, while a total of three hundred (300) copies of the questionnaire were retrieved with six (6) copies of the questionnaire rendered invalid because the questions were not filled bringing it to the total of 300 representing 98.0%.

**Responses to Research Questions**

**Research Questions One:** Would organization of intramural and extramural sport programmes by sport units have any significant impact on the status of sports in tertiary institutions?

**Table 1: Mean scores and Standard Deviation on the impact of organization of Intramural and Extramural Sport Competitions by the Sport Units on the promotion of sport status in Tertiary Institutions in the North-East Zone, Nigeria**

S/N	Statements	Mean	Std. Dev.	Remark
1.	My institution organizes intramural and extramural sports programme to promote Sport in Tertiary Institutions in Nigeria	3.86	1.33	Agree
2.	My institution organizes intramural and extramural sports programme once a year to promote Sport.	3.55	1.32	Agree
3.	My institution has never organized intramural and extramural sports programme to promote Sport.	3.90	1.26	Agree
4.	My institution organizes intramural and extramural sports programme regularly to promote Sport.	3.85	1.20	Agree
5.	My institution organizes intramural and extramural sports programme twice a year to promote Sport.	3.09	1.11	Agree
6.	The sports unit in my institution does not have a calendar of events in organizing intramural and extramural sports	3.42	1.19	Agree
7.	The sports unit does have a calendar for intramural and extramural sports but does not use it	3.20	1.28	Agree
8.	My institution has never organized extramural sports with other institutions	3.73	1.47	Agree
<b>Aggregate mean</b>		<b>3.58</b>	<b>1.27</b>	

(Benchmark: Mean ≥ 3.00 = Agreed; Mean < 3.00 = Disagree)

Table 1 shows the analysis of the mean scores and standard deviation of the responses by the respondents on the impact of organization of intramural and extramural sport programmes by the sport units in Tertiary Institutions in the North-East Zone, Nigeria. The analysis reveals a mean aggregate of 3.58 which is greater than the benchmark of 3.00. This analysis implies that the organization of intermural and extramural sports by the sport units has significant impact on the promotion of sport status in Tertiary institutions in the North-East of Nigeria.

**Research Questions Two:** Would the involvement of the sport units in budget planning for sports programmes have any significant impact on the status of sports in tertiary institutions?

**Table 2: Mean scores and Standard Deviation on the impact of Budget planning for sport programmes by the Sport Units on promotion of the status of sport in Tertiary Institutions in the North-East Zone, Nigeria**

S/N	Statements	Mean	Std. Dev.	Remark
1.	There is no proper budget planning of sports programme in my institutions sport unit	3.65	1.07	Agree
2.	There is inadequate budget planning of sports programme in my institutions sport unit	3.66	1.12	Agree
3.	There is proper budget planning for sports programme in my institutions sports unit.	3.36	1.56	Agree
4.	Sports Directors in the sport units restrict their budget planning to favour some selected sports	3.60	1.37	Agree
5.	Sports Directors in my institution does not involve coaches in budget planning	3.50	1.29	Agree
6.	The Sports committee in my institution plans the budget for the Sports unit	3.84	1.22	Agree
7.	The student's union of my institution are involved in the planning of the sports unit budget	3.55	1.23	Agree
8.	There is proper budget planning for sports programme in my institutions sports unit but not adequately followed	3.94	1.56	Agree
	<b>Aggregate mean</b>	<b>3.64</b>	<b>1.30</b>	

(Benchmark: Mean  $\geq$  3.00 = Agreed; Mean  $<$  3.00 = Disagree)

Table 2 shows the analysis of the mean scores and standard derivation of the responses by the respondents on the impact of budget planning for sport programmes by the sport units in Tertiary Institutions in the North-East Zone, Nigeria. The analysis reveals a mean aggregate of 3.64 which is greater than the benchmark of 3.00. this analysis implies that budget planning for sports by the sport units has significant impact on the promotion of sport status in Tertiary institutions in the North-East of Nigeria.

**Testing of hypotheses**

**Hypothesis One:** Organization of intramural and extramural sport programmes by sport units has no significant impact on the status of sports in tertiary institutions in North-East zone of Nigeria

**Table 3: Chi-square Analysis on the impact of organization of intramural and extramural sport programmes by sport units have impact on the promotion of sport status in Tertiary institutions in North-East Zone, Nigeria**

Variable	N	$\chi^2$ Cal	df	P value	Decision
<b>Organization of intramural and extramural sports</b>	300	158.553	28	0.000	Rejected

$X^2$  Crit (41.3),  $P < 0.05$

Results in table 3 showed that Organization of intramural and extramural sport programmes by sport units had significant impact on the status of sports in tertiary institutions in North-East zone of Nigeria. Reasons being that the P-value of 0.000 is less than 0.05 level of significance while the chi- square ( $\chi^2$ ) Cal. value of 158.553 is greater than the chi -square critical value of 41.3 ( $X^2$  Cal (158.553)  $>$   $X^2$  Crit (41.3) at df 28. Therefore, the null hypothesis which states that Organization of intramural and extramural sport programmes by sport units has no significant impact on the status of sports in tertiary institutions in North-East zone of Nigeria is hereby rejected. The result revealed that Organization of intramural and extramural sport programmes by sport units had significant impact on the status of sports in tertiary institutions in North-East zone of Nigeria.

**Hypothesis Two:** Involvement of the sport units in budget planning for sports programmes has no significant impact on the status of sports in tertiary institutions in North-East zone of Nigeria.

**Table 4: Chi-square Analysis on the impact of Budget planning for sports programmes by sport units on the promotion of the sport status in Tertiary Institutions in North-East Zone, Nigeria.**

Variable	N	$\chi^2$ Cal	df	P value	Decision
<b>Budget planning for Sports Programmes</b>	300	133.440	28	0.000	Rejected

$X^2$  Crit (41.3),  $P < 0.05$

Results in table 4 showed that involvement of the sport units in budget planning for sports programmes had significant impact on the status of sports in tertiary institutions in North-East zone of Nigeria. Reasons being that the P-value of 0.000 is less than 0.05 level of significance while the chi- square ( $\chi^2$ ) Cal. value of 133.440 is greater than the chi -square critical value of 41.3 ( $X^2$  Cal (133.440)  $>$   $X^2$  Crit (41.3) at df 28. Therefore, the null hypothesis which states that "Involvement of the sport units in budget planning for sports programmes has no significant impact on the status of sports in tertiary institutions in North-East zone of Nigeria" is hereby rejected. The result revealed that Involvement of the sport units in budget planning for sports programmes had significant impact on the status of sports in tertiary institutions in North-East zone of Nigeria.

**Discussion**

**Hypothesis One** reveal that the organization of intramural and extramural sports programs by sports units had a significant impact on the status of sports in tertiary institutions. This is supported by the statistical evidence (p-value  $<$  0.05 and chi-square

value exceeding the critical value). This finding is consistent with Aina (2022) who found out that well-coordinated sports programs not only improve student engagement in physical activities but also contribute to the overall development of sports culture in educational institutions. The presence of dedicated sport units plays a critical role in ensuring that these programs are effectively managed and promoted, leading to greater visibility and resource allocation for sports (Nwankwo & Udeh, 2022). Conversely, some studies suggest that the mere organization of sports programs is insufficient without adequate support structures, such as funding and facilities. For instance, Osho et al. (2018) argue that while organization is essential, it must be supplemented by investment in infrastructure to achieve meaningful impacts on sports status. Thus, while the current findings affirm the significance of organized sports programs, they also highlight the need for a multifaceted approach that includes resources and community support to maximize the benefits of such initiatives in tertiary institutions.

**Hypothesis Two** reveal that the involvement of sport units in budget planning for sports programs had a significant impact on the status of sports in tertiary institutions in the North-East zone of Nigeria. The statistical analysis showed a p-value of 0.000, which is less than the 0.05 alpha level of significance, and the calculated chi-square value of 133.440 was greater than the critical value of 41.3. This led to the rejection of the null hypothesis, indicating that the involvement of sport units in budget planning had a significant impact. This finding aligns with the study by Kayode and Tunrayo (2022), which found that bureaucratic processes, zero-based budgeting, and bottom-up budgeting had a significant impact on sports facility maintenance in the Kwara State Sports Council, Nigeria. The researchers recommended that sports budgeting should be prepared on a zero-budget basis to improve the effective management of sports facilities. Similarly, the study by Edenedo, Akarah, and Tayire (2022) on sports development in universities in South-South Nigeria revealed that budgeting is a panacea to sports development in these institutions. The researchers recommended training on budgeting principles and the advantages of preparing annual budgets for sports personnel in the universities. However, the findings from the study by Udokanma, and Onwunaka (2017) on the challenges and prospects in the promotion and development of sports in secondary schools in Awka South Educational Zone, Nigeria, suggest that secondary schools in the area face challenges such as inadequate sports facilities, insufficient support from the government, and mismanagement of funds. These findings contrast with the positive impact of involving sport units in budget planning on the status of sports in tertiary institutions.

### Conclusion

Based on the findings, it is concluded that the organization of intramural and extramural sport programs and the involvement of sport units in budget planning all had significant impacts on the status of sports in tertiary institutions in the North-East zone of Nigeria. These factors collectively demonstrate the crucial role that sport units play in promoting and enhancing the status of sports within these institutions, highlighting the importance of strong sport unit involvement and effective sports management for the overall development and recognition of sports in the region.

### Recommendations

Based on the findings of this study, the researcher put forward the following recommendations:

1. Sport Units in Tertiary institutions in North-East zone of Nigeria should maintain comprehensive intramural and extramural sports programmes with adequate funding and support.
2. Sport units in the North-East zone of Nigeria should have greater involvement in budget planning processes with dedicated annual allocations for sports programmes.

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## NEXUS BETWEEN HUMAN RESOURCE MANAGEMENT AND LECTURERS' JOB PERFORMANCE IN KWARA STATE COLLEGES OF EDUCATION, NIGERIA

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### Abstract

This study examined the nexus between human resource management and lecturers' job performance in Kwara State Colleges of Education, Nigeria. Descriptive research design of correlational type was used. Four hundred and four lecturers in the three state Colleges of Education formed the population of the study. All three institutions were purposively selected. Two hundred and two lecturers were proportionately selected out of the 404 in the institutions. Human Resource Management and Lecturers' Job Performance Questionnaire (HRMLJPQ) was used to collect data for the study. The instrument was validated, and its reliability test yielded a coefficient of 0.85. Pearson product-moment correlation was used to test the hypotheses. The study found that there was a significant relationship between human resource management and lecturers' job performance ( $p < 0.05$ ). The study concluded that human resource management plays a significant role in enhancing lecturers' job performance in Kwara State Colleges of Education, Nigeria. It was recommended, among other things, that the Kwara State Government should prioritise effective management of lecturers in Kwara State Colleges of Education, to perpetually boost their morale towards effective job performance, which would help enhance goal achievement in the institutions.

**Keywords:** Human Resource Management, Job Performance, Compensation, Recruitment, Professional Development

### Introduction

Lecturers are the engine room of any tertiary institution. The reason is that they are the custodians of knowledge and facilitators of learning. As such, for lecturers to be happy and highly motivated to discharge their duty of imparting knowledge to learners and others, which includes community service and research, effective human resource management needs to be put in place. Obeidat et al. (2016) explained human resource management as the policies and practices which include selection, job description, training, performance evaluation, reward, and career planning, for the purpose of maximising the profitability of organisation. Orozco et al. (2015) defined human resource management as the practices that entail examining and scheduling work, defining human resource needs, enticing potential employees, selecting employees, compensating employees, training employees, appraising their performance, and creating a positive work environment.

Yakubu et al. (2023) posited that human resource management involves recruitment, selection, supervision, promotion, development, reward, and appraisal. All these are essential for the realisation of effective lecturers' job performance in tertiary institutions. Yusuf and Adaramaja (2024) maintained that for higher institutions to achieve encouraging job performance of lecturers, there is a need for attractive human resource management which encompasses recruitment and selection, compensation, performance evaluation, and professional development, among others. Armstrong and Baron (2016) opined that human resource management is the managerial role that has to do with employee matters, which cover recruitment, compensation, development, performance management, safety, benefits, wellness, and training. Olaifa et al. (2023) stated that human resource management signifies a planned and holistic approach to handling employees in line with the culture and environment of a workplace, to achieve the predetermined goals. Effective human resource management helps lecturers to be productive and empowered to be able to contribute to the attainment of the institutional goals. The job performance of lecturers is key to the attainment of goal achievement in tertiary institutions (Abdulbaqi et al., 2024). Dar et al. (2014) elucidated job performance as the duties that a worker is expected to successfully carry out, with judicious use of the provided resources, so as to actualise the organisational goals. Owan et al. (2020) believed that job performance is a perception that is seen as the degree to which a blend of activities, such as research, teaching, and community service, is carried out by lecturers. Hassan (2018) explained that job performance means the attitudes exhibited by academic staff to the responsibilities given to them in the institutions. The job performance of lecturers is divided into three-community service, teaching, and research. Awodiji et al. (2020) stressed that job performance refers to the degree of effectiveness of academic staff, in reference to their responsibilities and roles within an institution. Onoyase (2017) viewed job performance of lecturers as a concept that could be observed from the angle of the result dimension. As such, job performance could be seen as the extent to which lecturers attain educational outcomes expected of them.

The aspects of human resource management which this study focused on were compensation, professional development, and the recruitment process. Reddy (2020) elucidated compensation as the remuneration given to a worker by the employer, in



exchange for his or her meaningful inputs to the attainment of the organisational goals. Compensation, through monetary and non-monetary benefits, helps to harmonise the employer-employee relationship. Akankpo (2024) opined that compensation is an initiative strategy to attract and retain efficient workers to an organisation. Not only that, it is a means of boosting employees' morale towards discharging their duties to enhance the attainment of higher productivity for an organisation. It is classified into two, viz, monetary reward and non-monetary rewards. The findings of the study conducted by Yusuff and Adaramaja (2025) revealed that there was a significant relationship between human resource management and teachers' job performance. The finding of study conducted by Afriyie et al. (2020) found that there was a significant effect of compensation on employees' performance at the Technical University in Ghana. Mestry (2017) believed that professional development is a crucial aspect of human resource management in the tertiary education system in Nigeria, because of its importance in enhancing services delivery of lecturers and the attainment of high-quality higher education. Maxwell (2024) believed that professional development refers to the process of improving the skills and abilities of the workers in organisations, to achieve their goals efficiently. It also means the systematic process of building, consolidating, and sustaining the capabilities of workers in organisations to realise the set objectives. Komariah et al. (2018) maintained that professional development assists in boosting educators' knowledge, skills, and competence. Through professional development, educators are allowed to dissect experiences through learning, exchange of ideas, knowledge development, and conduct experiments. Thahir et al. (2023) believed that professional development is a tool that could be utilised to facilitate effective job performance of teachers. If professional development of teachers is prioritised, there is a likelihood that their service delivery could be effective and contribute significantly to the attainment of institutional goals.

Babarinde et al. (2017) opined that recruitment is the channel utilised in educational institutions to facilitate sustainability of the employees, by filling the vacuum created due to retirement, death, resignation, sickness, or redeployment. Olujuwon (2016) believed that it is via an appropriate recruitment process that competent and qualified workers who can effectively perform towards the actualisation of the organisational goals could be derived. Amie-Ogan and Epelle (2021) believed that an appropriate recruitment and selection process is a way of achieving effective job performance of employees. Recruitment is an important aspect of human resource management. However, how recruitment is done could determine the level of quality of lectures delivered to an organisation, especially in the aspect of their job performance. The study of Oladmeji (2020) found that there was a significant relationship between the recruitment process and lecturers' job performance in Colleges of Education in Kogi State. Sanni (2019) also found that there was a significant impact of recruitment on lecturers' job performance.

#### **Statement of the Problem**

Human resource management in the Kwara State Colleges of Education has not been encouraging enough, based on the information garnered from some lecturers in the institutions. Compensation of lecturers is no longer attractive. For instance, what lecturers get as a monthly salary is not sufficient to take good care of themselves, let alone their family members, due to inflation. Fringe benefits and other attractive means of compensating employees have not been adequately explored. Workshops, conferences, lecturers, symposia, and other related programmes that can help boost the lecturers' professionalism are not given adequate priority. In addition, the process of recruiting lecturers in the institutions, for years, has not been based on thorough assessment. All these could be causing ineffective job performance of lecturers.

Many studies related to this study have been conducted. Onoyase (2017) researched on motivation and job performance of lecturers of tertiary institutions in Nigeria: Implications for counselling. Awodiji et al. (2020) examined lecturers' job performance and students' wastage rate in tertiary institutions in Kwara State, Nigeria. Joshua et al (2022) conducted a study on the effects of compensation practices on academic staff's job performance in the Federal University of Agriculture, Abeokuta, Ogun State, Nigeria. Monday (2021) investigated the impact of human resource management on lecturers' job performance in universities in Ogun State, Nigeria. None of the studies mentioned above focused on the nexus between human resource management and lecturers' job performance in Kwara State Colleges of Education, Nigeria. Hence, this is the academic gap that the study filled.

#### **Objectives of the Study**

The study:

- i. Examined the relationship between human resource management and lecturers' job performance in Kwara State Colleges of Education, Nigeria;
- ii. determined the relationship between the recruitment process and lecturers' job performance in Kwara State Colleges of Education, Nigeria;
- iii. determined the relationship between professional development and lecturers' job performance in Kwara State Colleges of Education, Nigeria; and
- iv. Find out the relationship between compensation and lecturers' job performance in Kwara State Colleges of Education, Nigeria.

#### **Hypotheses**

**H<sub>01</sub>:** There is no significant relationship between human resource management and lecturers' job performance in Kwara State Colleges of Education, Nigeria.

**H<sub>02</sub>:** There is no significant relationship between recruitment process and lecturers' job performance in Kwara State Colleges of Education, Nigeria.

**H<sub>03</sub>:** There is no significant relationship between professional development and lecturers' job performance in Kwara State Colleges of Education, Nigeria.

**H04:** There is no significant relationship between compensation and lecturers’ job performance in Kwara State Colleges of Education, Nigeria.

**Methodology**

This study used descriptive research design of correlational type. The population of the study comprised all 404 lecturers in the three Colleges of Education established and financed by the government of Kwara State. The purposive sampling technique was used to select all three institutions. Through the use of proportionate sampling technique, 50% of the lecturers were selected in each of the institutions (74 lecturers out of the 147 in Kwara State College of Education, Oro; 49 lecturers out of the 97 in Kwara State College of Education, Lafiagi; and 79 lecturers out of the 158 in Kwara State College of Education, Ilorin) to arrive at a total of 202 respondents. A self-designed instrument entitled ‘Human Resource Management and Lecturers’ Job Performance Questionnaire’ (HRMLJPQ) was utilised to gather information. The instrument was structured into sections A-F. Sections A, B, and C focused on Compensation, Professional Development, and Recruitment Process, respectively. Sections D, E, and F were based on Teaching, Research, and Community Service, respectively. The instrument was validated, and the reliability test was also conducted. The data gathered were analysed via the use of Cronbach’s Alpha, and a reliability coefficient of 0.85 was realised. Pearson product-moment correlation statistic was used to test the hypotheses.

**Results**

**Table 1: Relationship between Human Resource Management and Lecturers’ Job Performance**

Variable	N	Mean	Std. Dev.	r-value	p-value	Decision
Human resource management	202	2.57	.74	.63	.002	Ho <sub>1</sub> Rejected
Lecturers’ job performance	202	2.81	.97			

Table 1 showed the r-value (.63) and the p-value (.002), which is less than the significance level (.05). Therefore, hypothesis one was rejected. This means that a significant relationship existed between human resource management and lecturers’ job performance in Kwara State Colleges of Education, Nigeria.

**Table 2: Relationship between Recruitment Process and Lecturers’ Job Performance**

Variable	N	Mean	Std. Dev.	r-value	p-value	Decision
Recruitment process	202	1.97	.42	.58	.002	Ho <sub>2</sub> Rejected
Lecturers’ job performance	202	2.81	.97			

Table 2 showed the r-value (.58) and the p-value (.002), which is less than the significance level (.05). Hence, hypothesis two was rejected. This depicts that there was a significant relationship between the recruitment process and lecturers’ job performance in Kwara State Colleges of Education, Nigeria.

**Table 3: Relationship between Professional Development and Lecturers’ Job Performance**

Variable	N	Mean	Std. Dev.	r-value	p-value	Decision
Professional development	202	2.78	.69	.69	.026	Ho <sub>3</sub> Rejected
Lecturers’ job performance	202	2.81	.97			

Table 3 showed the r-value (.69) and the p-value (.026), which is less than the significance level (.05). Therefore, hypothesis three was rejected. This signifies that there was a significant relationship between professional and lecturers’ job performance in Kwara State Colleges of Education, Nigeria.

**Table 4: Relationship between Compensation and Lecturers’ Job Performance**

Variable	N	Mean	Std. Dev.	r-value	p-value	Decision
Compensation	202	2.96	1.11	.67	.001	Ho <sub>4</sub> Rejected
Lecturers’ job performance	202	2.81	.97			

Table 4 showed the r-value (.67) and the p-value (.001), which is less than the significance level (.05). Hence, hypothesis four was rejected. This means that there was a significant relationship between compensation and lecturers’ job performance in Kwara State Colleges of Education, Nigeria.

**Discussion**

The findings of the study revealed that there was a significant relationship between human resource management and lecturers’ job performance in Kwara State Colleges of Education, Nigeria. This finding agrees with the finding of Oladimeji (2020) which revealed that there was a significant impact of human resource management on lecturers’ job performance. The finding corroborates the position of Yakubu, et al. (2023) that when human resource management in terms of recruitment, selection, induction, development, compensation, and appraisal is properly done for lecturers, there effective job performance is likely to be actualised. This finding supports the position of Samuel (2022) that employees are engine room of any organisation, tertiary institutions in no exemption. If lecturers are well-managed, they are likely to be motivated and effective performance of their job could be realised.

The study found that there was a significant relationship between recruitment process and lecturers' job performance in Kwara State Colleges of Education, Nigeria. This finding supports the finding of Monday (2021) that recruitment process had a significant relationship on lecturers' job performance in universities in Ogun State, Nigeria. This finding supports the position of Sanni (2019) that effective recruitment process is a crucial tool which could be used to derive workers who can effectively perform in a way which would help an organization to achieve its goals. The finding is also in agreement with the submission of Alao (2018) that recruitment is very significant in organisation. Effective recruitment process would help an organisation to get employees who can effectively perform while haphazard recruitment could lead to employing wrong workers, thereby leading to ineffective job performance.

The findings of the study revealed that there was a significant relationship between professional development and lecturers' job performance in Kwara State Colleges of Education, Nigeria. This finding supports the assertion of Paul and Audu (2019) to assist employees to continually discharge their duties as desired as demanded by the laid down standards, the managements of the organizations need to persistently provide professional development their workers. The finding supports the position of Hassan (2018) that improving the knowledge and skills of lecturers via various professional development programmes would help enhance their effective job performance. This finding agrees with the position of Alao (2018) that the more employees are supported with exposure to capacity building, the more the effectiveness of their job performance.

The study found that there was a significant relationship between compensation and lecturers' job performance in Kwara State Colleges of Education, Nigeria. This finding agrees with the finding of Joshua (2020) which revealed that there was a significant relationship between compensation on academic staff's job performance. This finding is in tandem with the finding of Monday (2021) that there was a significant relationship between compensation and lecturers' job performance in universities in Ogun State, Nigeria. This finding is in consonance to the position of Samuel (2022) that the manner in which lecturers are compensated could determine their job performance. This is the reason government needs to make compensation of lecturers a priority.

### Conclusion

The study concluded that human resource management plays a significant role in enhancing lecturers' job performance in Kwara State Colleges of Education, Nigeria. Specifically, Recruitment process, compensation, and professional development contribute significantly to the effective lecturers' job performance.

### Recommendations

Based on the findings of the study, it was recommended that:

- i. Kwara State Government should prioritize effective management of lecturers in Kwara State Colleges of Education, so as to perpetually boost their morale towards effective job performance which would help enhance goal achievement in the institutions.
- ii. There is need to ensure that recruitment process in the institutions follows the standards laid for the exercise, so as to ensure that those who competent and ready for lecturing are eventually employed to teach in the institutions.
- iii. Professional development of lecturers via conferences, workshops, lectures and the likes should be more prioritized by the government, to enable lecturers acquire more techniques, knowledge, and skills which would help them perform their job effectively.

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## INFLUENCE OF PARENTAL SOCIO-ECONOMIC VARIABLES ON THE DIETARY PATTERNS OF SCHOOL-AGE CHILDREN IN KADUNA STATE, NIGERIA

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### Abstract

This study assessed the influence of parental socio-economic variables on the dietary patterns of school-age children in Kaduna State, Nigeria. The research design of the study was an ex-post facto design. The population of the study consists of 2,219,429 women of childbearing age and their children; the sample size of the study was 384 mothers with their children. Children's height, weight, and BMI were measured with a weighing scale and measuring tape, and a questionnaire was used to collect data on the socio-economic status of the parents. Descriptive statistics were used to describe the demographic characteristics, while ANOVA and one-sample t-tests were used to test the hypotheses 1, 2, 3, and 4 at a 0.05 level of significance. Findings showed that the dietary patterns of school-age children in Kaduna State were statistically significant ( $p = 0.001 < 0.05$ ). Additionally, parental socio-economic variables significantly influenced these dietary patterns ( $p = 0.00 < 0.05$ ). Meanwhile the study underscore the complexity of addressing dietary patterns of school age children in Kaduna State and the facts that the dual burden of malnutrition present a unique challenge for public health interventions and the study recommends nutrition education programs targeting children, parents and caregivers, promoting maternal education on nutrition and health, and calls for support from NGOs like FAO to help reduce hunger, malnutrition, and enhance sustainable agriculture in the north west region.

**Keywords:** Dietary Patterns, School-Age Children, Nutrition, Parental Socio-Economic Status.

### Introduction

Dietary patterns, which are defined as the habitual combinations and frequencies of food consumption, are fundamental determinants of health and development in school-age children (Umar et al., 2024). As children grow, their nutritional needs change, making continuous monitoring of their dietary intake essential to ensure adequate nourishment and prevent adverse health outcomes. According to the World Health Organization [WHO] (2022), over 390 million children and adolescents worldwide do not meet recommended dietary guidelines, contributing to a concerning rise in overweight and obesity rates among children and adolescents aged 5 to 19 years. This shift is emblematic of a broader "nutrition transition," characterised by evolving food choices and lifestyle changes that impact dietary habits globally.

This nutrition transition is particularly pronounced in low- and middle-income countries, where traditional diets based on locally sourced, plant-based staples are increasingly supplanted by convenience-oriented, processed foods (Popkin & Gordon-Larsen, 2004). In Nigeria, customary diets consist predominantly of roots, tubers, and grains such as yams, maize, and cassava. These staples are commonly prepared as eba, fufu, and pounded yams, among others, and consumed alongside vegetables, animal proteins, oils, and spices. These traditional dietary patterns have historically provided balanced nutrition, yet they are now being displaced by Westernised diets high in refined sugars, fats, and processed ingredients, which pose risks to children's health (Popkin, 2017; Amugsi et al., 2017; Adeyemi et al., 2018; Akorede et al., 2022; Akorede et al., 2023; Harande et al., 2025).

At the international level, the dietary patterns of school-age children are under intense scrutiny due to their implications for global public health. WHO (2022) reports that more than 340 million children and adolescents worldwide are overweight or obese, a figure that reflects widespread dietary shifts toward energy-dense and nutrient-poor foods. Nationally, in Nigeria, this trend is evident with a notable coexistence of undernutrition and overnutrition among children, especially in urban areas where processed and fast foods are increasingly accessible. Approximately 30% of Nigerian children under five experience stunting, while overweight and obesity rates among school-age children have been reported at up to 10% in some urban centres, coupled with high rates of micronutrient deficiencies (UNICEF, 2021). At the state level, Kaduna reflects many of these national challenges, compounded by unique socio-economic and cultural factors (Akorede et al., 2022). Limited research in Kaduna highlights a gap in understanding the specific dietary behaviours and barriers faced by children, underscoring the need for localised studies to inform tailored nutrition interventions.

The transformation in dietary patterns reflects broader socio-economic changes such as urbanisation, increased market availability of processed foods, and shifting cultural preferences. These factors contribute to a complex nutritional environment in which children may simultaneously be exposed to undernutrition and overnutrition. The proliferation of energy-dense,

nutrient-poor foods alongside persistent micronutrient deficiencies presents a dual burden of malnutrition. Understanding these dietary patterns is therefore essential to address the multifaceted nature of malnutrition effectively (Akorede et al., 2022).

Furthermore, dietary patterns are shaped by socio-demographic and cultural factors, including family income, parental education, occupation, household size, and prevailing food beliefs and taboos (Akorede et al., 2022). These influences often dictate food availability and preferences, thereby affecting the nutritional quality of children's diets (Upadhyay & Tripathi, 2017; Adetunji et al., 2019; Akorede et al., 2018; Baba et al., 2019). In regions such as Kaduna State, Nigeria, the intricate interplay of these factors highlights the need for localised research to unravel the specific dietary challenges faced by school-age children.

Dietary patterns among school-age children are dynamic and closely linked to socio-economic, cultural, and environmental contexts (Ningi et al., 2022; Umar et al., 2024). Therefore, preserving the consumption of nutrient-rich traditional foods while mitigating the increasing reliance on processed convenience foods is imperative for promoting optimal growth and preventing diet-related chronic diseases.

### **Statement of the Problem**

In Kaduna State, Nigeria, the dietary patterns of school-age children are a challenge that threatens their growth, development, and long-term well-being. Despite the recognised importance of nutrition during childhood, there is insufficient understanding of the specific dietary behaviours and nutritional risks faced by children in this region. Kaduna is undergoing a rapid nutrition transition, where traditional diets rooted in nutrient-rich staples like yams, maize, and cassava are increasingly displaced by Westernised eating habits characterised by high consumption of processed, energy-dense, and nutrient-poor foods. This shift has practical implications, as children's food choices are influenced by changing lifestyles, urbanisation, and the increased availability of inexpensive, processed snacks and fast foods, particularly in urban centres.

This transition has led to the coexistence of multiple nutritional problems. Undernutrition remains prevalent, with many children suffering from stunting, micronutrient deficiencies (especially vitamin A and iron), and underweight conditions due to insufficient intake of balanced meals. Concurrently, the rising trend of overweight and obesity among school-age children reported in some urban areas at rates approaching 10% introduces new health risks, including early onset of non-communicable diseases such as diabetes and hypertension. These dual burdens of malnutrition reflect inconsistencies in food access and quality, often shaped by socioeconomic disparities (Akorede & Habu, 2022).

The dietary inadequacies in Kaduna are compounded by several practical challenges: low household income limits the ability to purchase diverse and nutritious foods; parental education gaps reduce awareness of healthy dietary practices; large family sizes dilute available resources; and cultural beliefs or food taboos restrict the consumption of certain nutrient-rich foods. Additionally, limited access to nutrition education and health services means that parents and caregivers are often ill-equipped to make informed dietary decisions for their children. Urbanisation has also introduced sedentary lifestyles and easy access to unhealthy fast foods, further undermining traditional eating habits.

Moreover, the absence of localised data on children's dietary patterns hinders effective policy formulation and intervention programs. While national surveys provide a broad overview, they often overlook regional disparities and the unique socio-cultural context of Kaduna State. This gap results in inadequate targeting of nutrition programs and limited impact on the ground.

School-age children in Kaduna State face a complex array of dietary challenges ranging from inadequate nutrient intake and micronutrient deficiencies to increasing rates of childhood overweight and obesity. These problems are driven by economic hardship, educational limitations, cultural influences, and rapid lifestyle changes. Addressing these issues requires urgent, context-specific research to unravel the dietary patterns and underlying causes, enabling the design of effective, culturally sensitive interventions. Failure to do so risks perpetuating poor health outcomes, undermining child development, and escalating future burdens on the healthcare system.

### **Objectives**

The specific purposes of this study are:

1. To assess the dietary patterns of school-age children in Kaduna State, Nigeria.
2. To examine the influence of parental socio-economic variables on the dietary patterns of school-age children in Kaduna State, Nigeria.

### **Research Questions**

1. What is the dietary pattern of school-age children in Kaduna State, Nigeria?
2. What is the influence of the socio-economic variables of parents on the dietary pattern of school-age children in Kaduna State, Nigeria?

### **Hypotheses**

1. The dietary pattern of school-age children in Kaduna State, Nigeria, is not significant.
2. Parental socio-economic variables do not significantly influence the dietary pattern of school-age children in Kaduna State, Nigeria.

**Methodology**

The ex post facto research design was adopted for this study. Multistage sampling procedures of (simple random sampling, proportionate sampling, and convenience sampling techniques were used. A structured, closed-ended interviewer-administered questionnaire was used. Frequency and percentage descriptive statistics were employed to examine the respondents' demographic attributes. The stated hypotheses were tested at the 0.05 level of significance using ANOVA and the one-sample t-test as inferential statistics. Data were collected from mothers using a structured instrument divided into two sections. Section A: Completed by mothers and covered socio-demographic data, Section B contained child-related questions, answered by the mothers. A total of 384 questionnaires were completed across all three senatorial zones of Kaduna State.

**Results**

**Research Questions 1:** What are the Dietary Patterns among School-age children in Kaduna State, Nigeria?

**Table 1: Mean and Standard Deviation of the Dietary Patterns of School-Age Children in Kaduna State, Nigeria**

Group/Item	Mean	Std. Dev.
How often do your children eat a balanced diet? three times a day, e.g, rice and vegetable soup with meat or fish, tuwo and okro or vegetable soup, with fish or meat	1.20	0.65
How often do your children eat breakfast daily? e.g, Bread and tea with egg, Akara and pap, Beans and bread, Massa and soup with meat or fish, etc.	1.22	0.66
How often do your children eat lunch daily? E.g., rice and stew with meat, Tuo and okara soup, or vegetable soup	1.19	0.64
How often do your children eat dinner daily? E.g. (tuwo and soup, rice and sauce, Danbu masara or shinkafa, etc.)	1.18	0.63
How often do you include fruits in your children’s daily diet? E.g., oranges, Pineapple, banana, watermelon melon etc	1.21	0.68
How often do your children consume vegetables with their meals? E.g., carrot, cucumber, bitter leaf, pumpkin leaf, cabbage, lettuce	1.21	0.67
How often do your children consume vegetables alone? E.g., carrot, cucumber, cabbage, etc.	1.19	0.65
How often do your children eat the required portions of carbohydrate for breakfast per serving, i.e, 15g, e.g, (2 slices of bread or yam, ½ cup or a small soup bowl of rice or pasta, a fist-sized size of tuwo or eba, a medium-sized cup of pap)	1.20	0.67
How often do your children eat the required portions of carbohydrate for lunch per serving, i.e, 15g, e.g, (2 slices of bread or yam, ½ cup or a small soup bowl of rice or pasta, a fist-sized size of tuwo or eba, a medium-sized cup of pap)	1.21	0.66
How often do your children eat the required portions of carbohydrate for dinner per serving, i.e, 15g, e.g, 2 slices of bread or yam, ½ cup or a small soup bowl of rice or pasta, a fist-sized portion of tuwo or eba, a medium-sized cup of pap)	1.20	0.69
How often do your children eat the required portions of protein for breakfast, i.e, 28g-56g, e.g, (1 egg, one medium slice of meat or fish, ¼ cup of beans or soya beans, or a cup of milk or nono)	1.18	0.68
How often do your children eat the required portions of protein for launch, i.e, 28g-56g, e.g, (1 egg, one medium slice of meat or fish, ¼ cup of beans or soya beans, or a cup of milk or nono)	1.21	0.64
How often do your children eat the required portions of protein for dinner, i.e, 28g-56g, e.g, (1 egg, one medium slice of meat or fish, ¼ cup of beans or soya beans, or a cup of milk or nono)	1.20	0.66
How often do your children drink water throughout the day? 1.2 litres/ 5 cups – 1.6 liters 6 cups	1.18	0.64
How often do you eat together as a family?	1.79	.796
Aggregate mean=1.24	1.24	
Decision mean =2.50		

Table 1 presents an analysis of the dietary patterns among school-age children in Kaduna State, Nigeria, highlighting considerable nutritional inadequacies. The data revealed that it had a mean of 1.24, which is below the decision mean of 2.50, indicating poor dietary patterns among the children studied.

**Research Question 2:** What is the influence of parental socio-economic status on the dietary patterns of school-age children in Kaduna state, Nigeria?

**Table 2: Mean and Standard Deviation of the differences between dietary patterns and Parental Socio-economic variables**

Socio-demographic Variables	N	Mean	Std. Dev.	Mean Dif.
<b>Marital status</b>				
Married	160	1.80	0.60	-0.10
Divorced	40	2.00	0.75	+0.10
Separated	30	1.70	0.65	-0.20
Widowed	20	2.10	0.85	+0.20
Single	134	1.90	0.70	0.00
Aggregate mean		1.90		
<b>Income of the parents</b>				
Low income (below 10,000 Naira)	120	1.30	0.50	-0.20
Middle income (30,000 - 50,000 Naira)	180	1.60	0.65	+0.10
High income (above 50,000 Naira)	84	1.70	0.70	+0.20
Total	384			
Aggregate mean		1.50		
<b>Occupation</b>				
Civil servant	100	1.60	0.55	-0.18
Farmer	80	1.80	0.65	+0.02
Trader	104	1.90	0.70	+0.12
Artisan	100	1.80	0.60	+0.02
Total	384			
Aggregate mean		1.78		
<b>Qualification</b>				
Quranic education	50	2.00	0.80	-0.30
Primary	120	2.40	0.95	+0.10
Secondary	130	2.50	1.00	+0.20
Tertiary	84	2.20	1.10	-0.10
Aggregate mean	384	2.30		
<b>Settlement</b>				
	N	Mean	SD	Mean Dif.
Urban	140	2.00	0.55	+0.20
Sub Urban	130	1.70	0.70	-0.10
Rural	114	1.50	0.80	-0.30
Aggregate mean		1.80		

Decision mean =2.50

Table 2 shows that parental socio-economic factors significantly affect the dietary patterns of Kaduna State children. Widowed parents' children had the highest scores (2.10), separated the lowest (1.70). Low-income families (<10,000 Naira) had poor diets (1.30). Children of traders scored highest by occupation (1.90), and those with parents having secondary education scored best (2.50). Urban children (2.00) ate better than rural children (1.50). The overall mean (1.80) confirms that these factors strongly influence children's diets.

**Testing of Hypothesis**

**Hypothesis 1:** The Dietary pattern of school-age children in Kaduna State, Nigeria, is not significant.

**Table 3: Summary of One-Sample t-test Analysis on Dietary Pattern of School-Age Children in Kaduna State, Nigeria.**

Test	N	Mean	Std. Dev.	t-cal.	t-crit	df	P-value
Dietary Pattern of School-Age	384	1.294	0.1892	-130.57	1.96	383	0.001
Fixed mean	384	2.50					

(Decision mean =2.50)

The result of the One-sample t-test indicated on the dietary pattern of school-age children in Kaduna state, Nigeria, is not significant because the p-value 0.001 is less than the 0.05 level of significance, and the calculated t-value -130.57 is lower than the critical t-value of 1.96. This means that school-age children in Kaduna state have a poor dietary pattern. Therefore, the null hypothesis is rejected.

**Hypothesis 2:** Parental socio-economic variables do not significantly influence the dietary pattern of School-Age Children in Kaduna state, Nigeria.

**Table 4: Summary of One-Way ANOVA Analysis on the Parental Socio-economic Variables and the Dietary Pattern of School-Age Children in Kaduna State, Nigeria**

Variable	Sum of Squares	df	Mean Square	F-calculated	T-critical	P-value
Income of the Parents	6000.00	1	6000.00	392.16	7.88	0.000
Level of Education	3000.00	4	750.00	49.03	4.12	0.000
Marital Status	1171.29	1	1171.29	76.54	8.05	0.000
Occupation	500.00	1	500.00	32.59	7.56	0.000
Settlement	100.00	1	100.00	6.53	6.91	0.000
Error	657.91	383	1.72	-	-	-
Total	104998.0	384	-	-	-	-

One-way ANOVA showed significant effects of parental socio-economic factors, income, education, marital status, occupation, and settlement on the dietary patterns of school-age children in Kaduna State (all  $p = 0.000$ ). Income ( $F=392.16$ ) and education ( $F=49.03$ ) had the strongest influence. The low error sum of squares (657.91) indicates these factors explain most dietary variation. These findings highlight the key role of parental socio-economic status in shaping children’s diets.

**Discussion**

The study found that dietary patterns of school-age children in Kaduna State are statistically significant ( $p=0.001$ ) and are strongly influenced by parental socio-economic factors ( $p=0.00$ ). A  $p$ -value of 0.001 for dietary patterns implies a very strong statistical significance. This means there is less than a 0.1% probability that the observed relationship occurred by random chance. Similarly, a  $p$ -value of 0.00 (often reported when the value is less than 0.0001) for the influence of parental socio-economic factors further underscores the strength and reliability of the finding.

Together, these statistics suggest a robust correlation between the dietary behaviours of children and the socio-economic background of their parents in Kaduna State. These results should not be viewed in isolation but rather as a reflection of deep-rooted structural and behavioural determinants that are shaping children's nutritional outcomes. These results align with prior research by Birch and Fisher (2018), which highlighted the critical role of family and school environments in shaping children’s dietary habits. Children with parents who model healthy eating and access to nutritious school food tend to have better dietary patterns. Addressing children’s dietary needs in Kaduna requires a multifaceted approach, including parental nutrition education, school feeding programs, and public health campaigns. The influence of parental socio-economic status on dietary patterns also mirrors findings by Hinning et al. (2018), showing that higher parental education and income are linked to healthier diets in high human development countries. Overall, the findings emphasise the importance of socio-economic and environmental factors in shaping children’s nutrition in Kaduna State. Parental socio-economic status (SES) is a multidimensional construct that typically includes income level, educational attainment, and occupational status (Abulbaqi et al., 2024). Each of these aspects has a unique yet interrelated effect on children's diet. In Kaduna State, where socio-economic disparities are evident across urban-rural divides and between different local government areas, these factors significantly influence what children eat, when, and how frequently.

The results of the study suggest that children from better-off families, with educated parents and access to healthier home and school food environments, enjoy more nutritionally adequate diets than their peers from lower SES backgrounds and the fact that many families, especially in rural or peri-urban areas, may face economic hardship, limiting their ability to provide balanced meals, access to nutrition education particularly among mothers with low formal education, reducing awareness of dietary diversity and nutrient requirements. Even schools may lack adequate infrastructure or funding for school feeding programs, which are often a critical source of daily nutrition for children.

**Conclusions:**

1. There is a statistically significant relationship between the dietary patterns of school-age children in Kaduna State and various influencing factors. The low  $p$ -value (0.001) indicates that children's dietary habits are not occurring by chance but are shaped by identifiable, measurable variables.
2. Parental socio-economic status is a major determinant of children's dietary patterns in Kaduna State, as the extremely strong significance ( $p=0.00$ ) highlights the profound impact of parental income, education, and employment on children's nutrition and food choices.

**Recommendations:**

1. Targeted nutritional education and support programs for low-income families should be implemented by health educators or NGOs. Interventions should focus on educating parents in low-income brackets about affordable, nutritious food choices and provide support through subsidies or school feeding programs.
2. Socio-economic considerations into child nutrition policies and programs should be integrated by policymakers who should design nutrition interventions that address structural inequalities such as unemployment, poverty, and low educational attainment that directly influence dietary behaviour in children.



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## ASSESSMENT OF SOCIAL STIGMA OF HIV VOLUNTARY COUNSELLING AND TESTING (VCT) UTILIZATION AMONG FEDERAL UNIVERSITY STUDENTS IN NORTHERN NIGERIA

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### Abstract

This study examined the social stigma of HIV Voluntary Counselling and Testing (VCT) utilisation among federal university students in Northern Nigeria. To achieve this purpose, a descriptive survey research design was used. The population of the study comprised 421,436 federal university students in Northern Nigeria. The sample size of 662 respondents was drawn from the population using a multi-stage sampling procedure, which includes cluster, simple random, proportionate, and convenience sampling. The instrument for data collection was a researcher-structured closed-ended questionnaire which was validated by five (5) experts in the Department of Human Kinetics and Health Education, Department of Psychology and Counselling, and College of Medical Services in Ahmadu Bello University, Zaria. The instrument was pilot-tested using Cronbach's Alpha, and a reliability coefficient of 0.884 was obtained. Descriptive statistics of frequency and percentage were used to describe the demographic characteristics of the respondents. The research questions were answered using mean and standard deviation. Inferential statistics of one-sample t-test and independent sample t-test were used to test the stated hypotheses at a 0.05 level of significance. The result revealed a significant social stigma ( $t = 21.247$ ;  $p = 0.000$ ) regarding HIV VCT utilisation among federal university students in Northern Nigeria, with gender-based differences in social stigma ( $t = 17.824$ ;  $p = 0.000$ ). The study concluded that federal university students in Northern Nigeria face high levels of social stigma regarding HIV VCT utilisation, with female students perceiving greater stigma than their male counterparts. It recommends that government, university authorities, student unions, and NGOs implement comprehensive anti-stigma campaigns and gender-sensitive outreach programs, particularly targeting female students.

**Keywords:** HIV Voluntary Counselling and Testing (VCT), Social Stigma, Federal University Students, Northern Nigeria, Gender Differences

### Introduction

Human Immunodeficiency Virus (HIV) remains a pressing global public health concern, particularly in sub-Saharan Africa, where the burden of the epidemic continues to pose significant challenges. Voluntary Counselling and Testing (VCT) is a crucial entry point for HIV prevention, treatment, and care. It allows individuals to know their HIV status and, if positive, to access antiretroviral therapy (ART) and other supportive services. Despite its importance, the uptake of VCT remains low in many settings, largely due to the pervasive influence of social stigma (World Health Organization [WHO], 2022). Social stigma, which refers to negative societal attitudes and discrimination directed at individuals associated with HIV, has been identified as a key barrier to VCT utilisation, particularly among young populations who are highly vulnerable to HIV infection (Parker & Aggleton, 2020). In conservative contexts such as Northern Nigeria, this stigma is deeply rooted in cultural and religious norms, often associating HIV with moral failure, immorality, and promiscuity, thereby discouraging young people from seeking testing and related services (Shehu et al., 2015; Abdulrahman et al., 2021).

In Nigeria, the HIV epidemic remains a significant concern, with approximately 1.9 million people living with HIV as of 2022, making it the country with the second-highest HIV burden globally (National Agency for the Control of AIDS [NACA], 2023). The prevalence of new infections is particularly high among young people aged 15–24, many of whom are students in tertiary institutions. However, despite the heightened risk, the uptake of HIV testing services such as VCT among university students remains disproportionately low. Social stigma has been repeatedly cited as a primary deterrent preventing students from accessing VCT services (Mbonu et al., 2021). The fear of being labelled as promiscuous or immoral for merely seeking HIV testing results in widespread avoidance of VCT centres, especially among students in Northern Nigeria, where conservative values dominate societal perceptions of sexuality and health behaviours (Kalichman & Simbayi, 2020). This stigma is not only internalised but also externally reinforced through community norms, peer pressure, and even institutional practices, making the university environment a complex setting for HIV testing uptake.

The stigma surrounding HIV and its testing services in Nigeria is exacerbated by misinformation, cultural taboos, and religious interpretations that associate the disease with divine punishment or character flaws. Among federal universities in Northern Nigeria, this stigma significantly undermines public health efforts to encourage HIV testing among students (Onyemachi et al., 2021). Students who might otherwise be willing to get tested often hesitate for fear of being seen by peers at VCT centres, leading to assumptions about their sexual activity or health status. This climate of fear and judgment discourages open discourse about HIV and its prevention, making it difficult to challenge stereotypes and normalise testing behaviour. As a

result, many students avoid VCT entirely, missing crucial opportunities for early diagnosis, treatment, and prevention of further transmission (Fauk et al., 2022). The implication is a persistent underutilization of VCT services, contributing to continued HIV transmission among young people within higher education institutions.

Several studies have highlighted that social stigma not only affects the decision to undergo VCT but also influences disclosure, linkage to care, and adherence to treatment among those who test positive (Babel et al., 2021). In university environments, students often fear that a positive diagnosis—or even the perception of being tested—could lead to social isolation, discrimination by peers, or reputational damage. This fear is particularly pronounced in Northern Nigeria, where strong community ties and religious teachings amplify the consequences of stigma. Even when universities provide VCT services, the lack of assurance about confidentiality and the potential for stigmatisation within campus settings discourage students from accessing them (Odimegwu et al., 2017). In such a context, understanding the nature and extent of social stigma is imperative for developing interventions aimed at promoting VCT utilisation among students. Without addressing this stigma, efforts to reduce HIV prevalence among youth may continue to fall short.

Moreover, the sociocultural environment in Northern Nigeria creates a uniquely challenging landscape for VCT uptake among university students. Religious leaders and community elders wield significant influence over social behaviours, including attitudes toward HIV testing. In many instances, these influential figures may perpetuate stigmatising narratives, unintentionally reinforcing students' fears of being judged or ostracised (Moyo et al., 2023). Gender norms also intersect with stigma, as female students may face even more severe social backlash for seeking HIV testing due to the dual stigmatisation of being sexually active and potentially infected. Consequently, the burden of stigma is not uniformly distributed and must be examined through the lenses of gender, religion, and cultural identity. Federal universities in Northern Nigeria serve a diverse student body, making them critical spaces for exploring how stigma affects different subgroups and how tailored interventions can mitigate these effects (Rasweswe et al., 2024).

Given the high risk of HIV infection among young people and the significant role social stigma plays in preventing VCT uptake, it is essential to assess and understand the forms, sources, and consequences of stigma in federal universities in Northern Nigeria. Doing so will provide the empirical foundation necessary for designing targeted, culturally sensitive strategies to reduce stigma and improve VCT utilisation. Past research has called for multi-level interventions that not only raise awareness about the benefits of VCT but also challenge stigmatising attitudes and promote social support for those seeking testing (Asrina et al., 2023; Parker & Aggleton, 2020). This study, therefore, seeks to assess the social stigma associated with VCT utilisation among students in federal universities in Northern Nigeria, intending to identify barriers, explore students' perceptions, and propose evidence-based recommendations to enhance HIV testing uptake in this crucial demographic.

### **Purpose of the Study**

The main purpose of this study is to assess the social stigma of HIV Voluntary Counselling and Testing (VCT) utilisation among federal university students in Northern Nigeria. Specifically, this study intends to:

1. Assess the social stigmas of VCT utilisation among federal university students in Northern Nigeria.
2. Examine whether federal university students in Northern Nigeria differ in social stigma of HIV VCT utilisation based on gender.

### **Research Questions**

1. What are the social stigmas of VCT utilisation among federal university students in Northern Nigeria?
2. Is there a difference in the social stigma of HIV VCT utilisation among federal university students in Northern Nigeria based on gender?

### **Hypotheses**

1. There is no significant social stigma of HIV VCT utilisation among federal university students in Northern Nigeria.
2. There is no significant difference in the social stigma of HIV VCT utilisation among federal university students in Northern Nigeria based on gender.

### **Methodology**

This study adopted a descriptive survey research design. The descriptive survey design was considered appropriate because it allows the researcher to collect data from a representative sample to generalise to a larger population. According to Osuala (2000), descriptive survey design is useful when a group of individuals or items is studied through data collected from a sample that reflects the characteristics of the entire population. Similarly, Shaughnessy et al. (2011) emphasised that survey research is suitable for analysing the current status of variables in a population.

The study population comprised 421,436 students enrolled in federal universities located in Northern Nigeria during the 2023/2024 academic session. A sample size of 662 students was determined using the Research Advisor (2006) formula, which specifies an adequate sample for a population of this size at a 99% confidence level and a 5% margin of error. The sampling procedure followed a multi-stage technique. First, the states in Northern Nigeria were grouped into the three geopolitical zones—North East, North Central, and North West—using cluster sampling. In each zone, two federal universities were randomly selected using simple random sampling by balloting. In the third stage, the actual universities for sampling within each cluster were again selected randomly. Thereafter, proportionate sampling was employed to determine the number of

students selected from each university based on its population size, thereby ensuring fair representation. Finally, convenience sampling was used to recruit students on their respective campuses for the administration of the questionnaire.

The instrument used for data collection was a researcher-developed questionnaire titled Assessment of Social Stigma of HIV VCT Utilisation among Federal University students in Northern Nigeria Questionnaire (ASSHVUFUSNNQ). The instrument comprised two sections: Section A collected demographic data (age, level, gender, and marital status), while Section B contained 10 items designed to assess perceptions and experiences related to social stigma in the context of HIV VCT service utilisation. Responses were rated using a four-point modified Likert scale (Always = 4, Often = 3, Rarely = 2, Never = 1), with a benchmark mean score of 2.50 used to interpret results—mean scores of 2.50 and above indicated agreement or a positive response, while scores below 2.50 indicated disagreement or a negative response. The face and content validity of the instrument were evaluated by five experts from relevant departments at Ahmadu Bello University, Zaria. Their recommendations led to appropriate revisions and enhancements to ensure the instrument effectively measured the intended variables. A pilot study was conducted using 50 students from the University of Abuja (which was not included in the main study sample) to test the reliability of the instrument. The data from the pilot test were analysed using the split-half method and Cronbach's Alpha reliability test, which yielded a coefficient of 0.884, indicating high internal consistency and suitability for the main study.

For data collection, an introductory letter was obtained from the Head of Department, Human Kinetics and Health Education, Ahmadu Bello University, and presented to the management of the selected universities to secure their cooperation. Ethical clearance was granted by the Health Research and Ethics Committee of the university. Informed consent was obtained from each participant before the administration of the instrument. To facilitate data collection, six trained research assistants with relevant backgrounds in health and familiarity with the university environment were employed. These assistants received detailed instructions on the purpose of the study and the proper administration of the questionnaire, including how to clarify any unclear items in a language understandable to the respondents. Data collection was carried out over four weeks. Data were analysed using both descriptive and inferential statistical methods. Frequencies and percentages were used to summarise demographic characteristics, while means and standard deviations were used to answer research questions. Hypotheses were tested using one-sample t-tests and independent sample t-tests at a 0.05 level of significance using SPSS version 30.

**Results**

Data collected on demographic characteristics of the respondents were tabulated using frequencies and percentages as indicated in Table 1

**Table 1: Demographic Characteristics of the Respondents (N = 662)**

Variables	Options	Frequency	Percentage (%)
Age Range in Years	Below 20	103	15.6
	20 – 25	293	44.3
	26 – 30	179	27.0
	Above 30	87	13.1
Level	Undergraduate	571	86.3
	Postgraduate	91	13.7
Gender	Male	379	57.3
	Female	283	42.7
Marital Status	Single	395	59.7
	Married	196	29.6
	Widow	26	3.9
	Divorce	45	6.8

Table 1 shows the demographic characteristics of the respondents. In terms of age distribution, the largest proportion of respondents (44.3%) falls within the 20–25-year age range, followed by 27.0% who are between 26–30 years. A smaller percentage (15.6%) is below 20 years, while only 13.1% is above 30 years. With regard to educational level, the majority of the respondents (86.3%) are undergraduates, while the remaining 13.7% are pursuing postgraduate studies. The gender distribution shows that males constitute the majority at 57.3%, compared to females who represent 42.7% of the total respondents. Marital status data indicate that the majority of the respondents (59.7%) are single, which aligns with the age distribution and student status. About 29.6% of the respondents are married, while 3.9% are widowed, and 6.8% are divorced.

**Research Question One:** What are the social stigmas of VCT utilisation among federal university students in Northern Nigeria?

**Table 2: Mean Scores of Responses on Social Stigmas of HIV VCT Utilisation among Federal University Students in Northern Nigeria**

S/N	Item	Mean	Std Dev
1.	People usually seem afraid of someone once they learn the person has HIV.	3.61	0.72
2.	People tend to stop calling or associating with someone after finding out they have HIV.	3.53	0.76
3.	Some people avoid physical contact with someone who is known to have HIV.	3.25	0.72
4.	It is generally considered a mistake to tell others that one has HIV.	3.23	0.74
5.	Individuals living with HIV often reduce social interactions because of how people react.	3.37	0.68
6.	People living with HIV tend to lose friends after disclosing their status.	3.49	0.94
7.	People physically distance themselves from someone once they know that person has HIV.	3.29	0.75
8.	People with HIV are often emotionally hurt by how others react to their status.	3.04	0.80
9.	Many people don't want someone with HIV around their children.	3.20	0.81
10.	Some people believe that individuals who have HIV deserve it because of their lifestyle.	3.09	0.69
<b>Aggregate</b>		<b>3.31</b>	

(Decision Mean – 2.50)

Table 2 revealed the mean scores of responses on the social stigmas of HIV VCT utilisation among federal university students in Northern Nigeria. The highest mean score (3.61) was recorded for the item stating that "people usually seem afraid of someone once they learn the person has HIV," suggesting that fear-based reactions are common. This is closely followed by the belief that "people tend to stop calling or associating with someone after finding out they have HIV" (3.53) and "people living with HIV tend to lose friends after disclosing their status" (3.49). These responses highlight a general pattern of social rejection and isolation experienced by individuals living with HIV.

Other notable stigmas include the belief that individuals with HIV are avoided physically (3.25), socially distanced (3.29), or emotionally hurt by others' reactions (3.04). The respondents also agreed that disclosing one's HIV status is often seen as a mistake (3.23) and that people with HIV may choose to withdraw from social interaction due to anticipated stigma (3.37). Furthermore, stigma extends to protective behaviour, as some respondents affirmed that people don't want individuals with HIV around their children (3.20) and that some believe HIV is deserved due to lifestyle choices (3.09). The aggregate mean score across all 10 items is 3.31, which is above the decision mean of 2.50. This affirmed that federal university students in Northern Nigeria have a high level of perceived stigma associated with HIV and VCT utilisation among university students.

**Research Question Two:** Is there a difference in the social stigma of HIV VCT utilisation among federal university students in Northern Nigeria based on gender?

**Table 3: Mean and Standard Deviation of the difference in Social Stigma of HIV VCT Utilisation among Federal University Students in Northern Nigeria based on Gender**

Item	N	Mean	Std. Dev.	Mean Difference
Male	379	3.15	0.50	0.22
Female	283	3.37	0.49	

Table 3 revealed the result of the difference in social stigma of HIV VCT utilisation among federal university students in Northern Nigeria based on gender. The female had a higher mean score of 3.37 than the male, who had a mean score of 3.15, with a mean difference of 0.22. This implies that there is a difference in the social stigma of HIV VCT utilisation among federal university students in Northern Nigeria based on gender.

**Hypothesis One:** There is no significant social stigma of HIV VCT utilisation among federal university students in Northern Nigeria.

**Table 4: One-Sample t-test Analysis of Social Stigma of HIV VCT Utilisation among Federal University Students in Northern Nigeria**

Variable	N	Mean	Std. Dev.	df	t-value	p-value
Social Stigma	662	3.31	0.78	661	21.247	0.000
Test Mean	662	2.50	0.00			

*Calculated p < 0.05, calculated t-value > 1.972 at df 661*

The result of the one-sample t-test statistics in Table 4 revealed that there is a significant social stigma of HIV VCT utilisation among federal university students in Northern Nigeria because the calculated p-value of 0.000 is less than the 0.05 level of significance and the calculated t-value of 21.247 is higher than the 1.972 critical t-value at 661 degrees of freedom (df). Therefore, the null hypothesis, which stated that there is no significant social stigma of HIV VCT utilisation among federal university students in Northern Nigeria, was rejected. This means that federal university students in Northern Nigeria have a high level of perceived stigma associated with HIV and VCT utilisation among university students.



**Hypothesis Two:** There is no significant difference in the social stigma of HIV VCT utilisation among federal university students in Northern Nigeria based on gender.

**Table 5: Independent t-test Statistics on Difference in Social Stigma of HIV VCT Utilization among Federal University Students in Northern Nigeria based on Gender**

Item	N	Mean	Std. Dev.	Mean Difference	df	t-value	p
Male	379	3.05	0.57	0.32	660	17.824	0.000
Female	283	3.37	0.53				

t (662) = 17.824, p-value < 0.05, df = 660

Table 5 presents the results of an independent t-test conducted to examine whether there is a significant difference in the social stigma associated with HIV VCT utilisation among federal university students in Northern Nigeria based on gender. From the table, the mean score for male students (N = 379) on social stigma related to HIV VCT utilisation is 3.05, while the mean score for female students (N = 283) is higher at 3.37. The mean difference between the two groups is 0.32, indicating that female students perceive or report a higher level of social stigma associated with HIV VCT utilisation compared to their male counterparts. The t-test result shows a t-value of 17.824 with degrees of freedom (df) = 660, and a p-value of 0.000. Since the p-value is less than 0.05 level of significance, the result is statistically significant. This means that the observed difference in mean scores is not due to chance. Therefore, the null hypothesis that states "there is no significant difference in social stigma of HIV VCT utilisation among federal university students in Northern Nigeria based on gender" is rejected. The finding affirmed that gender plays a significant role in how students perceive social stigma regarding HIV VCT, with female students reporting significantly higher levels of stigma than male students.

**Discussion of Findings**

Hypothesis one revealed that there is a significant social stigma of HIV VCT utilisation among federal university students in Northern Nigeria (t = 21.247; p = 0.000). This implies that federal university students in Northern Nigeria experience high levels of social stigma related to HIV VCT utilisation. This finding aligns with Donkor (2012), who conducted a similar study among university students in Ghana and found that a significant majority (81%) of the respondents had experienced social stigma related to VCT. This strongly validates the presence of stigma in higher institutions, supporting the notion that stigma is a significant barrier to VCT uptake among youths in African contexts.

Likewise, Alemayehu (2018) discovered that in Tigray, Ethiopia, students were sensitive to social stigma associated with VCT, which discouraged their willingness to be tested. This finding aligns with the gendered experience of stigma, thereby validating concerns around social perceptions and reinforcing that stigma significantly impacts VCT utilisation. Ikechebelu et al. (2016) also provide strong support for this finding. Their research among undergraduates in Southeast Nigeria showed that although awareness was moderately high, utilisation of VCT services remained low due to stigma, fear of a positive result, and uncertainty about confidentiality. This aligns with the current finding and indicates a consensus among researchers regarding the detrimental role of social stigma on HIV testing behaviours.

Additionally, Reynell (2012) emphasised that social stigma and poor access to information limit the uptake of VCT in Nigeria, concluding that education and counselling are vital in combating stigma. This further corroborates the result by highlighting the consistent negative effect stigma has on student attitudes towards VCT. Similarly, Vuyelwa et al. (2012) noted that a significant percentage of South African students harboured negative perceptions and stigmatising attitudes toward people living with HIV and toward the use of VCT, despite high knowledge levels. This reflects a conformity to this study, where knowledge alone does not eliminate stigma and its impact on testing behaviours. The repeated emergence of stigma as a major deterrent in VCT utilisation among students demonstrates the need for sustained stigma-reduction strategies through education, peer counselling, and policy advocacy.

Hypothesis two revealed that there is a significant difference in social stigma of HIV VCT utilisation among federal university students in Northern Nigeria based on gender (t = 17.824; p = 0.000). Female students in federal universities in Northern Nigeria perceive higher levels of social stigma related to HIV VCT use than male students. This finding is strongly in agreement with Alemayehu (2018), who conducted a study in Tigray, Northern Ethiopia, and found that female respondents were more concerned about social stigma and were less willing to undergo VCT for HIV compared to males. This aligns with the current finding by reinforcing that females often face heightened fears of discrimination and social consequences, which hinders their participation in HIV testing programs.

Similarly, Reynell (2012) found a significant difference in social stigma based on gender, age, and religion in a study among Nigerian youths. He emphasised that gender plays a key role in how individuals perceive and respond to the stigma associated with HIV testing. This validates the observed pattern in the current study, underscoring a gender-based disparity in stigma perception. Donkor (2012) also reported that while a majority of university students in Ghana had positive attitudes towards VCT, many still stigmatised those who used VCT services, with a perception that such individuals were promiscuous. While this study did not isolate gender differences, the stigma highlighted is often more severely internalised by females, particularly in culturally conservative contexts like Northern Nigeria, which supports the present finding.

Moreover, the study by Abebe and Mitikie (2019) found that high perceived susceptibility and barriers, including social stigma, were negatively associated with willingness to undergo VCT. Although this study was based in Ethiopia and involved secondary school students, it further corroborates the idea that social stigma remains a substantial barrier, especially among populations with heightened social expectations regarding sexual purity—expectations more strongly imposed on females.



These studies consistently highlight gender as a critical factor influencing attitudes toward VCT, with females more likely to experience and internalise stigma, thus affirming the consensus in the literature.

### Conclusions

Based on the findings of the study, the following conclusions were made:

1. Federal university students in Northern Nigeria experience high levels of social stigma related to HIV VCT utilisation.
2. Female students in federal universities in Northern Nigeria perceive higher levels of social stigma related to HIV VCT use than male students.

### Recommendations

Based on the conclusion, the study recommended the following:

1. The Nigerian government and university management should implement comprehensive anti-stigma campaigns and peer education programmes across campuses.
2. Student unions and NGOs should develop targeted stigma-reduction strategies focusing on female students through gender-sensitive outreach.

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## THE EFFECTS OF LIFESTYLE CHOICES ON FERTILITY RATES OF WOMEN OF REPRODUCTIVE AGE IN EGOR LOCAL GOVERNMENT AREA OF EDO STATE

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### Abstract

This study investigated the effects of lifestyle choices on fertility rates of women of reproductive age in Egor Local Government Area of Edo State. To achieve the purpose of the study, two (2) research questions were raised and answered. The Descriptive survey research design was adopted for this study. The population of the study comprised one hundred and thirty-one (131) women of reproductive age attending the University of Benin Teaching Hospital fertility clinic. The census/total population sampling technique was used to select a sample size of one hundred and thirty-one (131) women from the total population, due to the small population size available. The instrument used for data collection was a closed-ended questionnaire. The instrument was validated by four experts in the Department of Health, Safety, and Environmental Education, Faculty of Education, University of Benin, Edo State. The data collected was analysed using percentages and frequency counts. The findings of this study revealed that dietary pattern do not indicate their infertile status. Furthermore, it was found that physical activity improves reproductive outcomes and overall health among infertile women. It was therefore recommended to encourage the consumption of a balanced diet rich in fruits, vegetables, protein, and whole grains to support overall reproductive health. Programs should be developed to encourage women to engage in moderate physical exercise regularly.

**Keywords:** Fertility rates, Behaviour, Lifestyle choices, Lifestyle factors,

### Background to the Study

Lifestyle factors can be modified to enhance overall well-being, and they are ultimately under one's control. They play a key role in determining reproductive health and can positively or negatively influence fertility. Lifestyle factors refer to the modifiable behaviours and ways of life that could influence the general health and well-being of individuals, including fertility (Acharya & Gowda, 2017). The ability to conceive, either spontaneously or through assisted reproduction, ensure a healthy pregnancy, and carry a foetus to live birth may be influenced by multiple factors, including modifiable factors and habitual practices that could influence the fertility potential of an individual (Wilcox et al., 2018). Many lifestyle factors, such as the age at which to start a family, nutrition, weight, exercise, psychological stress, environmental and occupational exposures, and others, can have substantial effects on fertility (Acharya & Gowda, 2017; Akorede et al., 2017; Akorede et al., 2021; Muhammed et al., 2025).

Infertility can be defined as the absence of conception within one year of unprotected sexual intercourse, while fertility is the capability of producing an offspring (Aydin *et al.* 2014). Fertility rate, also known as the total fertility rate (TFR), is a statistical measure used to estimate the average number of children born to women of childbearing age in a specific population (United Nations, 2019). It is an essential demographic indicator that provides insights into population growth, reproductive patterns, and the potential for future population changes (Akorede et al., 2022). Fertility rate is usually expressed as the number of live births per woman over her reproductive lifetime, which is typically considered to be between the ages of 15 and 49 (United Nations, 2019). It represents the hypothetical number of children a woman would have if she were to live through her reproductive years and experience the age-specific fertility rates observed in a particular year or time period.

Fertility, defined as the natural capacity to conceive and give birth to offspring, is influenced by a multitude of factors, including biological, environmental, and behavioural determinants. Women of reproductive age (typically 15-49 years) face several lifestyle choices that can significantly impact their fertility (Akorede et al., 2022; Akorede et al., 2023). These lifestyle factors include, but are not limited to, diet and physical activity. This research aims to explore the effects of these choices on the fertility rates of women of reproductive age, drawing from existing studies and theoretical models that explain the complex relationship between behaviour and reproductive health (Rooney & Domar, 2014).

Proper nutrition is a key determinant of fertility. Malnutrition, both under-nutrition and over-nutrition, can lead to hormonal imbalances that may disrupt ovulation and menstrual cycles, reducing fertility (Akorede et al., 2022; Harande et al., 2025; Wilcox et al., 2018). Adequate intake of micronutrients such as folic acid, zinc, and vitamins C and D has been shown to improve reproductive health, whereas deficiencies in these nutrients can impair fertility (Gaskins & Chavarro, 2012). High intake of trans fats and processed carbohydrates is also associated with reduced fertility (Chavarro et al., 2017). A balanced and nutritious diet is crucial for reproductive health. Consuming a variety of fruits, vegetables, whole grains, lean proteins,

and healthy fats provides essential nutrients that support hormonal balance and reproductive function. Adequate intake of vitamins (such as folate, vitamin D, and vitamin E), minerals (including iron and zinc), and antioxidants can promote optimal fertility. Conversely, a poor diet lacking in essential nutrients can lead to hormonal imbalances, irregular menstrual cycles, and reduced fertility. In women, reproduction involves much greater energy expenditures than in males, and as a protective mechanism against under-nutrition, ovarian activity is suppressed in women with eating disorders and exercise-induced amenorrhea through pathways in the hindbrain (Gurruti, Depalo & Angelis, 2019).

According to Hudson et al (2017), lifetime rates of prevalence of binge eating disorder, bulimia nervosa, and anorexia nervosa in women are 0.9%, 1.5% and 3.5% respectively. Bulimia nervosa is an eating disorder that is characterised by binge eating, which is followed by fasting or self-induced vomiting or purging. It is an emotional disorder that makes one have a distorted body image and an obsessive desire to lose weight. Anorexia, on the other hand, is also an eating disorder that is more of a psychological condition marked by extreme self-starvation due to a distorted body image. The likelihood of cure is higher with Bulimia nervosa (Tabler et al., 2018). Both disorders suppress ovulation in severely affected women and account for up to 60 (% of women with anovulatory infertility (Tabler, Utz, Smith, Hanson, & Geist, 2018).

Regular moderate physical activity has been shown to have a positive effect on fertility by promoting hormonal balance and healthy weight (Gaskins et al., 2014). Conversely, extremes of physical activity—both excessive exercise and a sedentary lifestyle—can impair fertility. Obesity, in particular, has been associated with an increased risk of anovulation and polycystic ovary syndrome (PCOS), both of which significantly reduce fertility (Pasquali et al., 2016). Similarly, being underweight, often a result of eating disorders or chronic excessive exercise, may also lead to ovulatory dysfunction and subfertility (Zacharias et al., 2020). Regular exercise is beneficial for overall health and fertility. Engaging in moderate-intensity physical activity improves blood circulation, reduces stress, and helps maintain a healthy weight (Sharma et al., 2013). Exercise can also regulate hormone levels, improve insulin sensitivity, and enhance ovarian function. However, excessive exercise or intense training can disrupt hormonal balance and menstrual cycles, potentially impacting fertility. Striking a balance between exercise and rest is important for reproductive health. Physical exercise is beneficial to overweight or obese infertile women. Lifestyle factors, including diet, physical activity, smoking, alcohol consumption, and stress, play a significant role in determining fertility outcomes in women of reproductive age. These choices can either promote or impair fertility depending on the nature and extent of the behaviour. Understanding the relationship between these factors and fertility can help in the development of public health strategies aimed at improving reproductive health outcomes for women.

### Statement of Problem

Despite advances in reproductive medicine, declining fertility rates among women of reproductive age remain a global concern. Various lifestyle choices, including diet and physical activity, are increasingly recognised as significant contributors to fertility challenges. However, many women remain unaware of the specific impacts that their daily habits have on their ability to conceive and maintain a healthy pregnancy. The lack of comprehensive understanding regarding the relationship between lifestyle choices and fertility has led to rising incidences of infertility, delayed conception, and complications related to reproductive health. As fertility rates decline worldwide, particularly in developed nations, it becomes crucial to examine how modifiable behaviours influence fertility and whether targeted interventions can improve reproductive outcomes for women of reproductive age. This research aims to address the gap in knowledge by investigating the effects of specific lifestyle factors on fertility and identifying strategies that can mitigate these effects. The findings will contribute to public health policies and interventions aimed at promoting healthier lifestyles to enhance fertility rates.

### Research Questions

1. Is there a correlation between dietary choices and fertility rates among women of reproductive age in Egor local government area of Edo state?
2. Is there a correlation between the level of physical activities and fertility rates among women of reproductive age in Egor local government area of Edo state?

### Methodology

The descriptive survey research design was used for the study. The population of the study comprised one hundred and thirty-one (131) women of reproductive age attending the University of Benin Teaching Hospital fertility clinic. The census/total population sampling technique was used to select a sample size of one hundred and thirty-one (131) women. This was considered most appropriate due to the availability of a relatively small population size. The instrument used for data collection was a closed-ended questionnaire. The instrument was validated by four experts in the Department of Health, Safety, and Environmental Education, Faculty of Education, University of Benin, Edo State. A pilot study was conducted in Ugbowo, Benin City, Edo State, and a coefficient of 0.81 was obtained; thus, the questionnaire is reliable for usage. Out of one hundred and thirty-one questionnaires administered by the researcher and two research assistants, one hundred and thirty-one (131) were duly completed, returned, and used for the analysis, connoting a 100% return rate. The data collected was analysed using frequency count and percentage.

### Result

The results of the study were presented as follows;

**Research Question One:** Is there a correlation between dietary choices and fertility rates among women of reproductive age in Egor local government area of Edo state?

**Table 1: Dietary choices and fertility rates among women of reproductive age in Egor local government area of Edo state**

S/N	Items	SA	A	D	SD
1	I often consume caffeinated drinks	18(13.7%)	65(49.6%)	29(22.1%)	19(14.5%)
2	My dietary choices are not usually high-fat diets	10(7.6%)	75(57.3%)	46(35.1%)	0.0%
3	I include a variety of fruits and vegetables in my daily meals	44(33.6%)	65(49.6%)	22(16.8%)	0.0%
4	I consume an adequate amount of protein-rich foods in my diet	39(29.8%)	70(53.4%)	12(9.2%)	10(7.6%)
5	I regularly choose refined grains over whole grains in my meals	13(9.9%)	49(37.4%)	54(41.2%)	15(11.2%)
6	I often consume foods rich in multi-vitamins	26(19.8%)	81(61.8%)	14(10.7%)	10(7.6%)
7	I drink an adequate amount of water throughout the day	52(39.7%)	48(36.6%)	16(12.2%)	15(11.5%)
8	I limit my consumption of sugary beverages in favour of water or healthier alternatives	22(16.8%)	59(45.0%)	22(16.8%)	28(21.4%)
9	I often consume foods rich in animal protein as against plant protein	16(12.2%)	72(55.0%)	23(17.6%)	20(15.3%)

The table showed the dietary choices and fertility rates among infertile women of reproductive age in Egor local government area of Edo state. It was observed that majority of the respondents indicated that they often consume caffeinated drinks (49.6%), their dietary choices are not usually high fats diets (57.3%), they include a variety of fruits and vegetables in their daily meals (49.6%), they consume an adequate amount of protein-rich foods in their diet (53.4%), they often consume foods rich in multi-vitamins (61.8%), they limit my consumption of sugary beverages in favour of water or healthier alternatives (45.0%), they often consume foods rich in animal protein as against plant protein (55.0%) and they drink an adequate amount of water throughout the day (39.7%). They disagree that they regularly choose refined grains over whole grains in their meals (41.2%). Hence, they engage in a proper dietary pattern apart from their consumption of caffeinated drinks. This shows that dietary pattern do not indicate their infertile status.

**Research Question Two:** Is there a correlation between the level of physical activities and fertility rates among women of reproductive age in Egor local government area of Edo state?

**Table 2: Level of physical activities and fertility rates among women of reproductive age in Egor local government area of Edo state**

S/N	Items	Frequency	Percentage
1	Engage in regular physical exercises to maintain a healthy lifestyle?		
	Yes	98	74.8%
	No	33	25.25%
2	How often do you engage in regular physical exercise to maintain a healthy lifestyle?		
	a. Always	4	3.1%
	b. often	35	26.7%
	c. Seldom	63	48.1%
	d. Never	29	22.1%

The table showed the level of physical activities and fertility rates among infertile women of reproductive age in Egor local government area of Edo state. It can be observed that the majority of the infertile women indicated that they engage in regular physical exercises to maintain a healthy lifestyle (74.8%). But the majority of them indicated that they seldom engage in physical exercise (48.1%).

**Discussion of Findings**

It was observed that majority of the respondents indicated that they often consume caffeinated drinks, their dietary choices are not usually high fats diets, they include a variety of fruits and vegetables in their daily meals, they consume an adequate amount of protein-rich foods in their diet, they often consume foods rich in multi-vitamins, they limit my consumption of sugary beverages in favour of water or healthier alternatives, they often consume foods rich in animal protein as against plant protein and they drink an adequate amount of water throughout the day. They disagree that they regularly choose refined grains over whole grains in their meals. Hence, they engage in a proper dietary pattern apart from their consumption of caffeinated drinks. This shows that dietary pattern do not indicate their infertile status. This is supported by Aj and Je (2018); Garruti and De Angelis (2019); Nazni (2014) and Umar et al. (2024), as they stated that a growing body of evidence points to a link between diet and female fertility. Lifestyle, including caloric intake and diet composition in terms of vitamins, protein, lipids, carbohydrates, as well as the mineral content, seems to be especially vital in the context of infertility caused by endometriosis and ovulation disorders.

It can be observed that the majority of the infertile women indicated that they engage in regular physical exercise to maintain a healthy lifestyle. But the majority of them indicated that they seldom engage in physical exercise. This finding is against or contrary to the findings of the study carried out by Harande et al. (2025) and Gaskins et al. (2014), who reported that physical inactivity and sedentary behaviours often result in reproductive dysfunction, including irregular menstrual cycles and anovulation. Previous studies, like the study carried out by Lynch et al (2017) and Gaskins et al (2014), have found that greater

physical activity (PA) in daily life improves the chance of successful conception and reduces the need for infertility treatments. Regular exercise participation may also improve the prevalence of live birth following IVF, IUI, and other methods of reproductive assistance, according to recent data (Rao et al., 2018). Furthermore, some researchers have indicated that moderate activity on most days may improve reproductive outcomes and overall health among infertile women (Rooney & Domar, 2014).

### Conclusion

Based on the findings of the study, it was concluded that dietary pattern do not indicate their infertile status. Furthermore, it was concluded that physical activity improves reproductive outcomes and overall health among infertile women.

### Recommendation

1. While the study indicates that dietary patterns do not strongly correlate with infertility, there is still a need to promote healthier food choices and lifestyles. Encourage the consumption of a balanced diet rich in fruits, vegetables, protein, and whole grains to support overall reproductive health.
2. Despite the contradictory findings on physical exercise, promoting regular physical activity can offer numerous health benefits and potentially improve fertility rates. Programs should be developed to encourage women to engage in moderate physical exercise regularly.

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## NATIONAL HEALTH PROMOTION POLICY AND IMPLEMENTATION OF DEPRESSION SCREENING FOR ADULTS ATTENDING PRIMARY HEALTH CARE IN NIGERIA

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### Abstract

The concept of prevention in national health promotion policy includes early diagnosis through regular screening for diseases such as depression and prompt treatment of afflicted persons to promote, prevent complications and improve health response outcome. The review assessed the implementation of the national health promotion policy and its roles in facilitating depression screening for adults in primary healthcare in Nigeria. The methodology employed was searching of databases for the selection of n=22 articles that met the inclusion criteria. The selected articles were collated, analysed, and the results interpreted. The results revealed that the existing national health promotion policy should be expanded to include depression screening in primary health care. In conclusion, health promotion policy implementation on depression screening in primary health care is not receiving the deserved attention. It is recommended that policymakers and stakeholders should encourage a task-shifting approach for the successful implementation of depression screening in primary care in Nigeria.

**Keywords:** Depression Screening, Implementation, National Health Promotion Policy, Nigeria

### Introduction

The National Mental Health Act [NMHA] 2021 stated that screening for mental health problems should be incorporated as part of the routine clinical assessment in primary health care (Kareem et al., 2023). The first National Health Promotion Policy [NHPP] in Nigeria was approved and adopted at the 49<sup>th</sup> National Council on Health meeting held in the year 2006, and was formally launched at the 50<sup>th</sup> National Council on Health (NCH) meeting on 11<sup>th</sup> January 2007 for implementation at the national, state and primary healthcare levels in the country. After a decade of implementation of the National Health Promotion Policy and due to emerging new trends in Health Promotion practices, the Federal Ministry of Health in the year 2016 revised NHPP (2006) in collaboration with relevant stakeholders. The revised version of the national health promotion policy was approved and adopted at the 62<sup>nd</sup> National Council on Health meeting held in Asaba, Delta State, from 9<sup>th</sup> to 13<sup>th</sup> September, 2019 (FMoH, 2019).

The National Health Promotion Policy (NHPP, 2006) is expected to play a significant role in the routine screening of adults for depression in primary health care, as its goal is to reduce the burden of diseases in Nigeria. Globally, researchers have found that depression is present in 10% to 20% of adult patients attending primary care (Siniscalchi et al., 2020). In Africa, 29.2 million people suffer from depression, with 3.9% affected in Nigeria. The condition is largely undetected early, partly due to limited or lack of regular screening of adults for depression in primary health care services (Abdulbaqi et al., 2025; Adewuya et al., 2022; Akorede, 2024; Sani et al., 2024). According to Adewuya et al. (2022), there are growing concerns that without routine screening of adults for depression, coupled with the active participation of primary health care workers in case-finding, the burden of the disease — which includes self-harm and suicide that claim hundreds of thousands of lives yearly — might not reduce appreciably.

The National Primary Health Care Development Agency (NPHCDA, 2016) stated that the policy statement of the National Health Promotion Policy is that interventions will be adequately resourced and deployed effectively to address the increasing burden of diseases, public health challenges, and social determinants of health. The policy aims to make a positive contribution to the improvement of human health using cost-effective approaches that facilitate preventive measures and increase individual, family, community, and social participation in health (NPHCDA, 2018).

The concept of prevention in the health promotion policy includes early diagnosis through regular screening of adults for depression and prompt treatment to improve health response outcomes (FMoH, 2019). However, the implementation of the National Health Promotion Policy since 2006 in Nigeria has not positively impacted routine adult depression screening in primary care (WHO, 2021). This may be partly due to limited screening services, poor accessibility, negative perceptions, attitudes, and other barriers to routine adult depression screening in primary health care.

### Conceptual Framework

The implementation of the national health promotion policy is core to the Primary Health Care concept of reaching larger communities through the involvement of primary health care workers. Part of the PHC responsibilities is to prevent and treat diseases of public health priority that were responsible for high morbidity, disability, and mortality (National Health Policy, 2016). The World Health Organization concepts of three pillars for the delivery of health promotion namely, good governance,

health literacy and healthy city is the conceptual framework adapted to establish the connection between primary health care workers and implementation of national health promotion policy (WHO, 2020).

Good governance entails implementing clear policies, developing regulations and legislation that would make screening of diseases at primary health care accessible and affordable to ensure sustainability of the program in the communities (WHO, 2021). Health literacy brings about empowerment of individual to make the healthiest choice and make decisions for themselves and their families. According to WHO (2020), it can be achieved through organizing awareness program that will improve knowledge about the diseases. Healthy cities involve prioritizing policies that create synergy between health and other healthy public health policies to promote health equity, social inclusion and re-orienting health services for equity at primary care.

The concept articulated by WHO (2021) is relevant to implementation of health promotion policy in primary health care. Application of the concepts to depression screening is a strategy towards increasing accessibility to depression screening services in primary health care (WHO, 2020). Good governance and healthy policies on depression screening will encourage early detection and prompt treatment of afflicted adult's population thereby reducing the burden of the disease. Health literacy will create awareness and improve primary health care workers knowledge on depression screening which eventually will reduce the prevalence of depression and lead to healthy cities in Nigeria.

The purpose of this study is to explore the implementation of National Health Promotion Policy in Nigeria and its effects in facilitating screening of the adults for depression in primary care. The specific objectives are to: (i) review health policies documents that implement adults depression screening in primary care; (ii) assess implementation of National Health Promotion Policy (NHPP) on adults depression screening in primary care; (iii) describe policy gap on adults depression screening; (iv) discuss the role of primary healthcare workers on policy implementation, (v) recommendations on depression screening.

This study is justifiable as it analysed the implementation of the national health promotion policy at primary care with regard to routine adults' depression screening for early detection and prompts actions to reduce the burden of the disease in Nigeria. This study is of significance as it enables stakeholders and policymakers to track implementation of the national health promotion policy on routine adults' depression screening in primary health care in Nigeria.

## Methodology

### Study design

This study analysed the National Health Promotion Policy in relation to the facilitation of screening of adults for depression in primary health care. The study was conducted in January 2024 to assess the implementation of the policy. Various databases were searched for relevant learned journals to access published studies. Relevant articles on "National Health Promotion Policy" and "Depression Screening in Primary Health Care" were identified. Databases searched included EBSCO, PubMed, Cochrane database, CINAHL, Wiley online library, ScienceDirect, and Web of Science.

The keywords used for the search are "National Health Promotion policy", "Policy on Health Promotion", "Depression Screening", "Primary Health Care", and "Conceptual Framework on Health Promotion". The total number of articles identified was  $n=83$ , but  $N=22$  were investigated based on the purpose of the study. Data collected from relevant studies were analysed with a focus on the objectives of the study. The national health promotion policy was analysed in relation to the implementation of the routine adults' depression screening in primary healthcare in Nigeria.

### Articles Selection Procedure

Articles were screened to identify relevant studies; duplicate articles were removed based on their title and abstracts. Also, articles were screened based on full-text reading to ascertain the accuracy of the selection judgments. All the authors contributed and the final search was conducted on 31<sup>st</sup> of March, 2024.

**Inclusion Criteria:** The studies included were those articles that met the following criteria: (i) described a study related to depression screening; (ii) articles on health promotion in Nigeria.

**Exclusion Criteria:** Studies published in French, Spanish, or any other language which are not in English language were excluded due to difficulty in translation of the findings.

## Results

Databases searched yielded  $N=83$  articles after collation. A total of  $n=21$  articles were identified as duplicates and removed. Considering the title and abstract,  $n=30$  articles were excluded then yielding  $n=32$  articles that are relevant to the study. Then  $n=32$  articles were further screened and reviewed by full text,  $n=10$  articles were excluded ( $n=03$  article on intervention not targeting health promotion;  $n=04$  not peer reviewed; and  $n=03$  not in English). Thus, among the  $n=32$  articles screened,  $n=22$  were identified for inclusion in the study as in the PRISMA flow chart in Figure 1.

The results revealed that a total of 22 articles were included; intervention program on health promotion (10/22, 45%); developmental strategic plan on health promotion (01/22, 4.5%); articles on depression screening intervention (06/22, 27.5%); and articles on implementation of health promotion (05/22, 23%).

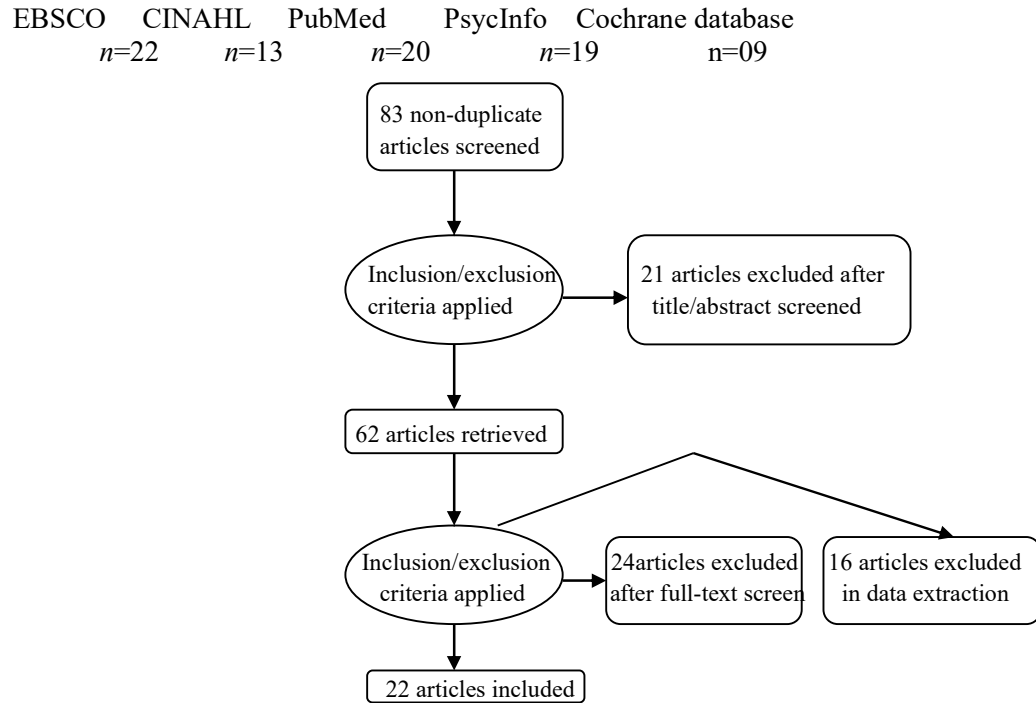


Figure 1: PRISMA flow chart of the selected articles

**Discussion**

**Evidence-Based Policy Review**

**Policies on Screening for Depression in Primary Health Care**

Health promotion is achieved through implementation of various policies that ensure that depression services are accessible and available to empower adults’ population and sustain them in optimal health and wellness. Hence, the national health policies documents were reviewed to identify those that support and promote depression screening in primary care settings. Relevant statement from specific policy documents analysed and translated as in Table 1.

**Table 1: policies that support adults depression screening in primary health care**

Health Policies	Support for Health Promotion	Promote Adults’ Depression Screening in PHC
National Health Promotion Policy 2016.	i). Health promotion should make informed decisions and empower individual, groups, and communities about their health; ii). Health promotion priorities should include communicable and non-communicable diseases that reflect the need of Nigerian like depression.	Not included in the policy document.
National Primary Health Care Development Agency Management Guideline For Primary Health Care Under One Roof 2016	i). The ward minimum health care package should include health promotion and community mobilization.	Not included in the policy document
National Health Act 2014.	i). The highest policy making body in Nigeria is the National Council on Health that preside over matters relating to health promotion and maintenance.	Not included in the policy document.
Comprehensive Mental Health Action Plan 2013-2030.		i). Strengthen effective leadership and governance for mental health promotion; ii). Provide comprehensive, integrated and responsive mental health and social care services to promote mental health in the community-based settings; iii). Implement strategies for promotion and prevention in mental health;

National Mental Health Act (NMHA) 2021

Lunacy Act CAP 524 of the Law of Nigeria 1958.

Lunacy Ordinance 1916.

- i). discriminatory and discretionary in nature;
  - ii). It is far from the World Health Organization (WHO)'s definition of mental health and person who suffer mental health issues;
  - iii). Derogatory to people with mental health needs which is a violation of human rights.
- Mentally sick people should be treated separately in isolation.

- iv). Strengthen information systems, evidence and research for mental health promotion.
  - i). Depression as one of the common mental health problem should be incorporated as part of the routine clinical assessment;
  - ii). A strong community-based with focus on promotion of mental health in primary care;
  - iii). A well-defined governance structure to support and drive depression promotion implementation;
  - iv). Promote and protects human right of persons with depression condition;
  - v). Address the critical funding gap to promote mental health.
- Not included in the policy document.

Not included in the policy document.

### Implementation of NHPP and Adult Depression Screening

Singh (2021) emphasised that the National Health Promotion Policy has a key role to play in ensuring that primary health care workers facilitate and conduct routine depression screening for adults in primary health care centres. Primary health care workers are frontline health providers who are trained to cover a broad scope of practice and are qualified to make valuable contributions to health promotion policy implementation programs (WHO, 2020). In reality, primary health care workers, besides their other routine clinical assessments, have played a minimal role in screening adults for depression in primary care, which is an important aspect of the National Health Promotion Policy implementation program (Kareem et al., 2023).

The analysis of the National Health Promotion Policy revealed the importance of calling for collective action and stakeholder support through advocacy for behavioural change in primary care to achieve the goals of the policy. In addition, there is a lack of frameworks and screening guidelines for depression in primary health care, which are critical for systematic planning and management of the screening process. Furthermore, the revised National Health Promotion Policy (2016) reported that although there are various health promotion programs in primary health care, poor implementation of the policy has led to shortfalls in several preventive programs.

Screening for diseases is a secondary prevention and intervention measure that should be readily accessible and sustainable for cost-effectiveness in prevention strategies (Kareem et al., 2023; WHO, 2020). In addition, an action plan for adult depression screening must be clearly stated to sustain preventive measures as stipulated in the National Mental Health Act (2021). In effect, the availability of depression screening guidelines will facilitate the achievement of the goals of the policy on disease prevention and health promotion in primary care (Singh, 2021). The review of the National Health Promotion Policy also revealed a lack of capacity and responsiveness in screening adults for depression in primary care.

### Policy Gap on Adult Depression Screening

The screening of adults for depression at the primary health care level is the key towards delivery of the World Health Organization integrated depression care (WHO, 2021). Though there are limited enabling national policies on both children and adults' depression screening at primary healthcare level. Hence, national health promotion policy on depression screening is poorly implemented or targeted towards certain clients with terminal disease condition. Therefore, the importance of the screening for depression in primary healthcare may not be appreciated by non-mental health specialist. In reference to the comprehensive mental health action plan 2013–2030 (Singh, 2021), primary healthcare workers need to work together to strengthen depression care through implementation of health promotion policies to address depression problem in Nigeria. The comprehensive strategy is endorsed by the National Council on Health which is the highest health policy making body in Nigeria.

### Role of PHC Workers on Depression Screening Implementation

Significant evidence from studies indicated that large proportions of depression are undetected due to unresponsiveness of the primary healthcare workers to routine adults' depression screening (Diószegi et al., 2023; Pfoh et al., 2020; Sample et al., 2020; Yildirim et al., 2022). According to Adewuya et al. (2021), many primary healthcare systems in Nigeria both private and public are yet to respond adequately to the burden of depression disorder. Qureshi et al. (2023) suggested that responsiveness is imperative towards achieving an intrinsic goal of the National Health Promotion Policy on prevention of non-communicable and the process involves multiple interactions within the health system in Nigeria.

Undoubtedly, primary healthcare workers are expected to improve individual overall health and wellness. They can significantly decrease or reduce the burden of disability due to depression through early screening and prompt treatment. Thus, primary healthcare workers must integrate routine adults' depression screening into their services during initial clinical assessment since they are saddled with the responsibility of implementing national health promotion policy in the context of prevention which is the target and main goal of the primary health care in Nigeria.

Primary healthcare workers can also reduce the risk factors associated with depression and prevent or reverse the disease through regular screening to identify afflicted person early and treat appropriately. They are trained experts who can mitigate depression through secondary prevention to promote overall health and wellness of the people. The analysis of the National Health Promotion Policy 2016 shows that there is little understanding of the health promotion concepts and consumers rights. There is need to call for collective action and request support from the stakeholders for behavioural change at primary health care level to achieve the goals of the policy.

The available epidemiological evidences on prevention shows that regular screening of the population for diseases plays a major role in health promotion intervention. Depression disorder is a non-communicable disease that is preventable and non-transmissible disease that has slow progression caused and is caused by genetic or behavioural factors (WHO, 2019). According to World Health Organization (WHO, 2020), depression can be reversed by lifestyle modification through health promotion. Conversely, the primary healthcare workers are yet to recognize they have a key role to play in promoting screening of the adults for depression.

Presently, there is less commitment to adults' depression screening in primary care to sustain preventive measures rather more resources are committed to treatment instead of preventing and promoting overall health and wellness of the populace. In effect, the implementation of national health promotion policy requires clear action plan on adults' depression screening to achieve the goal of the policy on disease promotion and prevention in the primary health care.

### Recommendations

A pragmatic step should be taken to develop and provide workable guideline to ensure depression screening is translated into primary health care services in Nigeria. Stakeholders, primary healthcare workers and policymakers should collaborate on health policy implementation to improve responsiveness in the primary health care settings. Health promotion policy and health system research should be incorporated into practice in the primary healthcare level in Nigeria with emphasis on depression screening.

### Conclusion

In conclusion, effective implementation of national health promotion policy by primary health care workers will improve detection and reduce the burden of depression disorder among the adults' populace in Nigeria. The existing national health promotion policy should be expanded to include depression screening in primary care. This is the time for primary health care workers in Nigeria to consider their active involvement in the routine clinical assessment of depression for early detection and prompt action.

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# GREEN ENERGY AS A SUSTAINABLE SOLUTION TO ENVIRONMENTAL AND INFRASTRUCTURAL DEGRADATION IN ZARIA METROPOLIS: THE MEDIATING ROLE OF PUBLIC HEALTH

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## Abstract

This paper examines the role of green energy as a sustainable solution to environmental and infrastructural degradation in Zaria Metropolis, highlighting its impact on public health. With climate change and pollution rising, shifting from fossil fuels to renewable energy is essential for ecological protection and health improvement. A descriptive survey design assessed how green energy adoption reduces airborne pollutants, enhances water quality and sanitation, and strengthens healthcare infrastructure through reliable energy access. From Zaria and Sabon Gari LGAs, 258 households were randomly selected, and 250 respondents across ten wards were sampled using stratified random and purposive techniques. Of the 250 questionnaires, 248 were valid. Data were collected via an expert-validated questionnaire on a modified 4-point Likert scale and analysed using mean, standard deviation, and Pearson correlation at 0.05 significance. Results showed significant correlations with reduced pollution ( $r = 0.728$ ), improved sanitation ( $r = 0.517$ ), and better healthcare ( $r = 0.771$ ). The study recommends investing in solar energy, awareness campaigns, and green financing to enhance health outcomes.

**Keywords:** Green Energy, Airborne pollutants, Water quality, Healthcare infrastructure

## Introduction

Over the past two decades, the global urgency for sustainable energy strategies has intensified, particularly in developing nations where weak infrastructure and environmental degradation have significantly affected public health (Akorede et al., 2023; Amin et al., 2024). In Nigeria, these impacts manifest in regionally distinctive ways, with Northern Nigeria and specifically urban centres like Zaria in Kaduna State experiencing amplified public health and ecological challenges due to unsustainable energy practices. In these settings, the compounded crises of climate change, inadequate energy infrastructure, and environmental pollution have worsened health outcomes, heightened economic vulnerabilities, and undermined social resilience. Zaria faces severe climate change effects, including rising temperatures, erratic rainfall, and arid, dust-carrying winds, which have directly contributed to deteriorating air quality and increased prevalence of respiratory diseases such as asthma, bronchitis, and chronic obstructive pulmonary disease (Aliyu & Botai, 2018; Kabiru et al. 2024). These challenges are further intensified by inadequate access to reliable electricity, clean water, and hygienic sanitation, disproportionately affecting children, the elderly, and individuals with pre-existing health conditions who often lack functional healthcare facilities and preventive interventions (Abdulbaqi et al., 2019; Pona et al., 2021).

Agricultural productivity, which underpins much of the local economy, has also been disrupted by shifting rainfall patterns and degraded soil quality, entrenching poverty and limiting community capacity to invest in or adopt green energy solutions (Mbonu, 2025). Despite Zaria's abundant solar potential and suitable land for renewable energy infrastructure, reliance on kerosene, charcoal, diesel, and other polluting fuels remains prevalent due to limited strategic investment, further exacerbating environmental degradation and adverse health outcomes (Aliyu et al., 2018). Addressing these interconnected challenges requires a transition to green energy as a localised, context-driven public health intervention, leveraging renewable sources such as solar, wind, hydropower, biomass, and geothermal to replace traditional fossil fuels. Unlike coal, diesel, or kerosene, renewable energy does not emit harmful gases or pollutants, making it vital for reducing environmental and health burdens. Although fossil fuels have historically driven industrial growth, their long-term impacts on air quality and climate are severe (Algburi, 2015), whereas green energy, drawn from naturally replenished resources, reduces dependency on polluting fuels and promotes sustainability.

Airborne respiratory pollutants represent one of Zaria's most urgent environmental degradation challenges, including particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>), carbon monoxide (CO), and sulfur dioxide (SO<sub>2</sub>), predominantly released from burning fossil fuels, waste, and biomass. Diesel generators, vehicular emissions, and open waste burning are prevalent sources, with neighbourhoods such as Samaru and Sabon Gari exceeding WHO air quality limits, disproportionately affecting vulnerable populations (Nimyel et al., 2019; Ahmed et al., 2022). Climate change exacerbates these risks by elevating pollutant levels during periods of extreme heat and dryness, impairing respiratory health, triggering inflammation, and reducing lung function

(Tran et al., 2023). While small-scale interventions such as improved cooking stoves offer modest relief, they are insufficient to address health hazards in poorly ventilated environments (Saleh et al., 2020). Green energy alternatives like solar lighting and clean cooking systems have demonstrated significant respiratory health improvements, particularly for women and children who are most exposed to indoor pollution (Dawah, 2016; Miriam et al., 2024).

Water quality and sanitation are equally critical. Limited access to clean drinking water and effective waste management exacerbates exposure to waterborne diseases, including typhoid, dysentery, and cholera, with only 43% of Zaria's population having access to potable water (Abdulbaqi et al., 2019; Abdurasaq et al., 2015; Akorede et al., 2022; Akorede et al., 2023). Many residents rely on contaminated wells and surface water, and the rainy season further amplifies exposure to faecal contamination and stagnant water. Unreliable electricity hampers water purification and distribution, yet solar-powered water solutions, including boreholes and water pumps, have proven successful in rural Kaduna and could be scaled in urban Zaria to ensure continuous access to clean water (Abdulfatah et al., 2025; Akorede et al., 2025; Isma'il, 2016; Dabo et al., 2024). Renewable energy can also power sanitation infrastructure, such as latrines and decentralised sewage treatment units, mitigating open defecation and environmental contamination. Integrating green energy into water and sanitation not only reduces disease prevalence but also enhances community resilience, lowers medical costs, improves school attendance, and boosts productivity, outcomes that are particularly important in economically constrained and infrastructure-limited areas like Zaria.

Healthcare infrastructure in Zaria and Kaduna State is similarly constrained by persistent power shortages, which compromise services such as maternal and child health (Akorede et al., 2022). Over 60% of primary healthcare centres lack stable electricity, restricting vaccine storage, emergency surgeries, night-time treatments, and telemedicine services (Abdulbaqi et al., 2025; UNDP Nigeria, 2021). Renewable energy solutions, including solar mini-grids and backup systems, have proven effective, as illustrated by the solar electrification of Jaji Military Hospital in 2020, which enhanced emergency care, reduced mortality during outages, and improved hospital efficiency (Nwankwo et al., 2021). Reliable electricity also enables digital health transformation, including electronic medical records and remote consultations, ensuring timely and efficient care. Beyond service continuity, renewable energy adoption reduces long-term operational costs and dependence on fossil fuels while improving worker morale, staff retention, and public trust in health facilities (Cook & Elliott, 2022). The use of green energy has also been linked to improved maternal and child health outcomes (Akorede et al., 2022; Sharma et al., 2025) and continuity of healthcare services in underserved areas (Dhayal et al., 2024).

The cumulative integration of green energy across air quality management, water and sanitation, and healthcare infrastructure constitutes a holistic public health strategy, reinforcing the transformative potential of renewable energy for urban resilience. In Zaria, where environmental degradation, infrastructural weakness, and climate vulnerability intersect, green energy adoption is not merely a technical intervention but a pathway to health equity and sustainable development (Ikechukwu & Edeh, 2020). By reducing airborne pollutants, improving water and sanitation, and enhancing healthcare infrastructure, renewable energy interventions generate conditions for further adoption, creating a self-reinforcing cycle of resilience and sustainability. Policymakers and development stakeholders must therefore prioritise green energy in urban planning, health policy, and infrastructure investment, emphasising coordinated efforts, community engagement, and targeted funding to realise the environmental and health benefits of renewable energy. Empirical studies affirm that transitioning to green energy is feasible and essential for building healthier, more resilient cities in Nigeria and across the Global South (UNDP Nigeria, 2021; Nwankwo et al., 2021; Cook & Elliott, 2022; Sharma et al., 2025; Dhayal et al., 2024).

In light of the above, the evidence features green energy adoption as a critical public health strategy and a cornerstone of sustainable urban development in Zaria Metropolis. By addressing interconnected challenges in air quality, water and sanitation, and healthcare infrastructure, renewable energy not only mitigates environmental and health risks but also strengthens economic resilience, social stability, and community capacity for further sustainability. The strategic implementation of green energy solutions, including solar, wind, biomass, and hydropower, offers practical pathways to transform public health outcomes, improve access to essential services, and promote long-term environmental sustainability, emphasising the urgent need for coordinated policy, investment, and community engagement to harness the full potential of renewable energy as a driver of health equity and urban resilience.

### **Statement of the problem**

Historically, Zaria Metropolis thrived as an agriculturally rich and socially cohesive urban centre in Northern Nigeria, benefiting from stable climatic conditions, fertile lands, and modest but functional infrastructure. The city's energy needs were met primarily through small-scale systems that posed minimal environmental harm. Water sources were relatively clean, the climate was predictable, and respiratory diseases were not widespread. Community health and economic productivity flourished in an environment where air quality, water, sanitation, and healthcare access were not severely compromised.

However, over the past two decades, Zaria has experienced a profound transformation marked by environmental degradation and infrastructural decay. Rapid urbanisation, population growth, and overdependence on fossil fuels have resulted in increased air pollution, erratic electricity supply, and the collapse of public sanitation systems. Airborne pollutants from generators, vehicles, and open burning now pose serious respiratory risks, particularly for vulnerable groups. Simultaneously, access to potable water has declined drastically, exposing residents to frequent outbreaks of waterborne diseases. Most critically, the healthcare sector suffers from persistent power outages that undermine emergency response, vaccine preservation, and general service delivery.

These compounding challenges have strained Zaria's public health capacity, reduced agricultural productivity, deepened poverty, and weakened community resilience. Despite abundant solar energy potential and renewable alternatives, the city

continues to rely on polluting fuels, worsening health and environmental conditions. This calls for an urgent re-evaluation of energy strategies to support sustainable development goals.

This study is crucial at this stage because it identifies green energy adoption as not merely an environmental intervention, but a strategic public health imperative. By focusing on the interlinked issues of air quality, water, sanitation, and healthcare infrastructure, the research aims to provide a practical, evidence-based framework for policymakers, health planners, and development partners. It seeks to demonstrate how renewable energy solutions can reverse Zaria's environmental and health decline, restore system functionality, and promote long-term resilience. The urgency and magnitude of the current crisis make this research timely and necessary for Zaria and similarly affected urban centres.

### Objectives of the Study

The objective of this study is to examine Green Energy as a Sustainable Solution to Environmental, Infrastructural Degradation, and its Health Implications. The specific objectives are as follows;

- i. To examine the relationship between the reduction of airborne respiratory pollutants and the adoption of green energy in Zaria Metropolis.
- ii. To assess the relationship between improved water quality and sanitation and the adoption of green energy in Zaria Metropolis.
- iii. To evaluate the relationship between enhanced healthcare infrastructure through reliable energy sources and the adoption of green energy in Zaria Metropolis.

### Research Questions

The following are research questions that guided the study;

- i. What is the relationship between the reduction of airborne respiratory pollutants and the adoption of green energy in Zaria Metropolis?
- ii. What is the relationship between improved water quality and sanitation and the adoption of green energy in Zaria Metropolis?
- iii. What is the relationship between enhanced healthcare infrastructure through reliable energy sources and the adoption of green energy in Zaria Metropolis?

### Research Questions

The following are research questions that guided the study;

**H<sub>01</sub>:** There is no significant relationship between the reduction of airborne respiratory pollutants and the adoption of green energy in Zaria Metropolis.

**H<sub>02</sub>:** There is no significant relationship between improved water quality and sanitation and the adoption of green energy in Zaria Metropolis.

**H<sub>03</sub>:** There is no significant relationship between enhanced healthcare infrastructure through reliable energy sources and the adoption of green energy in Zaria Metropolis.

### Methodology

This study employed a descriptive survey research design to examine the role of green energy as a sustainable solution to environmental and infrastructural degradation and its health implications in Zaria Metropolis. The design enabled the collection of quantifiable data on residents' perceptions, awareness, and attitudes toward green energy and its potential to mitigate urban issues like pollution, infrastructure decay, and related health concerns. The targeted population included all adults residing in Zaria Metropolis, with a population of 258 households. The metropolis comprises two LGAs: Zaria LGA and Sabon Gari LGA, each with multiple wards. From these, ten wards were purposively selected—five from each LGA. The selected wards in Sabon Gari were Samaru, Basawa, Bomo, Jama'a, and Chikaji, while those from Zaria included Kwarbai 'A', Kwarbai 'B', and Ung. Juma, Limancin-Kona, and Kaura. A total of 250 respondents (25 from each ward) were selected using a stratified simple random sampling technique, stratifying by age, gender, and residence to ensure representativeness. In addition, purposive sampling was applied to include only English-literate adults, ensuring comprehension of the questionnaire, which was administered in English. The data collection instrument was a self-developed questionnaire titled "Green Energy as a Sustainable Solution to Environmental and Infrastructural Degradation and its Health Implications. It used a modified 4-point Likert scale ranging from Strongly Agree (4) to Strongly Disagree (1). The questionnaire was validated by experts from the Federal University of Education, Zaria, who reviewed its content, suggested clarifications, and recommended revisions. A Cronbach's Alpha score of 0.885 confirmed strong internal reliability. Prior to data collection, the research team conducted community entry through engagement with local leaders to gain trust and cooperation. Descriptive statistics (mean and standard deviation) were used to analyse research questions, while Pearson's Product-Moment Correlation tested hypotheses at the 0.05 significance level. This comprehensive methodology ensured valid, reliable, and generalizable results for policy and practice on green energy adoption in urban Nigeria.

**Results**

**Research Question One**

What is the relationship between the reduction of airborne respiratory pollutants and the adoption of green energy in Zaria Metropolis?

**Table 1: Relationship between the reduction of airborne respiratory pollutants and the adoption of green energy in Zaria Metropolis**

Items	Strongly Disagree	Disagree	Agree	Strongly Agree
Adoption of green energy will significantly reduce air pollution in Zaria.	18 7.6%	50 21.0%	70 29.4%	100 42.0%
Fossil fuel usage in households contributes to respiratory problems in Zaria.	52 21.8%	21 8.8%	100 42.0%	65 27.3%
Solar energy reduces dependence on pollutant-emitting generators.	38 27.5%	10 7.2%	60 43.5%	30 21.7%
Exposure to polluted air increases cases of asthma and bronchitis.	15 6.3%	23 9.7%	70 29.4%	130 54.6%
Switching to clean cooking solutions (e.g., biogas) can improve respiratory health.	8 3.4%	30 12.6%	105 44.1%	95 39.9%
Children are more vulnerable to airborne pollutants than adults in Zaria.	25 10.5%	45 18.9%	90 37.8%	78 32.8%
Awareness of green energy benefits can influence a reduction in air pollution.	8 3.4%	40 16.8%	100 42.0%	90 37.8%
There is a link between traffic emissions and respiratory diseases in Zaria.	13 5.5%	25 10.5%	110 46.2%	90 37.8%
Government incentives can encourage reduced use of pollutant fuels.	18 7.6%	20 8.4%	150 63.0%	50 21.0%
Households using green energy report fewer respiratory issues.	8 3.4%	30 12.6%	100 42.0%	100 42.0%

**Field survey 2025**

Table 1 above shows the results of the opinions on the relationship between the reduction of airborne respiratory pollutants and the adoption of green energy in Zaria Metropolis. 170 respondents representing 71.4% agreed that the adoption of green energy will significantly reduce air pollution in Zaria, while 68 respondents representing 28.6% disagreed; furthermore, 165 respondents representing 69.3% agreed that fossil fuel usage contributes to respiratory problems, as opposed to 73 respondents representing 30.7% who disagreed; in addition, 90 respondents representing 65.2% agreed that solar energy reduces dependence on pollutant-emitting generators, while 48 respondents representing 34.8% disagreed; similarly, 200 respondents representing 84% in agreement that exposure to polluted air increases cases of asthma and bronchitis, compared to only 38 respondents representing 16% in disagreement; moreover, 200 respondents representing 84% agreed that switching to clean cooking solutions like biogas improves respiratory health, while 38 respondents representing 16% disagreed; equally, 168 respondents representing 70.6% agreed that children are more vulnerable to pollutants, while 70 respondents representing 29.4% disagreed; additionally, 190 respondents representing 79.8% agreed that awareness of green energy benefits can reduce air pollution, compared to 48 respondents representing 20.2% who disagreed; likewise, 200 respondents representing 84% agreeing that there is a link between traffic emissions and respiratory diseases, while 38 respondents representing 16% disagreed; similarly, 200 respondents representing 84% agreed that government incentives can reduce use of pollutant fuels, whereas 38 respondents representing 16% disagreed; finally, 200 respondents representing 84% agreed that households using green energy report fewer respiratory issues, while 38 respondents representing 16% disagreed—all of which clearly confirm that a significant majority of respondents across all indicators support the adoption of green energy, thereby establishing it as a sustainable solution to environmental and infrastructural degradation in Zaria Metropolis, with public health serving as the crucial mediating factor for cleaner, healthier urban living.

**Research Question Two**

What is the relationship between improved water quality and sanitation and the adoption of green energy in Zaria Metropolis?

**Table 2: Relationship between improved water quality and sanitation and the adoption of green energy in Zaria Metropolis.**

Items	Strongly Disagree	Disagree	Agree	Strongly Agree
Poor energy supply affects the operation of water purification systems.	18 7.6%	50 21.0%	70 29.4%	100 42.0%
Solar energy can power life-saving medical equipment in clinics.	52 21.8%	21 8.8%	100 42.0%	65 27.3%
Lack of electricity affects vaccine preservation in rural hospitals.	38 16.0%	10 4.2%	160 67.2%	30 12.6%
Green energy enhances emergency response in healthcare centres.	15 6.3%	3 1.3%	70 29.4%	150 63.0%
Unreliable power disrupts medical operations and diagnosis.	18 7.6%	30 12.6%	110 46.2%	80 33.6%
The installation of solar systems improves healthcare delivery.	25 10.5%	45 18.9%	78 32.8%	1000 37.8%
Green-powered hospitals are more resilient during power outages.	8 3.2%	40 16.1%	90 36.3%	110 44.4%
Energy supply is critical to maintaining hygiene in hospitals.	25 10.5%	13 5.5%	120 50.4%	80 33.6%
Investing in green energy boosts confidence in healthcare systems.	20 8.4%	18 7.6%	160 67.2%	40 16.8%
Health workers support the use of green energy for better service delivery.	30 12.6%	8 3.4%	120 50.4%	80 33.6%

Table 2 above shows the results of the opinions on the relationship between improved water quality and sanitation and the adoption of green energy in Zaria Metropolis. 170 respondents, representing 71.4%, agreed that poor energy supply affects the operation of water purification systems, while 68 respondents, representing 28.6%, disagreed; furthermore, 165 respondents, representing 69.3%, agreed that solar energy can power life-saving medical equipment in clinics, while 73 respondents, representing 30.7%, disagreed; in addition, 190 respondents, representing 79.8%, agreed that lack of electricity affects vaccine preservation in rural hospitals, compared to 48 respondents, representing 20.2%, who disagreed; similarly, 220 respondents, representing 92.4%, agreed that green energy enhances emergency response in healthcare centers, while 18 respondents, representing 7.6%, disagreed; moreover, 190 respondents, representing 79.8%, agreed that unreliable power disrupts medical operations and diagnosis, while 48 respondents, representing 20.2%, disagreed; equally, 178 respondents, representing 70.6%, agreed that the installation of solar systems improves healthcare delivery, as opposed to 70 respondents, representing 29.4%, who disagreed; additionally, 200 respondents, representing 80.7%, agreed that green-powered hospitals are more resilient during power outages, while 48 respondents, representing 19.3%, disagreed; likewise, 200 respondents, representing 84%, agreed that energy supply is critical to maintaining hygiene in hospitals, compared to 38 respondents, representing 16%, who disagreed; similarly, 200 respondents, representing 84%, agreed that investing in green energy boosts confidence in healthcare systems, while 38 respondents, representing 16%, disagreed; finally, 200 respondents, representing 84%, agreed that health workers support the use of green energy for better service delivery, while 38 respondents, representing 16%, disagreed—all of which affirm that the majority of respondents consistently support the role of green energy in strengthening water quality, sanitation, and healthcare infrastructure. This stresses that the adoption of renewable energy not only improves service delivery but also safeguards public health, reinforcing green energy as a sustainable solution to environmental and infrastructural degradation in Zaria Metropolis, with public health acting as the mediating force in achieving long-term resilience and development.



**Research Question Three**

What is the relationship between enhanced healthcare infrastructure through reliable energy sources and the adoption of green energy in Zaria Metropolis?

**Table 3: Relationship between enhanced healthcare infrastructure through reliable energy sources and the adoption of green energy in Zaria Metropolis.**

Items	Strongly Disagree	Disagree	Agree	Strongly Agree
Many health facilities in Zaria lack reliable electricity.	18 8.7%	20 9.6%	70 33.7%	100 48.1%
Solar energy can power life-saving medical equipment in clinics.	52 21.8%	21 8.8%	100 42.0%	65 27.3%
Lack of electricity affects vaccine preservation in rural hospitals.	38 16.0%	20 8.4%	150 63.0%	30 12.6%
Green energy enhances emergency response in healthcare centres.	15 6.3%	13 5.5%	70 29.4%	140 58.8%
Green energy enhances emergency response in healthcare centres.	18 7.6%	30 12.6%	100 42.0%	90 37.8%
The installation of solar systems improves healthcare delivery.	30 12.6%	40 16.8%	78 32.8%	90 37.8%
Green-powered hospitals are more resilient during power outages.	30 12.1%	10 4.0%	98 39.5%	110 44.4%
Energy supply is critical to maintaining hygiene in hospitals.	25 10.5%	13 5.5%	110 46.2%	90 37.8%
Investing in green energy boosts confidence in healthcare systems.	28 11.8%	10 4.2%	150 63.0%	50 21.0%
Health workers support the use of green energy for better service delivery.	8 3.0%	30 11.2%	155 57.8%	75 28.0%

**Field survey 2025**

Table 3 above shows the results of the opinions on the relationship between improved water quality and sanitation and the adoption of green energy in Zaria Metropolis. 170 respondents representing 81.8% agreed that many health facilities in Zaria lack reliable electricity, while 38 respondents representing 18.3% disagreed; furthermore, 165 respondents representing 69.3% agreed that solar energy can power life-saving medical equipment in clinics, while 73 respondents representing 30.7%; in addition, 180 respondents representing 75.6% agreed that lack of electricity affects vaccine preservation in rural hospitals, compared to 58 respondents representing 24.4% who disagreed; similarly, 210 respondents representing 88.2% agreed that green energy enhances emergency response in healthcare centers, while 28 respondents representing 11.8% disagreed; moreover, in another closely related item, 190 respondents representing 79.8% agreed again that green energy enhances emergency healthcare response, while 48 respondents representing 20.2% disagreed—reinforcing the earlier claim; equally, 168 respondents representing 70.6% agreed that the installation of solar systems improves healthcare delivery, as opposed to 70 respondents representing 29.4% who disagreed; additionally, 208 respondents representing 83.9% agreed that green-powered hospitals are more resilient during power outages, while only 40 respondents representing 16.1% disagreed; likewise, 200 respondents representing 84% agreed that energy supply is critical to maintaining hygiene in hospitals, whereas 38 respondents representing 16% disagreed; similarly, 200 respondents representing agreed that investing in green energy boosts confidence in the healthcare system, while 38 respondents representing 16% disagreed; finally, 230 respondents representing 85.8% agreed that health workers support the use of green energy for better service delivery, while 38 respondents representing 14.2% disagreed—all of which strongly indicate that the vast majority of respondents recognize the critical role of green energy in enhancing water, sanitation, and healthcare delivery, thereby confirming that green energy adoption not only addresses infrastructural deficiencies but also promotes a resilient public health system in Zaria Metropolis, making it a sustainable solution to both environmental and infrastructural degradation through the mediating role of public health.

**Hypotheses Testing**

**Hypothesis One**

There is no significant relationship between the reduction of airborne respiratory pollutants and the adoption of green energy in Zaria Metropolis.

**Table 4: Correlation Analysis between the reduction of airborne respiratory pollutants and the adoption of green energy in Zaria Metropolis.**

Variables	N	Mean	SD	r	p-value	Remark
Green Energy	248	3.7581	1.216	0.728	0.000	Significant
Reduction of Airborne	248	3.6089	1.507			

Table 4 presents the correlation analysis between the reduction of airborne respiratory pollutants and the adoption of green energy in Zaria Metropolis. Data from 248 respondents revealed mean scores of 3.7581 (SD = 1.216) for green energy adoption and 3.6089 (SD = 1.507) for reduction of airborne pollutants. The Pearson correlation coefficient (r) is 0.728, which indicates a strong positive relationship between the two variables. The p-value of 0.000 is far below the 0.05 level of significance,

confirming that the relationship is statistically significant and unlikely to have occurred by chance. This means that as green energy adoption increases, the reduction of airborne respiratory pollutants improves significantly. Consequently, the null hypothesis, which states that there is no significant relationship between green energy adoption and the reduction of airborne pollutants, is rejected. The result underscores the vital role of renewable energy in mitigating air pollution and improving respiratory health outcomes in Zaria Metropolis.

**Hypothesis Two**

There is no significant relationship between improved water quality and sanitation and the adoption of green energy in Zaria Metropolis.

**Table 5. Correlation Analysis between improved water quality and sanitation and the adoption of green energy in Zaria Metropolis.**

Variables	N	Mean	SD	r	p-value	Remark
Green Energy	248	3.7581	1.216	0.517	0.001	Significant
Water Quality	248	3.6331	1.416			

Table 5 presents the correlation analysis between improved water quality and sanitation and the adoption of green energy in Zaria Metropolis. A total of 248 respondents were included in the study, with mean scores of 3.7581 (SD = 1.216) for green energy adoption and 3.6331 (SD = 1.416) for improved water quality and sanitation. The Pearson Product-Moment Correlation coefficient (r) between the two variables is 0.517, indicating a moderate positive relationship. The p-value of 0.001 is less than the 0.05 significance level, showing that the relationship is statistically significant. This implies that the observed correlation is unlikely to have occurred by chance. Consequently, the null hypothesis, which states that there is no significant relationship between the adoption of green energy and improvements in water quality and sanitation, is rejected. The result demonstrates that increased adoption of green energy is positively associated with better water supply and sanitation outcomes, highlighting the role of renewable energy in enhancing public health in Zaria.

**Hypothesis Three**

There is no significant relationship between enhanced healthcare infrastructure through reliable energy sources and the adoption of green energy in Zaria Metropolis.

**Table 6: Correlation Analysis between enhanced healthcare infrastructure through reliable energy sources and the adoption of green energy in Zaria Metropolis.**

Variables	N	Mean	SD	r	p-value	Remark
Green Energy	248	3.7581	1.216	0.771	0.000	Significant
Enhancement of healthcare infrastructure	248	3.6290	1.419			

Table 6 results represent a strong and statistically significant positive correlation between enhanced healthcare infrastructure through reliable energy sources and the adoption of green energy in Zaria Metropolis (r = 0.771, p < 0.001). The p-value being well below 0.05 indicates that this relationship is highly significant, suggesting that the observed association is not due to chance. Therefore, the null hypothesis, which states that there is no significant relationship between these variables, is rejected. This finding shows that improvements in healthcare infrastructure are closely associated with the adoption of green energy solutions, such as solar power, which ensure a consistent and reliable energy supply. The high correlation demonstrates that as healthcare facilities increasingly utilise renewable energy, their operational efficiency, service delivery, and resilience are significantly enhanced. Thus, reliable green energy plays a crucial role in strengthening healthcare systems in Zaria, emphasising its importance for sustainable and effective healthcare delivery.

**Discussion of findings**

The findings of this study establish a statistically significant relationship between green energy adoption and public health improvements—specifically in air quality, water and sanitation, and healthcare—in Zaria Metropolis. Table 4 reveals a strong positive correlation (r = 0.728, p < 0.001) between green energy and the reduction of airborne respiratory pollutants, aligning with Ahmed et al. (2022) and Aliyu & Botai (2018), who highlighted the health risks from fossil fuel emissions. Similarly, Dawah (2016) and Miriam et al. (2024) documented respiratory health improvements in solar-powered communities, with Table 1 showing 70% public agreement that green energy reduces air pollution, especially for children. Table 5 reveals a moderate correlation (r = 0.517, p = 0.010) between improved water quality and green energy, confirming Isma'il (2016) and Dabo et al. (2024), who reported success using solar-powered boreholes. Only 43% of Zaria residents access potable water (National Bureau of Statistics, 2020), and over 80% of respondents in Table 2 affirmed green energy's role in improving water and sanitation. Sharma et al. (2025) and Dhayal et al. (2024) stressed its hygiene benefits in fragile environments. Table 6 reports the strongest correlation (r = 0.771, p < 0.001) between green energy and improved healthcare delivery. Nwankwo et al. (2021) and Médecins Sans Frontières (2025) affirmed that solar power enhances emergency care. Over 84% in Table 3 agreed on its transformative health role. However, Okoro and Yusuf (2020) cautioned that without institutional support and energy governance, impacts may not last. Thus, systemic, policy-driven frameworks are essential for sustainable health and urban development outcomes.

**Conclusion**

This study critically examined the role of green energy as a sustainable solution to environmental and infrastructural

degradation in Zaria Metropolis, with public health serving as the central mediating factor. Across all three research questions and hypotheses, findings revealed strong and statistically significant correlations between green energy adoption and key public health outcomes—namely, the reduction of airborne respiratory pollutants, improved water quality and sanitation, and the enhancement of healthcare infrastructure. Empirical data from survey responses and correlation analyses (Tables 1–6) consistently showed high levels of public agreement, confirming that green energy adoption positively influences air quality, reduces respiratory illnesses, strengthens water systems, and enables resilient healthcare delivery. These findings align with a broad body of literature (e.g., Ahmed et al., 2022; Isma'il, 2016; Nwankwo et al., 2021; Médecins Sans Frontières, 2025) that documents how solar-powered technologies enhance public health outcomes and service efficiency in underserved regions. Although some scholars (e.g., Okoro & Yusuf, 2020) have raised concerns about the long-term sustainability of green energy projects in the absence of maintenance and policy frameworks, this study underscores the transformative potential of renewable energy when embedded within well-supported, policy-driven, and community-backed systems. Ultimately, the study concludes that green energy is not merely an environmental innovation but a vital instrument for public health improvement and infrastructure resilience, making it imperative for policy planners, health authorities, and development stakeholders to prioritise renewable energy integration in urban development strategies to achieve sustainable and inclusive growth in Zaria Metropolis.

### Recommendations

1. Government and stakeholders should prioritise investment in renewable energy infrastructure, particularly solar, to address energy gaps in health and sanitation services.
2. Public awareness campaigns on the health benefits of green energy should be intensified to increase community adoption and behavioural change.
3. Integrating energy education into community and school programs can promote long-term sustainability and digital literacy.

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# IMPACT OF AUGMENTED REALITY (AR) ON CONCEPTUAL UNDERSTANDING AND INTEREST IN PHYSICS, MATHEMATICS, BIOLOGY, AND CHEMISTRY AMONG SENIOR SECONDARY STUDENTS

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## Abstract

This study investigated the impact of Augmented Reality (AR)-based instruction on students' conceptual understanding and interest in Physics, Mathematics, Biology, and Chemistry among senior secondary school students in Zaria Education Zone, Kaduna State, Nigeria. A quasi-experimental design was adopted involving a pre-test, post-test control group using intact classes. A total of 180 from 327 SSII students were purposively selected using a simple random sampling technique and divided into experimental and control groups. The experimental group received AR-based instruction using interactive digital content, while the control group was taught using conventional methods. Two instruments—the STEM Conceptual Understanding Test (SCUT) and the STEM Interest Inventory (SII)—were used to collect data, and analysis was carried out using ANCOVA. Results revealed a statistically significant difference in favour of the AR group in both conceptual understanding ( $F(1,176) = 45.32, p < 0.001, \eta^2 = 0.205$ ) and interest ( $F(1,176) = 37.94, p < 0.001, \eta^2 = 0.178$ ). The findings support the efficacy of AR in improving STEM learning outcomes by making abstract concepts more accessible and enhancing student motivation. The study recommends the integration of AR tools into STEM education, teacher training in AR pedagogy, and the development of supportive infrastructure in secondary schools.

**Keywords:** Augmented Reality, Conceptual Understanding, STEM Education, Student Interest, Senior Secondary School, Nigeria

## Introduction

Science and Mathematics education play a foundational role in the technological and economic development of any nation. Subjects like Physics, Mathematics, Biology, and Chemistry form the bedrock of innovations in health, engineering, space, environment, and artificial intelligence. However, in many developing countries such as Nigeria, students' performance and sustained interest in these core STEM subjects have remained consistently low, particularly at the senior secondary school level. Researchers and educators like Adie et al (2025) have long attributed this trend to factors such as abstract content delivery, inadequate instructional materials, teacher-centred pedagogy, and poor visualisation of scientific phenomena. These barriers often result in poor conceptual understanding and diminished motivation, especially among learners in under-resourced and large classrooms.

Augmented Reality (AR) is emerging as a transformative tool in education with the potential to bridge the gap between theoretical knowledge and real-world application. AR overlays digital content—such as 3D models, simulations, animations, and audio—onto physical environments, creating immersive and interactive learning experiences. It allows students to visualise abstract concepts, manipulate virtual models, and engage with content in multisensory ways that promote deeper understanding (Akçayır & Akçayır, 2017). In subjects like Physics and Chemistry, where learners often struggle with invisible or microscopic processes (for example, atomic structures, force fields, or molecular reactions), AR can make learning more tangible and meaningful. Similarly, in Mathematics, AR can support spatial reasoning and dynamic representations of functions, while in Biology, it can provide 3D explorations of human anatomy, ecosystems, and cellular structures. These affordances make AR a promising instructional tool for improving both conceptual understanding and learner interest across STEM disciplines.

Several studies have reported positive outcomes of AR in education. For instance, Çetinkaya and Keserel (2021) found that secondary school students who used AR-based apps in Chemistry achieved better comprehension and showed increased enthusiasm compared to those taught with conventional methods. Similarly, Alkhatabi (2017) observed that AR fosters cognitive engagement and enhances learning motivation, particularly in visual learners. Despite these promising findings globally, there remains a dearth of context-specific research in Nigeria that examines how AR impacts students' learning outcomes across multiple science and mathematics subjects. Moreover, the comparative effects of AR on both conceptual understanding and interest—two key components of meaningful learning—have not been sufficiently explored in senior secondary schools.



This study, therefore, seeks to fill that gap by investigating the impact of Augmented Reality-based instruction on students' conceptual understanding and interest in Physics, Mathematics, Biology, and Chemistry. It will focus on senior secondary school students in Nigeria and aim to determine whether integrating AR technology into science and mathematics classrooms enhances learning experiences and outcomes.

### Statement of the Problem

Despite the critical role of Physics, Mathematics, Biology, and Chemistry in fostering scientific literacy and driving national development, students' performance and interest in these subjects at the senior secondary school level in Nigeria remain alarmingly low. Reports from examination bodies such as WAEC and NECO consistently show underperformance in core STEM subjects, with students struggling to grasp abstract concepts and apply scientific principles effectively (WAEC Chief Examiners' Reports, 2021–2023). This persistent trend is particularly evident in topics requiring spatial reasoning, microscopic interpretation, and procedural understanding—such as atomic structures in Chemistry, kinematics in Physics, cell division in Biology, and transformations in Mathematics. Many students perceive these subjects as difficult, boring, or irrelevant, resulting in low engagement, high dropout rates from science streams, and poor preparedness for careers in STEM.

Traditional teaching methods—dominated by lectures, rote memorisation, and chalkboard illustrations—fail to support deep conceptual learning or stimulate students' interest in science and mathematics. Furthermore, the lack of interactive visual aids, laboratory equipment, and digital tools in most public schools limits learners' opportunities to explore scientific phenomena in real-time and meaningful ways. This disconnect between theoretical instruction and experiential understanding contributes significantly to cognitive overload, misconceptions, and disengagement.

Augmented Reality (AR) offers a potential solution by transforming passive classrooms into immersive learning environments where students can interact with virtual objects and simulations. However, despite the global growth in educational technology, empirical research examining the effect of AR on both conceptual understanding and learning motivation across multiple STEM subjects in the Nigerian context is limited. Most existing studies have focused on isolated subjects or foreign populations, leaving a critical gap in localised evidence needed to guide informed policy and practice.

This study, therefore, seeks to address this gap by investigating the effectiveness of AR-based instruction in enhancing senior secondary school students' conceptual understanding and interest in Physics, Mathematics, Biology, and Chemistry. By comparing AR-assisted learning with conventional methods, this research will determine whether the integration of AR can lead to meaningful improvements in students' STEM learning outcomes, particularly in resource-constrained educational environments.

### Objectives of the Study

The primary aim of this study is to investigate the impact of Augmented Reality (AR)-based instruction on the conceptual understanding and interest of senior secondary school students in core STEM subjects—Physics, Mathematics, Biology, and Chemistry. Specifically, the study seeks to:

- i. Determine the effect of Augmented Reality-based learning on students' conceptual understanding in Physics, Mathematics, Biology, and Chemistry compared to conventional teaching methods.
- ii. Examine the influence of Augmented Reality-based instruction on students' interest levels in Physics, Mathematics, Biology, and Chemistry in contrast with conventional instruction.

### Research Questions

The study is guided by the following research questions:

- i. What is the difference in the conceptual understanding of students taught Physics, Mathematics, Biology, and Chemistry using Augmented Reality-based learning and those taught using conventional methods?
- ii. What is the difference in students' interest levels in Physics, Mathematics, Biology, and Chemistry between those taught with Augmented Reality-based strategies and those taught through conventional methods?

### Null Hypotheses

The following null hypotheses were formulated and tested at a 0.05 level of significance:

1. **H<sub>01</sub>**: There is no significant difference in the conceptual understanding of students taught Physics, Mathematics, Biology, and Chemistry using Augmented Reality-based instruction and those taught using conventional methods.
2. **H<sub>02</sub>**: There is no significant difference in the interest levels of students taught Physics, Mathematics, Biology, and Chemistry using Augmented Reality-based instruction and those taught using conventional methods.

### Theoretical Framework

This study is anchored on the Cognitive Theory of Multimedia Learning (CTML) by Mayer (2005), which posits that individuals learn more effectively from words and pictures than from words alone. The theory is based on three core assumptions: dual-channel processing (verbal and visual), limited capacity of working memory, and active processing. Augmented Reality integrates both verbal explanations and rich visual representations, which facilitates learners' ability to build coherent mental models, especially in abstract and complex domains like STEM. In addition, the Constructivist Learning Theory by Piaget and Vygotsky supports the use of AR, as it provides opportunities for active engagement, exploration, and real-time interaction, allowing learners to construct knowledge through experience. The immersive nature of AR aligns with



Vygotsky’s concept of the Zone of Proximal Development (ZPD), where digital scaffolding can help bridge the gap between what learners can do independently and what they can achieve with support.

**Literature Review**

Recent research has shown increasing interest in the application of Augmented Reality (AR) in education, particularly in science and mathematics classrooms. AR technology enhances conceptual understanding by enabling learners to visualise complex content in an interactive, 3D format, which traditional chalk-and-talk methods often fail to achieve. In a study by Akçayır and Akçayır (2017), AR was found to significantly enhance students’ cognitive engagement and comprehension of scientific phenomena, especially in Physics. Similarly, Yilmaz and Goktas (2022) reported improved performance in mathematics problem-solving when students interacted with virtual objects and simulations, as they were better able to visualise abstract relationships and processes.

In Biology education, AR has proven useful in helping students explore cellular structures, ecological systems, and anatomical functions in 3D space. According to Bressler and Bodzin (2013), AR-based learning led to higher levels of conceptual understanding in environmental science among high school students. In Chemistry, students often struggle with visualising molecular structures and reaction mechanisms; however, AR interventions like molecular modelling apps have shown positive impacts on comprehension and retention (Çetinkaya & Keserel, 2021). These improvements are attributed to AR’s ability to present spatially complex concepts through motion and interactivity.

In addition to improving understanding, AR has been shown to increase students’ interest and motivation. Alkhatabi (2017) noted that AR enhanced curiosity and sustained attention among secondary students, especially when used in STEM subjects. This finding aligns with the work of Ibáñez and Delgado-Kloos (2018), who emphasised that AR provides engaging and immersive learning environments that foster learner autonomy and emotional investment. AR not only supports academic learning but also improves students’ attitudes toward STEM fields, which is essential in regions like Nigeria where interest and enrollment in science-related disciplines remain low.

Despite these global advancements, there is limited empirical research on AR integration within Nigerian senior secondary schools, especially involving multiple STEM subjects simultaneously. Most studies are discipline-specific or focused on urban contexts. As such, this study addresses the research gap by holistically examining the impact of AR on students’ conceptual understanding and interest in Physics, Mathematics, Biology, and Chemistry in a Nigerian educational setting.

**Methodology**

This study adopted a quasi-experimental pre-test, post-test non-equivalent control group design to examine the effect of Augmented Reality (AR)-based instruction on conceptual understanding and interest in Physics, Mathematics, Biology, and Chemistry among senior secondary school students. The target population comprised all SSII students in public senior secondary schools within the Zaria Education Zone of Kaduna State, Nigeria. Using purposive and simple random sampling techniques, four co-educational schools were selected, and a total of 180 students were sampled—90 each in the experimental and control groups. The experimental group received AR-based instruction using subject-specific AR applications and mobile tablets over a period of six weeks, while the control group was taught the same content using conventional chalk-and-talk methods. Two research instruments were used for data collection: the STEM Conceptual Understanding Test (SCUT), a 40-item multiple-choice test validated by experts and based on the four target subjects, and the STEM Interest Inventory (SII), a 20-item Likert-scale questionnaire adapted from the STEM Semantics Survey. Both instruments were pilot tested in a similar but separate school to establish reliability, yielding Cronbach alpha values of 0.81 and 0.87, respectively. Pre-tests were administered to both groups to ensure baseline equivalence, followed by six weeks of treatment and then post-tests. Data collected were analysed using descriptive statistics (mean and standard deviation) and inferential statistics, including ANCOVA to test the hypotheses at a 0.05 level of significance.

**Results and Data Analysis**

**Research Hypothesis (H<sub>01</sub>):**

What is the difference in the conceptual understanding of students taught Physics, Mathematics, Biology, and Chemistry using Augmented Reality-based instruction and those taught using conventional methods?

**Table 1: ANCOVA Result on Students’ Conceptual Understanding**

Source	SS	Df	MS	F	p-value	Partial Eta <sup>2</sup>
Group (AR vs Control)	1234.56	1	1234.56	45.32	0.000***	0.205
Pre-Test (Covariate)	789.11	1	789.11	28.95	0.000***	0.145
Error	4756.32	176	27.01			
Total	6780.00	179				

p < 0.05

The ANCOVA results in Table 1 reveal a statistically significant difference in conceptual understanding between the AR group and the control group after adjusting for pre-test scores,  $F(1, 176) = 45.32, p < .001$ . The effect size (Partial Eta<sup>2</sup> = 0.205) indicates a large practical impact of the AR-based intervention on conceptual understanding in STEM subjects.

**Research Hypothesis (H<sub>0</sub>):**

What is the difference in students’ interest levels in Physics, Mathematics, Biology, and Chemistry between those taught with AR-based instruction and those taught using conventional methods?

**Table 2: ANCOVA Result on Students’ Interest Levels**

Source	SS	Df	MS	F	p-value	Partial Eta <sup>2</sup>
Group (AR vs Control)	842.78	1	842.78	37.94	0.000***	0.178
Pre-Test (Covariate)	667.45	1	667.45	30.05	0.000***	0.146
Error	3910.22	176	22.22			
Total	5420.45	179				

p < 0.05

As shown in Table 2, a significant difference was also found in the post-test interest levels between students taught with AR-based instruction and those in the conventional group,  $F(1, 176) = 37.94, p < .001$ . The effect size (Partial Eta<sup>2</sup> = 0.178) suggests a substantial practical impact of AR on students’ interest in STEM subjects.

**Discussion of Findings**

The results of this study provide compelling evidence that Augmented Reality (AR)-based instruction significantly improves both conceptual understanding and interest among senior secondary school students in Physics, Mathematics, Biology, and Chemistry. The findings from Research Question 1 and its corresponding hypothesis show that students who were taught using AR-based tools demonstrated markedly higher conceptual understanding compared to those taught using conventional methods. This outcome aligns with Mayer’s (2005) Cognitive Theory of Multimedia Learning, which asserts that combining visual and verbal input supports deeper learning. Through interactive simulations and dynamic 3D representations, AR helps learners visualise complex and abstract STEM concepts—such as atomic bonding in Chemistry, vector motion in Physics, biological systems, or geometric transformations in Mathematics—making them more accessible and memorable. In support of this result, studies by Akçayır and Akçayır (2017) and Çetinkaya and Keserel (2021) also found that AR enhances learners’ comprehension by transforming abstract content into concrete experiences. These findings suggest that AR acts as an effective cognitive scaffold that bridges the gap between theory and application in science and mathematics instruction.

Similarly, the second research question revealed a significant increase in students’ interest levels following AR intervention. The interactive and immersive nature of AR environments likely contributed to greater emotional and cognitive engagement, as learners found the lessons more enjoyable, relatable, and meaningful. This supports the conclusions of Alkhatabi (2017) and Ibáñez and Delgado-Kloos (2018), who emphasised that AR promotes learner motivation and sustained attention through personalised and immersive learning environments. The high effect sizes observed in both conceptual understanding ( $\eta^2 = 0.205$ ) and interest ( $\eta^2 = 0.178$ ) indicate that AR has a practical, not just statistical, influence on student outcomes.

In Nigeria, where STEM education is often hindered by abstract curricula, inadequate resources, and low student engagement, the integration of AR could revolutionise science and mathematics classrooms. The success of AR in this study highlights the need to reimagine traditional pedagogies in favour of technology-driven, student-centred approaches that promote both cognitive and affective learning outcomes.

**Conclusion**

The study has demonstrated that Augmented Reality (AR)-based learning significantly enhances senior secondary students’ conceptual understanding and interest in STEM subjects, specifically Physics, Mathematics, Biology, and Chemistry.

**Recommendations**

Based on the findings of this study, the following recommendations are proposed:

1. **Integration of AR into STEM Curricula:** Educational stakeholders, including curriculum developers and policy makers, should integrate AR-supported instruction into the national STEM curriculum to make teaching and learning more engaging and conceptually rich.
2. **Teacher Training and Capacity Building:** Teachers should be trained in the effective use of AR tools and applications to facilitate learner-centred instruction. This can be achieved through regular workshops, seminars, and professional development programs.

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## INFLUENCE OF PARENTAL CARE ON PREVENTION OF SUBSTANCE ABUSE AMONG ADOLESCENTS IN SABON GARI LOCAL GOVERNMENT AREA, KADUNA STATE

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### Abstract

This study investigated the influence of parental care on preventing substance abuse among adolescents in Sabon Gari Local Government Area, Kaduna State. Utilising a descriptive survey design, the research explores the relationship between the quality of parental care, specific parenting practices, and the likelihood of adolescent substance abuse. The descriptive survey design was used for the study. The current estimated population in 2022, at a 2.5% annual increase, is 430,500 for Sabon-Gari. The sample size is three hundred and eighty-four (384). The instrument used for data collection is a structured questionnaire. The findings reveal that there is a significant relationship between specific parenting practices that are most effective in preventing substance abuse among adolescents in Sabon Gari Local Government Area, Kaduna State. Moreover, specific parenting practices, including setting clear expectations and consequences, regular family discussions on substance abuse, consistent reinforcement of positive behaviours, structured routines, and parental involvement in school and extracurricular activities, are identified as effective strategies in preventing substance abuse. The study recommends targeted interventions that leverage the positive influence of parental care on adolescent behaviour. These interventions could involve educational programs for parents, particularly mothers, focusing on enhancing parenting skills and fostering open communication about substance abuse risks. The findings also highlight the need for interventions tailored to the age and gender differences among adolescents, recognising that parental support may have a more significant impact on older adolescents. Overall, this research contributes valuable insights to the ongoing discourse on adolescent substance abuse prevention, offering a foundation for the development of evidence-based interventions in Sabon-Gari and similar communities.

**Keywords:** Parent, Prevention, Substance Abuse

### Introduction

Parenting is an important component in the family system and plays a key role in engaging children in assuming diverse and complementary responsibilities. Parents are expected to meet the biological, physical, financial, and health needs of their children (Groenewald & Bhana, 2017). Parents are perceived as enablers who provide children with opportunities and space to engage in meaningful and purposeful activities and relationships as part of their learning. Parents are sometimes faced with considerable challenges in their parenting experiences. Berge, Sundell, and Håkansson (2016), while investigating the role of parenting styles in adolescent substance use in Sweden, defined parenting style as the general style of parenting, as well as substance-specific parenting practices may influence children's substance use behaviour. The result of their study revealed that a neglectful parenting style was associated with worse substance use outcomes across all substances. Parenting style was found to be unrelated to substance use outcomes, with one exception: authoritative parenting style was associated with less frequent drinking. Association with deviant peers, delinquent behaviour, provision of alcohol by parents, and previous use of other substances were associated with substance use outcomes at follow-up (Akorede et al., 2017; Odhiambo et al., 2020; Olubiye et al., 2019).

Substance abuse has been considered to be one of the most serious problems in every human society. The phenomenon exists in various dimensions such as medical, social, economic, and cultural. Unchecked substance abuse among youths and the entire population could negatively affect general well-being and life expectancy. This is supported by the 2017 World Drug Report, which states that substance abuse is dangerous, affects users' health, and can result in disability and even death (Ann, 2009). The prevalence of substance abuse, such as alcohol, tobacco, and other illicit medications, among adolescents and undergraduates spreading across the globe constitutes an important public concern. It cuts across Central and Eastern Europe, with girls and young women identified with smoking, while it affects a larger population of young people in developing countries like Nigeria (Pradeep, 2021).

Substance abuse is a serious matter that should not be taken lightly. It occurs when you consume too much or in the wrong way alcohol, prescription medications, and other legal and illicit substances. Addiction is not the same as substance misuse. Many people who struggle with substance misuse can quit or adjust their destructive habits. On the other hand, addiction is a disease. It implies that you are unable to stop utilising, although your condition is causing you harm (Pradeep, 2021)

Despite various governments' stringent legislations outlawing illicit use of unprescribed substances across the world, citizens, including adolescents and undergraduates, still get involved to the extent that their health and well-being are threatened, thereby leading to moral decadence and psychological trauma both within the family system and society at large. This, over the years, has become a serious and continuous problem in most of the African nations (Akingbade & Emmanuel, 2018).

However, Substance abuse, a form of risk-taking behaviour among adolescents, is not unconnected with the general features of adolescence as a stage of storm, stress, and confusion characterised by curiosity, exploration, quest for experimentation, and identity search. Some, if not all, of the illicit substances taken by adolescents and undergraduates in particular exert aversive effects on the brain. The effects include, but are not limited to, stimulated sedation and mood swings among the young population. It has been observed that there is a threat to the health and well-being of substance abusers. For instance, abuse of substances such as alcohol, cigarettes, and various other drugs is detrimental to the well-being of the abusers, the family, and the larger society (Olugbenga et al., 2020)

Parental support and monitoring have emerged as two important tools in efforts to reduce adolescent substance use and abuse. Understanding how to use parental support and monitoring in an increasingly refined and targeted manner to prevent adolescent use of substances such as tobacco smoking represents an especially important opportunity to strengthen primary prevention efforts. Parental care has been defined as “parental behaviours toward the child, such as praising, encouraging and giving physical affection, which indicate to the child that he or she is accepted and loved”. In practice, parents with high parental care will demonstrate several qualities, such as caring and warmth, willingness to provide advice, and having open discussions with their children. Existing narratives show that children with low parental support often display negative emotions, cannot cope with stress, and more often engage in substance use (Mills et al., 2021)

Parental monitoring has been found to delay alcohol initiation in adolescents, as well as to reduce levels of later drinking. Lack of parental monitoring has been associated with an increased risk of engagement in alcohol use among adolescents. On a related note, high parental monitoring has been associated with improved health-related outcomes in adolescents, such as better mental well-being and less delinquency; improved medication adherence; and reduced substance use and substance use intentions among adolescents, all of which are positively related to substance use (Mills et al., 2021)

Alcohol use by young people is an increasing concern worldwide (WHO, 2015). Alcohol use is initiated at a worrying age; 14% of adolescent girls and 18% of boys between the ages of 13–15 years in low- and middle-income countries (WHO, 2015). Consequently, 5% of deaths of young people below 30 years are attributed to alcohol abuse (WHO, 2016). In Central and Eastern Europe, it was reported that 25% of under-20-year-olds use drugs, with high usage across Western Europe, Australasia, and North America (Romo-Avilés et al., 2016), as well as lifetime cannabis use in these countries. The age of onset was similar across countries (16–19 years) except in South Africa, where it was 20 years (Dykes & Casker, 2021).

The Principles of substance abuse prevention are seven (7) which include the following: Intervening early in childhood can alter the life course trajectory in a positive direction, Intervening early in childhood can both increase protective factors and reduce risk factors, Intervening early in childhood can have positive long-term effects, Intervening in early childhood can have effects on a wide array of behaviours, Early childhood interventions can positively affect children’s biological functioning, Early childhood prevention interventions should target the proximal environments of the child, and Positively affecting a child’s behaviour through early intervention can elicit positive behaviours in adult caregivers and in other children, improving the overall social environment.

One factor that may contribute to adolescent substance use is parenting styles and how adolescents respond to different types of parenting. Forms of parenting styles and the application of specific parenting behaviours are important in the upbringing of children and adolescents. If parenting styles are not enforced properly, then parents do not develop a healthy form of attachment with their child, which can result in deviant behaviour such as drug abuse (Odhiambo, 2020). Therefore, this study examines the associations between parental support, parental monitoring, and adolescent substance use and whether these associations differ by gender and age group among middle and high school students. Findings may provide new evidence about how to best use parental support and monitoring to prevent adolescent use of substances to reduce the risk of misuse, abuse or addiction in the future.

Adolescent substance abuse is a growing concern with far-reaching implications for the well-being of individuals and communities. Sabon Gari Local Government Area in Kaduna State is not exempt from this challenge, and there is a pressing need to investigate the specific influence of parental care on the prevention of substance abuse among adolescents in this region. Despite the recognition of parental influence on adolescent behaviours, there is a gap in understanding the nuanced dynamics, effective parenting practices, and environmental factors associated with parental care that either contribute to or mitigate the risk of substance abuse.

### **Research Question**

What are the specific parenting practices that are most effective in preventing substance abuse among adolescents in Sabon Gari Local Government Area, Kaduna State?

### **Hypothesis**

There is no significant specific parenting practices that are most effective in preventing substance abuse among adolescents in Sabon Gari Local Government Area, Kaduna State.

### **Materials and Methods**

This study employed a descriptive survey design. The descriptive survey design, according to Nworgu (2006), is one in which a group of people or items is studied by collecting and analysing data from only a few people or items considered to be representative of the entire group. The population for the study consisted of all the Adolescents across Sabon-Gari LGA. The census population of Sabon-Gari is 291,358 (National Population Commission, 2006). The current estimated population in 2022, at a 2.5% annual increase, is 430,500 for Sabon-Gari. Sample size 384 at a confidence level of 95.0% and 0.05 margin of error (Research Adviser, 2006). The instrument for data collection for the study was a questionnaire titled “Influence of

Parental Care on Prevention of Substance Abuse Questionnaire” (IPCPSAQ) developed by the researchers. The questionnaire consisted of three sections, A and B. Section A was designed to obtain demographic characteristics of the respondents that including age, level, among others. Sections B, C, and D contain five (5) items each on the influence of parental care on the prevention of substance abuse, which were rated on a four-point rating scale. The instrument for data collection was validated by three experts: two experts from the Health Education and Human Kinetics Department, one from the College of Medical Sciences, all at Ahmadu Bello University, Zaria. The instrument was administered to the respondents in the sampled schools with the help of two research assistants. The research assistants were briefed by the researchers on the administration and collection of the instruments to ensure maximum return of the instruments. Mean and standard deviation were used to answer all the research questions, while the t-test was used to test the two null hypotheses at a 0.05 level of significance. The mean value set at 2.50 was used as a benchmark for decision; any item with a mean value of 2.5 and above was accepted, while any item with a mean value below 2.50 was rejected. The mean was interpreted using the real limit of numbers as follows: 3.50 - 4.00 = Strongly Agree (SA), 2.50 - 3.49 = Agree (A), 1.50 - 2.49 = Disagree (D), and 0.50 - 1.49 = Strongly Disagree (SD).

**Results**

**Table 1: Demographic Characteristics of the Respondents (n = 378)**

Variable	Options	Frequency	Percentage
Age	10-14years	45	11.9
	14-18 years	182	48.2
	19-21 years	151	39.9
Gender	Male	267	70.6
	Female	111	29.4
Marital Status	Single	257	68.0
	Married	81	21.0
	Divorced	21	5.5
	Widow	19	5.5
Occupation	Farmer	11	2.9
	Student	289	76.5
	Housewife	47	12.5
	Civil Servant	31	8.1
Parental Status	Parent	277	73.3
	Guardian	54	14.3
	Non-parents	4	1.0
	Poster parents	18	4.8
	Grandparents	25	6.6
Level of Education	No formal Education	9	2.4
	Primary	55	14.6
	Secondary	202	53.6
	Tertiary	112	29.6

Table 1 shows that 182 (48.2%) of the respondents are between the ages of 14-18 years, 151 (39.9%) of the respondents are between the ages of 19 - 21 years, while 45 (11.9%) of the respondents were between the ages of 10-14. Moreover, it shows that 267 (70.6%) are male, while 111 (29.4%) are female. It shows that singles are 257 (68%), married are 81 (21%), divorced are 21 (5.6%), while widows are 19 (5.4%). The majority, 289 (76.5%) of the respondents are students, 47 (12.5.3%) of the respondents are housewives, 31 (8.1%) of the respondents are civil servants, while 11 (2.9%) of the respondents are farmers. It reveals that the majority, 277 (73.3%) of the respondents have parents, 54 (14.3%) of the respondents have guardians, 25 (6.6%) of the respondents have grandparents, 18 (4.8%) of respondents have poster parents, while 04 (1%) of the respondents have no parents. Furthermore, it reveals that the majority, 202 (53.4%) of the respondents have secondary education, 115 (29.6%) of the respondents have a tertiary education, 55 (14.6%) of the respondents have primary education, while 09 (2.4%) of the respondents have no formal education.

**Table 2: What are the specific parenting practices that are most effective in preventing substance abuse among adolescents in Sabon Gari Local Government Area, Kaduna State?**

S/N	Items	Mean	Std. Dev.
1	Setting clear expectations and consequences by parents is an effective strategy in preventing adolescent substance abuse.	3.73	0.69
2	Regular family discussions about the dangers of substance abuse contribute to a healthier environment.	2.59	1.18
3	Consistent reinforcement of positive behaviours by parents helps in deterring substance use.	3.22	0.97
4	Implementing structured routines and rules within the family has a positive impact on preventing substance abuse.	3.37	0.88
5	Parents’ involvement in school and extracurricular activities enhances effective preventive measures against substance abuse.	3.67	0.68
(Mean 2.50 Benchmark)		<b>3.32</b>	<b>0.88</b>

A careful observation of Table 4 showed the mean scores of the responses on specific parenting practices that are most effective in preventing substance abuse among adolescents in Sabon Gari Local Government Area of Kaduna State. The responses for each item were computed, and item 1 had the highest mean score of 3.73, indicating that the majority of the respondents have



made setting clear expectations and consequences by parents is an effective strategy in preventing adolescent substance abuse. All the aforementioned items have a mean score that is higher than the benchmark mean score of 2.5. Similarly, the average mean score of 3.32 was obtained, which is greater than the benchmark mean score of 2.5. This implies that there is a positive attitude towards different parenting practices that are most effective in preventing substance abuse among adolescents in Sabon Gari Local Government Area of Kaduna State.

### Hypothesis Testing

**Table 3: There is no significant specific parenting practices that are most effective in preventing substance abuse among adolescents in Sabon Gari Local Government Area, Kaduna State**

Variables	N	Aggregate Mean	Std.	df	t-value	P-value
	379	3.32	0.88	378	111.1	0.001
<b>Test mean</b>	379	2.50	0.00			

The result of the one-sample t-test from table 3 revealed that the specific parenting practices that are most effective in preventing substance abuse among adolescents in Sabon Gari Local Government Area of Kaduna State is significant because the calculated p-value (0.001) is lower than the 0.05 level of significance and the calculated t-value of 111.1 is greater than the 1.972 critical t-value at 378 degrees of freedom (df). The overall mean computed was 3.32, and the standard deviation of 0.88. Therefore, the null hypothesis, which stated that there is no significant relationship between specific parenting practices that are most effective in preventing substance abuse among adolescents in Sabon Gari Local Government Area of Kaduna State, is hereby rejected. The specific parenting practices that are most effective in preventing substance abuse among adolescents in Sabon Gari Local Government Area of Kaduna State are significant, which implies that the adolescents in Sabon Gari Local Government Area, Kaduna State, have a positive response to various parenting practices that are most effective in preventing substance abuse among adolescents.

### Discussion of Findings

The quality of parental care and likelihood of substance abuse among adolescents in Sabon Gari Local Government Area of Kaduna State is significant, which implies that the adolescents in Sabon Gari Local Government Area, Kaduna State have a positive quality of parental care towards substance abuse. A study titled "Parental permissiveness, control, and affect and drug use among adolescents" by Becoña et al. (2013) found that the young people who perceived their parents as permissive and those who perceived less maternal control and higher levels of both paternal and maternal affect were more likely to use alcohol, tobacco, and cannabis. Sex differences were found within this pattern. Variables of maternal affect and control were not influential among males, whereas the general pattern was maintained among females (Akorede et al., 2022). This study highlights the importance of perceived permissiveness and the need to consider parents' and children's gender when providing control and affection, as fathers will influence male children, whereas mothers will influence female children. It has also shown similar verdicts in the results of this study.

The specific parenting practices that are most effective in preventing substance abuse among adolescents in Sabon Gari Local Government Area of Kaduna State are significant, which implies that the adolescents in Sabon Gari Local Government Area, Kaduna State, have a positive response to various parenting practices that are most effective in preventing substance abuse among adolescents. A study titled "Parental support and monitoring as associated with adolescent alcohol and tobacco use by gender and age" by Mills et al., (2021) finalized a similar result that parental support was a more significant factor in preventing substance use for older adolescents (high school aged group) than for younger adolescents, irrespective of gender suggesting that parental support may be more impactful and important as adolescents age. As children mature, particularly from middle school to high school, parental support may play a larger role in preventing substance use for older adolescents compared to younger ones. A study titled "Influence of Parenting Style on Drug Abuse among Girls in Secondary Schools in Nakuru County" by Odhiambo et al., (2020) the researcher concluded that parents contribute a lot in spoiling their daughters by; giving them too much pocket money, not guiding them on what channels to watch on television, on what to read in magazines, books etc. Poor relationship between parents and their daughters was also noted as a contributing factor to drug abuse, which automatically leads to a lack of general parental guidance. Poor relationship between girls and their parents was also identified as a key factor that contributes to drug abuse among girls. From the findings, the researcher recommended that parents should ensure that they have strict control over their children by monitoring their behaviour while at home. This would include talking to their children on the dangers of drug abuse on the health, behaviour and general academic performance.

### Conclusion

Based on the findings of the study, the quality of parental care and the likelihood of substance abuse among adolescents in Sabon Gari Local Government Area of Kaduna State are significant, which implies that the adolescents in Sabon-Gari Local Government Area, Kaduna State have a positive quality of parental care towards substance abuse. The specific parenting practices that are most effective in preventing substance abuse among adolescents in Sabon Gari Local Government Area of Kaduna State are significant, which implies that the adolescents in Sabon-Gari Local Government Area, Kaduna State have a positive response to various parenting practices that are most effective in preventing substance abuse among adolescents.

### Recommendation

Based on this finding, the study recommends the need to develop interventions to promote the already existing positive influence of parental care on the prevention of substance abuse among adults in Sabon Gari local government area of Kaduna State. These interventions could focus on educating women about the importance of parental care for children's development and supporting them to develop positive parenting skills.

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## RISK PERCEPTION OF COVID-19 AMONG ADULTS IN JALINGO, TARABA STATE, NIGERIA

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### Abstract

This community-based cross-sectional study aimed to determine the risk perception of COVID-19 among adults in Jalingo. The study involved 420 consenting adults. A self-structured questionnaire with a reliability coefficient of 0.86 (Cronbach's Alpha) was used for data collection. A pilot study was conducted using 20 of the participants. The questionnaires were administered by hand and collected on the spot. The information obtained was analysed using descriptive statistics and presented in tables and figures, while the differences between variables were tested using the Chi-square test at a 0.05 level of significance and a 95% confidence interval. The results revealed that the variables with the highest percentages of participants who strongly agreed with the statement "COVID-19 is a severe disease" were: 101 (54.5%) males, 43 (55.8%) in the 26–35 age group, 153 (60%) employed, and 10 (71.4%) secondary school leavers. For the statement "COVID-19 prevents regular association," 89 (48.1%) males, 11 (57.9%) aged 46–55, 134 (52.5%) employed, and 111 (57.8%) participants with no formal education (NFE) strongly agreed. Regarding the statement "I may likely get COVID-19 in the course of the pandemic," 104 (44.3%) males, 47 (62%) in the 26–35 age group, 134 (52.5%) employed, and 114 participants with no formal education strongly agreed. For the statement "There is a chance that my close relative may contract COVID-19," 111 (60%) males, 63 (81.8%) aged 26–35, 153 (60%) employed, and 114 (59.4%) with no formal education strongly agreed. Lastly, 97 (52.4%) males, 43 (55.8%) in the 26–35 age group, 134 (52.5%) employed, and 113 (58.9%) participants with no formal education strongly agreed with the statement that "COVID-19 will affect many Nigerians." In conclusion, gender, age, employment status, and educational level influenced the risk perception of COVID-19. It is therefore recommended that more public enlightenment is needed to enable the population to have an accurate perception of the risks associated with COVID-19.

**Keywords:** Age, COVID-19, Employment status, Gender, Influence, Risk Perception

### Introduction

COVID-19 is still with us despite all the preventive measures recommended by the World Health Organization (WHO) and implemented by various countries of the world, including Nigeria. Several measures have been instituted by the Federal Government of Nigeria through the Presidential Task Force (PTF) on COVID-19, together with the Federal Ministry of Health, to curtail the spread of the disease and protect the health of Nigerians. These measures included the initial lockdown of non-essential activities, closure of schools, and a ban on international flights, among others (NCDC, 2023). Also, the COVID-19 vaccine is now available, yet the disease remains in our midst. According to Statista Research Department (2022), the total number of COVID-19 cases in Nigeria was 262,402 as of August 10, 2022, while the number of active cases was approximately 3.2 thousand. However, more than 5.4 million people had been tested.

So, why is COVID-19 still here? Is it that Nigerians are not making themselves available for testing, or that those infected are not presenting themselves for treatment? What about the vaccine — is it acceptable to the people? What percentage of the population has accepted it? All these questions have their answers in the risk perception of the disease, COVID-19. Risk perceptions are beliefs about the possibilities of harm or loss. It is a subjective judgment about the characteristics and severity of a risk (Darker, 2013). Paek and Hove (2017) defined risk perception as people's subjective judgments about the chances or possibilities of negative occurrences such as injury, illness, disease, and death.

According to Paek and Hove (2017), risk perception has two main dimensions: The cognitive dimension, which relates to how much people know about and understand risks, and the emotional dimension, which relates to how they feel about the risk. Similarly, Darker (2013) stated that risk perception can be viewed in three dimensions: Perceived likelihood — the probability that one will be harmed by a hazard, perceived susceptibility — an individual's constitutional vulnerability to a hazard, and perceived severity — the extent of harm a hazard would cause. A common assumption in risk perception research is that there is an association between people's knowledge and certainty about a risk and how they perceive it. Risk perceptions are important precursors to health-related behaviours and other behaviours that experts recommend for either dealing with or preventing risks (Paek & Hove, 2017).

The Health Belief Model (HBM) shows that individual beliefs about risks can be influenced by different modifying factors, such as sociodemographic and sociopsychological variables. To perceive risk includes evaluations of both the probability and the consequences of an uncertain outcome (Darker, 2013). Sociodemographic factors such as gender, education, and employment are believed to influence risk perception (Akorede et al., 2022; Rosi et al., 2021; Bruine de Bruin, 2020; Dryhurst et al., 2020) as well as preventive practices during pandemics (Carlucci et al., 2020). The study of risk perception is now a necessity since beliefs, knowledge, values, and attitudes are recognised as influencing not only decisions but also behaviours (Akorede & Aliyu, 2021; Cori et al., 2020). What seems possible today is to try to understand public reactions by applying

established theories of risk perception research to COVID-19 and reflecting on how this knowledge can be utilised to improve health risk communication, build trust, and contribute to collaborative governance (Cori et al., 2020). Accurate public risk perceptions are critical to effectively managing public health risks (Dryhurst, 2020).

Understanding COVID-19 risk perception may help inform public health messaging aimed at encouraging preventive measures and improving countermeasures against the pandemic (Adachi et al., 2022; Akorede, 2021; Akorede et al., 2021). Also, acceptance of the vaccine is closely linked to the perception of the disease (Akorede et al., 2022). In a report by Ihenacho (2022), there was an association between the perception of COVID-19 and acceptance of the COVID-19 vaccine. He reported that a high-risk perception of COVID-19 was found in over half of the respondents, and the COVID-19 vaccine acceptance rate was a little more than 50%. Similarly, Quin et al. (2022) reported that 88.46% of child caregivers were willing to have a booster dose of the COVID-19 vaccine administered to their children, and the acceptance was closely associated with a higher level of perceived susceptibility and perceived benefit.

## COVID 19

COVID-19 was characterised as a pandemic in March 2020 (WHO, 2020) as it crossed the shores of China — the country where it was first reported in a town called Wuhan (WHO, 2022; WHO, 2020) — and began ravaging various countries around the world. Before then, on January 30, 2020, the WHO had declared the disease a Public Health Emergency of International Concern (PHEIC) based on the recommendations of the 15-member International Health Regulations Emergency Committee (EC) (Jee, 2020). COVID-19 is caused by the virus SARS-CoV-2. SARS-CoV-2 is a coronavirus belonging to the family Coronaviridae. Coronaviruses are minute in size (65–125 nm in diameter) and contain single-stranded RNA as their nucleic material, with a genome size ranging from 26 to 32 kilobases (kb) in length. It is a novel coronavirus, known for the first time to be pathogenic to humans, and the first coronavirus to have caused a pandemic. The virus can be spread by inhalation of tiny droplets containing the virus or by touching contaminated surfaces (fomites) and then touching one's own nose, mouth, or eyes (CDC, 2022). A lot of measures were instituted to curtail the spread of the disease in Nigeria. Such measures included the lockdown of non-essential activities, closure of schools, and a ban on international flights.

Nigeria, like many other countries, later commenced the gradual easing of lockdown measures initially instituted at the beginning of the COVID-19 pandemic. This was aimed at balancing the need to preserve lives and livelihoods while addressing the socio-economic disruptions caused by the outbreak (Idris et al., 2022; Muanya, 2022). According to a report by Muanya of The Guardian Newspaper (December 2022), President Muhammadu Buhari approved the immediate relaxation of COVID-19 safety measures following the recommendations of the Presidential Steering Committee on COVID-19. However, the elderly, the immunocompromised, and those with comorbidities were advised to continue practising COVID-19 preventive measures (Muanya, 2022). The general public was also encouraged to take their COVID-19 vaccinations as well as booster doses.

Though there has been a relaxation of COVID-19 safety measures, it does not mean that the disease has been eliminated — it is still present among us. A report from the NCDC (2023) revealed that from 24th to 30th December 2022, 35 new confirmed cases were recorded in Nigeria. So far, 266,450 cases have been confirmed, 259,841 cases discharged, and 3,155 deaths recorded across 36 states and the Federal Capital Territory. The 35 new cases were reported from four states — FCT (22), Lagos (10), Delta (2), and Plateau (1). Therefore, there is a need to find out the perception of adults in Jalingo regarding COVID-19.

## Methodology

This community-based cross-sectional study utilised a self-structured questionnaire, self-administered to 420 adults aged 18–55 years residing in Jalingo. The study was conducted between June and November 2022. The research instrument was validated, and a reliability coefficient of 0.86 (Cronbach's Alpha) was obtained. Following the informed consent of the respondents, data were collected and analysed using descriptive statistics (frequencies and percentages), while inferential statistics (Chi-square) were used to determine the relationship between variables at a 0.05 level of significance and a 95% confidence interval. The Statistical Package for the Social Sciences (SPSS) version 21 was utilised for the analysis.

## Results and Discussions

### Demographic characteristics of respondents

The study comprised 235 (56.0%) females and 185 (44.0%) males. Three hundred and twelve (74.3%) participants were in the age group 18–25 years, 77 (18.3%) were within 26–35 years, 12 (2.9%) were within 36–45 years, and 19 (4.5%) were between 46–55 years. Nevertheless, 29 (6.9%), 175 (41.7%), 208 (49.5%), and 8 (1.9%) of the participants were single, widowed, divorced, and separated, respectively. Two hundred and fifty-five (60.7%), 155 (36.9%), and 10 (2.1%) of the participants were employed, unemployed, and students, respectively. However, 192 (45.7%), 205 (48.8%), 14 (3.3%), and 9 (2.1%) of the participants had no formal education, primary, secondary, and tertiary education, respectively, as presented in Table 1 below.

**Table 1: Demography of the respondents**

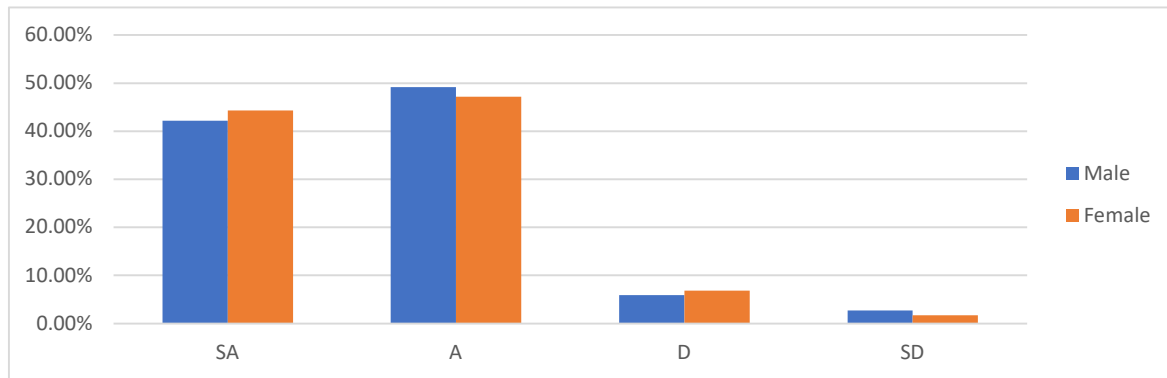
Variable	Options	Frequency	Percentage
Gender	Male	185	44.0
	Female	235	56.0
	<b>Total</b>	<b>420</b>	<b>100.0</b>
Age	18 - 25 years	312	74.3
	26 - 35 years	77	18.3
	36 - 45 years	12	2.9
	46 - 55 years	19	4.5
	<b>Total</b>	<b>420</b>	<b>100.0</b>
Marital status	Single	29	6.9
	Widowed	175	41.7
	Divorced	208	49.5
	Separated	8	1.9
	<b>Total</b>	<b>420</b>	<b>100.0</b>
Employment status	Employed	255	60.7
	Unemployed	155	36.9
	Student	10	2.4
	<b>Total</b>	<b>420</b>	<b>100.0</b>
Highest Educational Qualification	None	192	45.7
	Primary	205	48.8
	Secondary	14	3.3
	Tertiary	9	2.1
	<b>Total</b>	<b>420</b>	<b>100.0</b>

**Research Question 1: What is the risk perception of COVID-19 among male and female adults in Jalingo?**

The result obtained from this study reveals that more than half of the respondents strongly agreed with the statements in Table 2 while a little above one-third of the females strongly agreed (Figure 2) which revealed that there was a higher risk perception of COVID 19 among males than females and this could be because men are usually more influenced by anticipatory emotions (i.e. arising from considering consequences). In addition, males are more conversant with social media than females, and there is a popular saying that "It is what man knows that kills man. In other words, the information they get from social media, some of which is not true, contributed to increasing their risk perception of the disease. The result of this study agrees with the report by Iorfa *et al.* (2020) that risk perception of COVID-19 is gender sensitive.

**Table 2: Gender and the Risk Perception of COVID-19 among Adults in Jalingo**

	Gender		SA	A	D	SD	P-value
COVID-19 is a Severe Disease	Male	Freq.	101	78	5	1	0.000
		Percent.	54.6	42.2	2.7	0.5	
	Female	Freq.	88	142	0	5	
		Percent.	37.4	60.4	0	2.1	
	Total	Freq.	189	220	5	6	
		Percent.	45	52.4	1.2	1.4	
COVID-19 prevents regular Association	Male	Freq.	89	90	3	3	0.852
		Percent.	48.1	48.6	1.6	1.6	
	Female	Freq.	109	123	3	0	
		Percent.	46.4	52.3	1.3	0	
	Total	Freq.	198	213	6	3	
		Percent.	47.1	50.7	1.4	0	
I may likely get COVID-19 in the course of the Pandemic	Male	Freq.	78	91	11	5	0.852
		Percent.	42.2	49.2	5.9	2.7	
	Female	Freq.	104	111	16	4	
		Percent.	44.3	47.2	6.8	1.7	
	Total	Freq.	182	202	27	9	
		Percent.	43.3	48.1	6.4	2.1	
There's a chance that my close relative may contract COVID-19.	Male	Freq.	111	69	2	3	0.049
		Percent.	60	37.3	1.1	1.6	
	Female	Freq.	115	109	9	2	
		Percent.	48.9	46.4	3.8	9	
	Total	Freq.	226	178	11	5	
		Percent.	53.8	42.4	2.6	1.2	
COVID-19 will affect many Nigerians	Male	Freq.	97	77	5	6	0.000
		Percent.	52.4	41.6	2.7	3.2	
	Female	Freq.	75	147	9	4	
		Percent.	31.9	62.6	3.8	1.7	
	Total	Freq.	172	224	14	10	
		Percent.	41	53.3	3.3	2.4	



**Figure 2: The Influence of Gender on the Risk perception of covid-19 among Adults in Jalingo**

**Research Question 2: What is the risk perception of COVID-19 among adults of various age groups in Jalingo?**

With regard to the risk perception of COVID-19 among adults of various age groups in Jalingo, the results revealed that three-quarters (75%) of the participants in the age group 36–45 strongly agreed with the statements in Table 3. However, more than half (55.8%), 41.3%, and 42.1% of the age groups 18–25, 36–45, and 46–55, respectively, also strongly agreed (Figure 2). This shows that the highest risk perception of COVID-19 was among the age group 36–45, which could probably be because this age group is usually very vibrant and, therefore, subjects itself to a lot of stress. Stress has been shown to lead to higher perceived risk (Sobkow et al., 2016). Moreover, this particular age group often receives information from multiple sources, and it is also believed that knowledge is positively related to risk perception. Afocha et al. (2021) observed that there is a



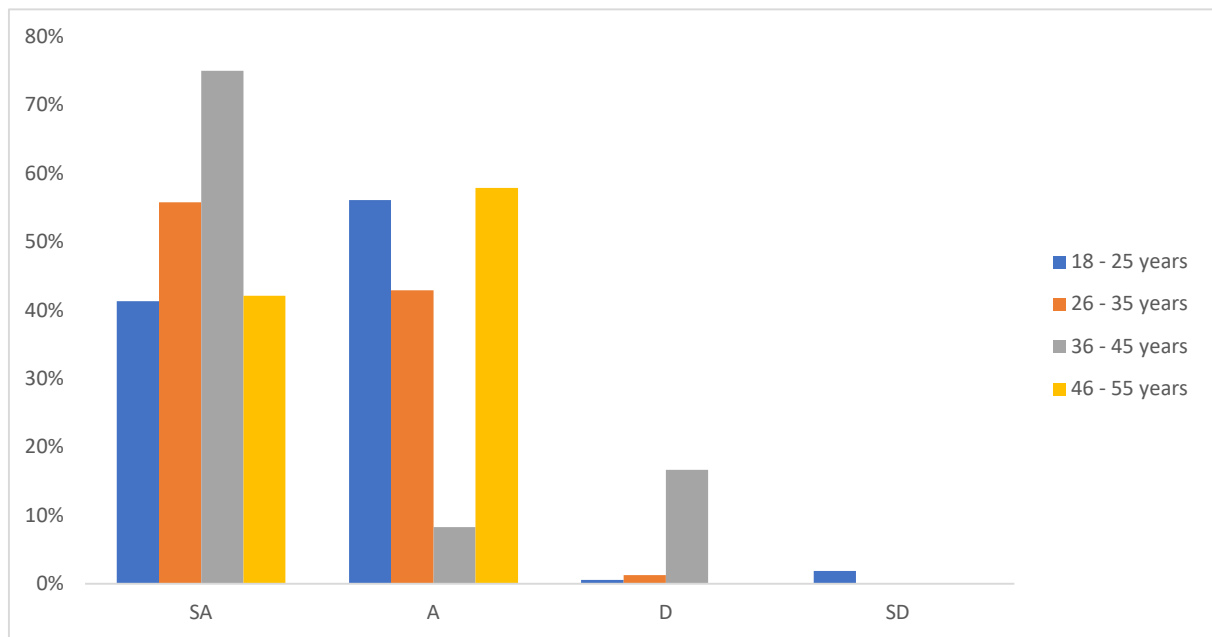
statistically significant relationship between the age of respondents and their level of knowledge. Therefore, it is most probable that the knowledge level of this age group, as well as the stress they subject themselves to, contributed to their higher risk perception.

The results obtained in this study agree with the report by Iorfa et al. (2020), which stated that the risk perception of COVID-19 is age-dependent. However, while Iorfa et al. reported that the elderly (age not specified) had the highest risk perception, this study observed that it was the 36–45 age group. The difference could be attributed to the fact that this study’s findings were based on self-reported responses to questionnaire items, whereas Iorfa et al. (2020) based their conclusions on observed precautionary behaviours. Similarly, Rosi et al. (2021), in a study on age-related differences in risk perception during the COVID-19 outbreak, found that the perceived risk of contracting COVID-19 tends to decrease as age increases. Bruine de Bruin (2020) also reported that older people had a lower risk perception.

**Table 3: The Risk Perception of COVID-19 among adults of various age groups in Jalingo**

		Age	SA	A	D	SD	P
COVID-19 is a severe disease	18-25	Freq.	129	173	2	6	0.000
		Percent.	41.3	36.1	0.6	1.9	
	26-35	Freq.	43	33	1	0	
		Percent.	55.8	42.9	1.3	0	
	36-45	Freq.	9	1	2	0	
		Percent.	75	8.3	16.7	0	
	46-55	Freq.	8	11	0	0	
		Percent.	42.1	37.9	0	0	
	Total	Freq.	189	220	3	6	
		Percent.	45	32.4	1.2	1.4	
COVID-19 prevents regular Association	18-25	Freq.	140	164	5	3	0.729
		Percent.	44.9	52.6	1.6	1	
	26-35	Freq.	43	33	1	0	
		Percent.	55.8	42.9	1.3	0	
	36-45	Freq.	4	8	0	0	
		Percent.	33.3	66.7	0	0	
	46-55	Freq.	11	8	0	0	
		Percent.	57.9	42.1	0	0	
	Total	Freq.	198	213	6	3	
		Percent.	47.1	50.7	1.4	0.7	
I may likely get COVID-19 in the course of the Pandemic	18-25	Freq.	122	162	21	7	0.000
		Percent.	39.1	51.9	6.7	2.2	
	26-35	Freq.	47	27	3	0	
		Percent.	62	33.1	3.9	0	
	35-45	Freq.	5	2	3	2	
		Percent.	41.7	16.7	25	16.7	
	45-55	Freq.	8	11	0	0	
		Percent.	42.1	57.9	0	0	
	Total	Freq.	182	202	9	9	
		Percent.	43.3	48.1	6.4	2.1	
There’s a chance that my close relative may contract COVID-19	18-25	Freq.	153	149	7	3	0.000
		Percent.	49	47.8	2.2	1	
	26-35	Freq.	63	13	1	0	

		Percent.	81.8	16.9	1.3	0	
	35-45	Freq.	3	5	2	2	
		Percent.	25	41.7	16.7	16.7	
		Freq.	7	11	1	0	
	45-55	Percent.	36.8	41.7	5.3	0	
	Total	Freq.	226	178	11	5	
		Percent.	53.8	42.4	2.6	1.2	
COVID-19 will affect many Nigerians	18-25	Freq.	123	172	9	8	0.000
		Percent.	39.4	55.1	2.9	2.6	
	25-35	Freq.	43	33	1	0	
		Percent.	55.8	42.9	1.3	0	
	36-45	Freq.	3	5	2	2	
		Percent.	25	41.7	16.7	16.7	
	45-55	Freq.	3	14	2	0	
		Percent.	15.8	73.7	10.5	0	
	Total	Freq.	172	224	14	10	
		Percent.	41	53.3	3.3	2.4	



**Figure 2: The Influence of Age on the Risk Perception of COVID-19 among Adults in Jalingo**

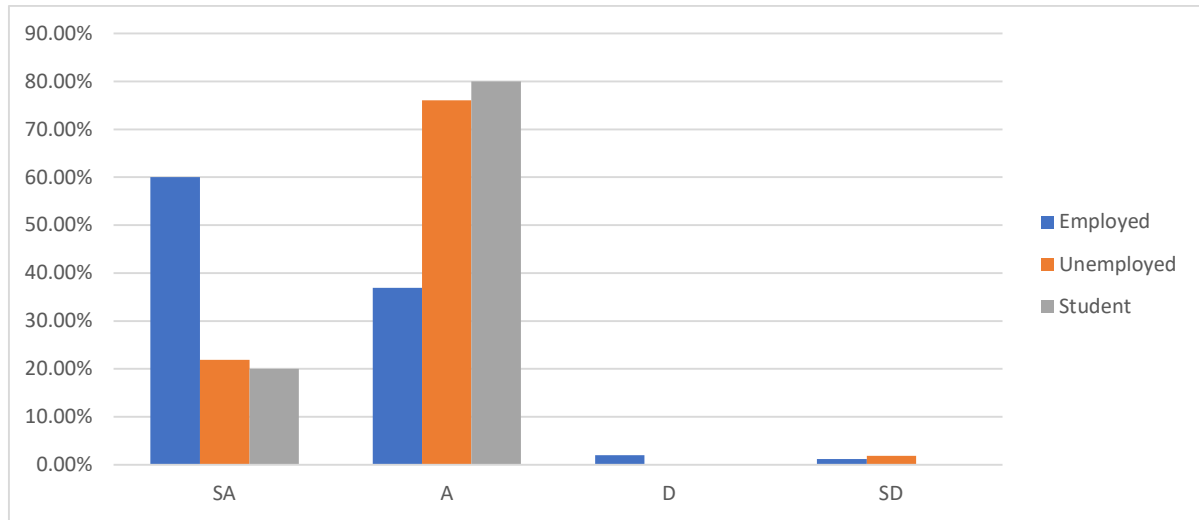
**Research Question 3: What is the risk perception of adults in Jalingo who are employed, unemployed, and students regarding COVID-19?**

Concerning the influence of employment status on the risk perception of COVID-19, the results obtained revealed that 60%, 21.9%, and 20% of the employed, unemployed, and students respectively (Figure 3) strongly agreed with the statements in Table 4, while 80%, 76.1%, and 36.9% of the students, unemployed, and employed respectively agreed. This shows that the majority of the employed perceived COVID-19 with a lot of fear. This could be because they believed that their jobs, in one way or another, exposed them to infection with COVID-19. They were also worried about their dependents contracting the disease. However, Reed-Thryselius (2022) reported that those with higher income have a higher risk perception. Since higher income is often associated with employment status, this aligns with the findings of this study. The higher-income earners (the employed) exhibited higher risk perception, while the unemployed and students, who generally have lower income, showed lower perception of risk. Thus, the findings of this study support the report of Reed-Thryselius (2022) by revealing that the employed participants had a higher risk perception of COVID-19.

**able 4:The Risk Perception of COVID-19 among adults in Jalingo who are employed, unemployed, and students**

	Employment Status		SA	A	D	SD	P-value
COVID-19 is a Severe Disease	Employed	Freq.	153	94	5	3	0.00
		Percent.	60	36.9	2	1.2	
	Unemploye	Freq.	34	118	0	3	
		Percent.	21.9	76.1	0	1.9	
	Student	Freq.	2	8	0	0	
		Percent.	20	80	0	0	
Total	Freq.	189	220	5	6		
	Percent.	45	52.4	1.2	1.4		
COVID-19 prevents regular Association	Employed	Freq.	133	116	3	3	0.00
		Percent.	52.2	45.5	1.2	1.2	
	Unemployed	Freq.	65	90	0	0	
		Percent.	41.9	58.1	0	0	
	Student	Freq.	0	7	3	0	
		Percent.	0	70	30	0	
Total	Freq.	198	213	6	3		
	Percent.	47.1	50.7	1.4	0.7		
I may likely get COVID-19 in the course of the Pandemic	Employed	Freq.	134	102	12	7	0.00
		Percent.	52.5	40	4.7	2.7	
	Unemploye	Freq.	46	96	11	2	
		Percent.	29.7	61.9	7.1	1.3	
	Student	Freq.	2	4	4	0	
		Percent.	20	40	40	0	
Total	Freq.	182	202	27	9		
	Percent.	43.3	48.1	6.4	2.1		
There's a chance that my close relative may contract COVID-19	Employed	Freq.	153	93	6	3	0.00
		Percent.	60	36.5	2.4	1.2	
	Unemploye	Freq.	70	80	3	2	
		Percent.	45.2	51.6	1.9	1.3	
	Student	Freq.	3	5	2	0	
		Percent.	30	50	20	0	
Total	Freq.	226	178	11	5		
	Percent.	53.8S	42.4	2.6	1.2		
COVID-19 will affect many Nigerians	Employed	Freq.	134	111	5	5	0.00
		Percent.	52.5	43.5	2	2	
	Unemploye	Freq.	38	104	8	5	
		Percent.	24.5	67.1	5.2	3.2	
	Student	Freq.	0	9	1	0	
		Percent.	0	90	10	0	

Total	Freq.	172	224	14	10
	Percent.	41	53.3	3.3	2.4



**Figure 3: The Influence of Employment Status on the Risk Perception of COVID-19 among the Adults in Jalingo**

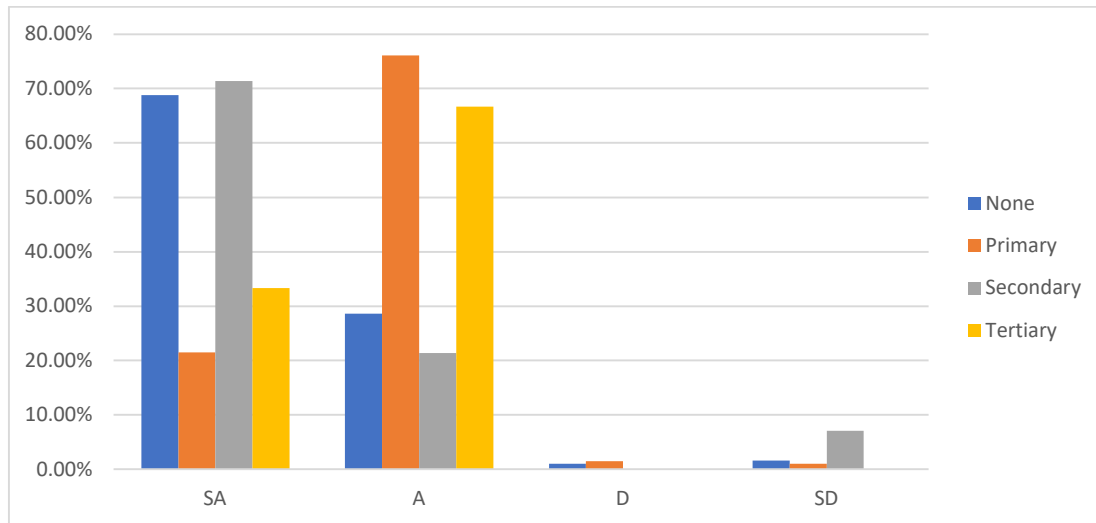
**Research Question 4: What is the risk perception of COVID-19 among adults of various educational levels?**

Concerning the risk perception of COVID-19 among adults of different educational levels, the responses obtained indicate that 68.8%, 21.5%, 71.4%, and 33.3%, respectively, of those who had no formal education, primary, secondary, and tertiary education, strongly agreed (Figure 4) with the statements in Table 5. This shows that the highest risk perception was among the secondary school leavers, followed by those who had no formal education. However, the 71.4% of secondary school leavers represent a smaller proportion of the participants compared to the number of people who had no formal education. Adults who had a tertiary education perceived COVID-19 with fear but not with a great deal of fear, as they are aware that COVID-19 can be prevented. Moreover, adults with higher education are more likely to have access to accurate and up-to-date information. This study agrees with Rattay et al. (2021) in reporting a relationship between educational level and risk perception. It also aligns with their findings that there is an association between low education level and higher perceived severity of COVID-19.

**Table 5: The risk perception of COVID-19 among adults of various educational levels**

		Educational Level	SA	A	D	SD	P-value
COVID-19 is a severe Disease	None	Freq.	132	55	2	3	0.000
		Percent.	68.8	28.6	1	1.6	
	Primary	Freq.	44	156	3	2	1.5
		Percent.	21.5	76.1	1.5	1	
	Secondary	Freq.	10	3	0	1	7.1
		Percent.	71.4	21.4	0	7.1	
Tertiary	Freq.	3	6	0	0	0	
	Percent.	33.3	66.7	0	0		
Total		Freq.	189	220	5	6	
		Percent.	45	52.4	1.2	1.4	
COVID-19 prevents regular Association	None	Freq.	111	78	2	1	0.000
		Percent.	57.8	40.6	1	5	
	Primary	Freq.	83	118	2	2	1
		Percent.	40.5	57.6	1	1	

	Secondary	Freq.	4	10	0	0		
		Percent.	28.6	71.4	0	0		
	Tertiary	Freq.	0	7	2	0		
		Percent.	0	77.8	22.2	0		
	Total	Freq.	198	213	6	8		
		Percent.	47.1	50.7	1.4	0.2		
I may likely get COVID-19 in the course of the Pandemic	None	Freq.	104	75	8	6	0.000	
		Percent.	54.2	39.1	4.2	2.6		
	Primary	Freq.	71	118	15	1		
		Percent.	34.6	57.6	7.3	5		
	Secondary	Freq.	5	3	2	2		
		Percent.	35.7	35.7	14.3	14		
	Tertiary	Freq.	2	4	2	11		
		Percent.	22.2	44.4	22.2	9		
	Total	Freq.	182	202	27	2.1		
		Percent.	43.3	48.1	64	1		
	There's a chance that my close relative may contract COVID-19	None	Freq.	114	74	34	5	0.000
			Percent.	59.4	38.5	1.6	1	
Primary		Freq.	108	91	5	1		
		Percent.	52.7	44.4	2.4	5		
Secondary		Freq.	2	9	1	2		
		Percent.	14.3	64.3	7.1	14		
Tertiary		Freq.	2	4	2	1		
		Percent.	22.2	44.4	22.2	11		
Total		Freq.	226	178	11	5		
		Percent.	53.8	42,4	2.6	1.3		
COVID-19 will affect many Nigerians		None	Freq.	113	66	8	5	0.000
			Percent.	58.9	34.4	4.2	2.6	
	Primary	Freq.	59	140	4	2		
		Percent.	28	68.3	2	1		
	Secondary	Freq.	0	10	2	2		
		Percent.	0	71.4	14.3	14		
	Tertiary	Freq.	0	8	0	1		
		Percent.	0	88.9	0	11		
	Total	Freq.	172	2.24	14	10		
		Percent.	41	53.3	3.3	2.4		



**Figure 4: The Influence of Education on the risk perception of covid-19 among adults in Jalingo**

**Conclusion**

This study concludes that most male adults had a higher risk perception of COVID-19 than females. They also believed that a close relative of theirs might contract COVID-19. However, the age group 26–35 years had the highest risk perception of COVID-19 compared to other age groups. They strongly agreed that COVID-19 is a severe disease and that they are very much afraid of contracting it. Likewise, the employed had a higher risk perception of COVID-19 compared to students and the unemployed; they perceived COVID-19 as a severe disease. Similarly, many secondary school leavers and those with no formal education strongly agreed that COVID-19 is a severe disease.

**Recommendations**

It is therefore recommended that male adults be made to understand that their wives, children, fiancées, and other relatives are less likely to contract COVID-19 if they observe social distancing and practice regular and proper handwashing. In the same vein, individuals within the age group 26–35 years need to be assured that observing the preventive measures against COVID-19 will greatly reduce their chances of infection. The employed should be enlightened that COVID-19 is not a death sentence; it can be effectively managed, and vaccines are available for protection. Furthermore, secondary school leavers and those with no formal education need more enlightenment and accurate information about COVID-19. Overall, COVID-19 vaccines should be made readily available to everyone, and the general public should be further educated to ensure accurate risk perception and proper preventive practices against the disease.

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## PERCEIVED EFFECT OF NON-COMPLIANCE TO PUBLIC HEALTH SAFETY MEASURES AMONG WORKERS IN GENERAL HOSPITAL IN ONDO TOWN.

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### Abstract

This study was carried out to investigate the perceived effect of non-compliance with public health safety measures among workers in General Hospital in Ondo Town. Descriptive research of the survey type was adopted for this study. 455 respondents were sampled for the study (including doctors, nurses, laboratory scientists, and hospital attendants) and were selected using purposive sampling. A structured questionnaire validated by experts was used for data collection. Data were analysed using inferential statistics of Chi-square ( $\chi^2$ ) at 0.05 alpha level. The findings of the study revealed the following: Biological hazards were significantly perceived as effects of non-compliance (Cal  $\chi^2 = 207.03 > \text{Tab } \chi^2 = 16.92$ ); Chemical hazards were significantly perceived as effects of non-compliance (Cal  $\chi^2 = 282.33 > \text{Tab } \chi^2 = 16.92$ ); Physical hazards were also significantly perceived as effects of non-compliance (Cal  $\chi^2 = 282.33 > \text{Tab } \chi^2 = 16.92$ ). Based on these findings, it was concluded that health workers in Selected Hospitals in Ondo Town are at increased risk of exposure to various occupational hazards due to non-compliance with public health safety measures. It is therefore recommended that the hospital management should ensure strict enforcement of safety protocols, provide regular training on hazard prevention, and make personal protective equipment (PPE) readily available and mandatory for use. Establishing a strong culture of safety within the hospital will help safeguard health workers and enhance quality patient care.

**Keywords:** safety, non-compliance, public health, health worker

### Introduction

Deuffic-Burban et al. (2011) reported that compliance with standard precautions (a set of guidelines that can protect health care professionals from being exposed to microorganisms) is low among health workers. Additionally, high rates of exposure to microorganisms among health workers through several modes (needlesticks, hand contamination with blood, exposure to air-transmitted microorganisms) occur. These occupational exposures can occur in different modes (Muhammed et al., 2025). These modes include contact (direct and indirect) transmission, droplet transmission, airborne transmission, percutaneous exposure, and mucus membrane exposure. The standard precautions, proposed by the United States Centers for Disease Control and Prevention (CDC) in 1996, are guidelines for reducing the risk of transmission of blood-borne and other pathogens in hospitals.

Roy and Robillard (2018) opined that health workers are at risk of exposure to hazardous medications during several different procedures for example, when priming IV tubing, transferring a medication to a different container, removing syringes from a port, touching equipment that has been contaminated by the medication, or coming in contact with the urine or feces of a patient who has taken the medication. Exposure to hazardous drugs such as antivirals, hormone therapy, or those used for cancer treatment can cause acute and chronic health effects such as rashes, infertility, and possibly cancer (Akorede et al, 2018; Akorede et al., 2022; Akorede, 2020; Akorede, 2021). Wearing gloves and other types of protective gear (such as masks and eyewear) as well as following the appropriate protocol every time the nurse may come into contact with the hazardous medication will decrease the exposure risk. Okechukwu and Motshedisi (2012) reveal that compliance with precautions among health workers to avoid exposure to microorganisms is low. More specifically, compliance was found inadequate concerning hand hygiene guidelines, use of gloves when exposure to body fluids was anticipated, eye protection, mouth and nose protection (mask use), wearing a gown when required, avoiding recapping the needle after it was used for a patient, and provision of care considering all patients as potentially infectious (Akorede & Toyin, 2020).

In a prevalence survey conducted by the World Health Organization (WHO) (2017) in 55 hospitals across 14 countries, it was found that 8.7% of inpatients acquire infections in hospital. According to Mao (2019), the incidence of clinic nurses being pierced with sharp instruments potentially contaminated with infected blood is high. They reported the incidence rate of needle stick injury in nurses to be 80.6%. Standard precautions protect patients as well as medical workers and help to control the occurrence of hospital infections. As the incidence of infectious blood diseases has increased and with the spread of non-blood infectious diseases such as avian influenza and severe acute respiratory syndrome worldwide, there has been increased

emphasis on standard precautions for medical workers, and research into standard precautions has been carried out in many countries (Kabiru et al., 2024).

Furthermore, Efstathiou et al. (2011) reveal that workplace safety greatly depends on the enforcement of occupational safety policy and inspection of the workplace environment to ensure compliance with health and safety standards. Amin et al. (2024) and Ogoina et al. (2015) submitted that the use of personal protective equipment (PPE) such as sterile surgical gloves and gowns, and sterile equipment, hygiene practices such as antiseptic hand washing, and safe instrument and waste disposal procedures can keep the health workers safe from blood-borne infections. Gershon (2000) reported that workers who perceive a strong organization-wide commitment to safety are significantly more likely to adhere to safety protocols than those who lack such perceptions, and that they were half as likely to have experienced an occupational exposure incident. Lawali et al. (2024) and Punia et al. (2014) findings revealed that the factors that contribute to non-compliance with Standard Precautions and also Reports that the factors were lack of knowledge, lack of time, forgetfulness, lack of means, negative influence of the equipment on nursing skills, uncomfortable equipment, skin irritation, and lack of training, conflict between the need to provide care and self-protection and distance to necessary equipment or facility.

Mailu (2016) noted that hand hygiene was suboptimally practised, regular hand hygiene is very crucial in infection control, and that the present finding is significantly lower than the previous report from South India, in which the practice of hand hygiene was 95%. The probable reason for the poor practice could be irregular access to materials for hand hygiene. On the other hand, it could be due to nonchalance on the part of Health workers who may believe that hand hygiene before patient care is irrelevant. Doctors and nurses were more likely to be exposed to patients' body fluids. This could be because they work in proximity with the patients than laboratory scientists, but it could also be as a result of the lower likelihood of using PPEs by the doctors and nurses. Thus, strict compliance with the Standard Procedure is of utmost importance in the prevention of health workers' contact with patients' body fluids.

Risk of exposure to biological hazards (Needlesticks) includes potential exposures to allergens, infectious zoonotics (animal diseases transmissible to humans), and experimental agents such as viral vectors. Allergens, ubiquitous in animal research facilities, are one of the most important health hazards, yet they are frequently overlooked. The final category contains the physical hazards associated with research facilities (Ahmed et al., 2021; Charney, 2004). An estimated 600,000 to 800,000 needlestick injuries occur annually, about half of which go unreported. Henry and Campbell (2018) reiterate that it is estimated that each year more than 1,000 health care workers will contract infection, such as hepatitis B or C virus or HIV, from a needlestick injury. An estimated 50 to 247 health care workers are infected with the hepatitis C virus (HCV) each year from work-related needlesticks. At an average hospital, workers incur approximately 30 needlestick injuries per 100 beds per year. Nursing staff incur most needlesticks; 54 per cent of reported needlestick and sharp object injuries involve nurses. Henry and Campbell (2018) submitted that the risk of transmission from a positive source for hepatitis C is between 0.4 per cent and 1.8 per cent, and the average risk of transmission of HIV is 0.3 per cent. Risk of transmission increases if one is injured by a device visibly contaminated with blood, if the device is used to puncture the vascular system, or if the stick causes a deep injury. Sreedharan, Muttappillymyalil, and Venkatramana (2011) reiterate that the main diseases with risk of transmission into the environment are hepatitis B and C, herpes virus, and HIV. Glove contamination during venipuncture procedures occurs in 18% of cases, which represents a high risk of exposure to infectious agents if gloves are not used.

There are thousands of chemicals and other toxic substances to which nurses are exposed in practice. Hazardous chemical exposures can occur in a variety of forms, including aerosols, gases, and skin contaminants from medications used in practice (Sepkowitz & Eisenberg, 2018). Matz (2016) noted that exposures can occur on an acute basis, up to chronic long-term exposures, depending upon practice sites and compounds administered; primary exposure routes are pulmonary and dermal. Substances commonly used in the health care setting can cause asthma or trigger asthma attacks, according to a recent report. Volatile organic compounds (VOCs) are chemicals that readily evaporate at room temperature, thus allowing the chemicals to be easily inhaled. Formaldehyde and artificial fragrances are two such sources that have a ubiquitous presence in hospitals. Strong odours, fumes, and perfumes are also potent triggers of asthma. Formaldehyde, a known carcinogen, is used in pathology and lab settings and is contained in bedding, drapes, carpets, acoustic ceiling tiles, and fabricated furniture. Artificial fragrances are used to address unpleasant odours. As an example, ethylene oxide (EtO) and glutaraldehyde are commonly used in medical settings for sterilisation. Nurses and other medical staff are exposed while cleaning equipment and work surfaces. Although both of these chemicals are powerful and effective, they are associated with serious human health risks. Glutaraldehyde is associated with respiratory irritation, including asthma, skin irritation and dermatitis, and eye irritation and conjunctivitis.

Research facilities inherently have significant physical hazards present that include electrical safety hazards, ergonomic hazards associated with manual material handling and equipment use, handling sharps, and basic housekeeping issues (Sepkowitz & Eisenberg, 2005). National Occupational Research Agenda (2001) opined that many operations in the lab can result in lab workers assuming sustained or repetitive awkward postures. Examples are eluting a column in a fume hood, working for extended periods in a biosafety cabinet, or looking at slides on a microscope for extended periods. What is found acceptable for brief or occasional use may become problematic if performed for long durations or very frequently. Pain is a good indicator that something is wrong. Conduct work with a neutral, balanced posture. Mailu (2016) noted that many injuries stem from poor laboratory and facility keeping. Slips, trips, and falls are very common but easily avoided. Start with safe and organised storage areas. Material storage should not create hazards. Bags, containers, bundles, stored in tiers, should be stacked, blocked, interlocked, and limited in height so that they are stable and secure against sliding or collapse. Keep storage areas free from an accumulation of materials that could cause tripping, fire, explosion, or pest harborage.

**Statement of the Problem**

Health care professionals and particularly nurses are often exposed to microorganisms, many of which can cause serious or even lethal infections. According to the WHO (2016), an estimated 59 million people work in healthcare facilities globally, accounting for roughly 12% of the working population. The WHO also reports that all healthcare workers, including healthcare professionals, are exposed to occupational hazards (Muhammed et al., 2025). The International Labour Organization (ILO) (2017) reported that millions of healthcare workers suffer from work-related diseases and accidents, and many succumb to occupational hazards. The researchers observed that healthcare workers in Selected Hospitals in Ondo Town continue to face several hazards in their workplaces. The factors associated with experiencing hazards include not wearing all necessary protective equipment, experiencing work-related pressures, working in multiple facilities, and complacency in adhering to protective measures, poor attitude towards hand washing by both patients and clients. Therefore, the researchers examined the perceived effect of non-compliance with public health safety measures among workers in selected hospitals in Ondo town.

**Research Questions**

1. Will the risk of exposure to biological hazards be a perceived effect of non-compliance with public health safety measures among workers in General Hospital in Ondo Town?
2. Will the risk of exposure to chemical hazards be a perceived effect of non-compliance with public health safety measures among workers in General Hospital in Ondo Town?
3. Will the risk of exposure to physical hazards be a perceived effect of non-compliance with public health safety measures among workers in General Hospital in Ondo Town?

**Hypotheses**

1. Risk of exposure to biological hazards will not be a perceived effect of non-compliance with public health safety measures among workers in General Hospital in Ondo Town.
2. Risk of exposure to chemical hazards will not be a perceived effect of non-compliance with public health safety measures among workers in General Hospital in Ondo Town.
3. Risk of exposure to physical hazards will not be a perceived effect of non-compliance with public health safety measures among workers in General Hospital in Ondo Town.

**Methodology**

The study adopted a descriptive research design of the survey type, which is appropriate for assessing the perceptions of a large population on a specific health issue, in this case, the perceived effect of non-compliance with public health safety measures among workers in General Hospital in Ondo Town. The population for the study comprised all workers in General Hospital in Ondo Town, Nigeria, with a total population of 1,256 (including doctors, nurses, laboratory scientists, students in training, and hospital attendants). Given the size of the population, it was neither feasible nor necessary to study every individual. Instead, a representative sample was drawn. A multi-stage sampling technique was employed to select the sample for the study. This procedure was chosen to ensure representativeness and manageability: Stratified Sampling: the hospital was first divided into strata based on its operations. Purposive Sampling: Within the selected units, respondents were chosen purposively based on eligibility criteria such as doctors, nurses, laboratory scientists, students in training, and hospital attendants. This ensured the participants had relevant experience and knowledge about the subject of study. A total of 455 respondents were sampled for the study. This sample size was considered sufficient to allow for meaningful statistical analysis and generalisation of findings to the entire hospital workforce. The instrument used for data collection was a researcher-developed questionnaire, which was validated by three experts in the related field and tested for reliability. Test re-test method was used to obtain the reliability of the instrument. Pearson Product-Moment Correlation was used to obtain a correlation coefficient result of  $r = 0.68$ . The instrument was administered by the researcher and two trained research assistants. Inferential Statistics was used to test the three research hypotheses set for the study at the 0.05 alpha level.

**Results**

**Table 1: Chi-square analysis showing the Risk of exposure to biological hazards be a Perceived Effect of Non-Compliance with Public Health Safety Measures Among Workers in General Hospital in Ondo Town.**

Items	SA	A	D	SD	Cal $\chi^2$	df	Crit. Value	Remarks
Exposure to the blood of patients without adequate protection, such as the use of gloves, can result in infection with viral, fungal, and bacterial infections	198 (43.5%)	151 (33.2%)	28 (6.2%)	78 (17.1%)				
Needlesticks mishap can lead to transmission of infections	121 (26.6%)	70 (15.4%)	81 (17.8%)	183 (40.2%)	207.03	9	16.92	Rejected
Sweat and spume from patients are considered infectious, and without adequate precaution, infections can be contracted	103 (22.6%)	73 (16.0%)	56 (12.3%)	223 (49.0%)				
Eating while attending to patients increases the risk of infections	136 (29.9%)	54 (11.9%)	56 (12.3%)	209 (45.9%)				

0.05 alpha level

Table 1 above shows that 349 (76.7%), 191 (42%), 176 (38.6), and 190 (41.8%) of the respondents believed that the risk of exposure to biological hazards would be a perceived effect of non-compliance with public health safety measures among

workers in General Hospital in Ondo Town. The findings from the analysis in Table 1 show the calculated Chi-square ( $\chi^2$ ) value of 207.03 against the table value of 16.92 at 0.05 alpha level with degree of freedom 9. Since the calculated  $\chi^2$  value of 207.03 is greater than the table value of 16.92, thus, the null hypothesis was rejected, which means the risk of exposure to biological hazards will be a perceived effect of non-compliance with public health safety measures among workers in General Hospital in Ondo Town.

**Table 2: Chi-square Analysis Showing Risk of exposure to chemical hazards be a Perceived Effect of Non-Compliance with Public Health Safety Measures Among Workers in General Hospital in Ondo Town.**

Items	SA	A	D	SD	Cal $\chi^2$	df	Crit. Value	Remarks
Abnormal use of hand sanitiser and cleaning reagents could lead to chemical burns	75 (16.5%)	173 (38.0%)	169 (37.1%)	38 (8.4%)	282.33	9	16.92	Rejected
Accidental exposure to corrosive reagents and certain drugs could lead to certain injuries	75 (16.5%)	173 (38.0%)	169 (37.1%)	38 (8.4%)				
Poor ventilation in a laboratory can trigger an asthma crisis among the staff or clients	84 (18.5%)	177 (38.9%)	151 (33.2%)	43 (9.5%)				
Improper labelling of drugs and chemicals could result in dispensing errors.	50 (11.0%)	204 (44.8%)	157 (34.5%)	44 (9.7%)				

@ 0.05 alpha level

Table 2 above shows that 248 (54.5%), 248 (54.5%), 261 (57.4%), and 254 (55.8%) of the respondents believed that the risk of exposure to chemical hazards would be a perceived effect of non-compliance with public health safety measures among workers in General Hospital in Ondo Town. The findings from the analysis in Table 2 show the calculated Chi-square ( $\chi^2$ ) value of 282.33 against the table value of 16.92 at 0.05 alpha level with degree of freedom 9. Since the calculated  $\chi^2$  value of 282.33 is greater than the table value of 16.92, thus, the null hypothesis was rejected, which means the risk of exposure to chemical hazards is a perceived effect of non-compliance with public health safety measures among workers in General Hospital in Ondo Town.

**Table 3: Chi-square Analysis Showing Risk of exposure to physical hazards being perceived. Effect of Non-Compliance with Public Health Safety Measures Among Workers in a General Hospital in Ondo Town.**

Items	SA	A	D	SD	Cal $\chi^2$	df	Crit. Value	Remarks
Mishandling of medical equipment can result in mechanical error, which in turn affects patients' medical results	75 (16.5%)	173 (38.0%)	169 (37.1%)	38 (8.4%)	282.33	9	16.92	Rejected
Improper storage of material for laboratory and theatre work could harm staff and patients	75 (16.5%)	173 (38.0%)	169 (37.1%)	38 (8.4%)				
A nonchalant attitude towards hazard preventive measures could lead to workplace accidents	84 (18.5%)	177 (38.9%)	151 (33.2%)	43 (9.5%)				
Non-availability of sand bucket and fire extinguishers could affect fire emergency Management	50 (11.0%)	204 (44.8%)	157 (34.5%)	44 (9.7%)				

@ 0.05 alpha level

Table 3 above shows that 248 (54.5%), 248 (54.5%), 261 (57.4%), and 254 (55.8%) of the respondents believed that the risk of exposure to physical hazards is a perceived effect of non-compliance with public health safety measures among workers in General Hospital in Ondo Town. The findings from the analysis in Table 2 show the calculated Chi-square ( $\chi^2$ ) value of 282.33 against the table value of 16.92 at 0.05 alpha level with degree of freedom 9. Since the calculated  $\chi^2$  value of 282.33 is greater than the table value of 16.92, thus, the null hypothesis was rejected, which means the risk of exposure to physical hazards is a perceived effect of non-compliance with public health safety measures among workers in General Hospital in Ondo Town.

**Discussion of findings**

The study examined the perceived effect of non-compliance with public health safety measures among workers in General Hospital in Ondo Town. Hypothesis one indicated that the Risk of exposure to biological hazards will be a perceived effect of non-compliance with public health safety measures among workers in General Hospital in Ondo Town. This corroborates the findings of Roy and Robillard (2018) opined that health care workers continue to be exposed to the serious and sometimes life-threatening risk of blood-borne infections in a wide variety of occupations and health care settings, and that an estimated 600,000 to 800,000 needlestick injuries occur annually, about half of which go unreported. Also, Henry and Campbell (2018) reiterate that it is estimated that each year more than 1,000 health care workers will contract infection, such as hepatitis B or C virus or HIV, from a needlestick injury. Sreedharan, Muttappillymyalil, and Venkatramana (2011) also reiterate that the main diseases with risk of transmission into the environment are hepatitis B and C, herpes virus, and HIV. Glove contamination during venipuncture procedures occurs in 18% of cases, which represents a high risk of exposure to infectious agents if gloves are not used.



Hypothesis two indicated that the risk of exposure to chemical hazards will be a perceived effect of non-compliance with public health safety measures among workers in General Hospital in Ondo Town. The findings supported the report of Matz (2016) noted that exposures can occur on an acute basis, up to chronic long-term exposures, depending upon practice sites and compounds administered; primary exposure routes are pulmonary and dermal. Substances commonly used in the health care setting can cause asthma or trigger asthma attacks, according to a recent report. Isara and Ofili (2010) noted that there are hundreds of hazardous chemicals, including immune agents, dermatologic agents, carcinogens, neurotoxins, and reproductive toxins. Asthmagens, sensitizers, and systemic toxins are also hazardous chemicals; long-term exposure to chemicals such as silica dust, engine exhausts, tobacco smoke, and lead (among others) has been shown to increase the risk of heart disease, stroke, and high blood pressure. Okechukwu and Motshedisi (2012) opined that nurses and other medical staff are exposed while cleaning equipment and work surfaces. Although both of these chemicals are powerful and effective, they are associated with serious human health risks. Glutaraldehyde is associated with respiratory irritation, including asthma, skin irritation and dermatitis, and eye irritation and conjunctivitis.

Hypothesis three indicated that the risk of exposure to physical hazards is a perceived effect of non-compliance with public health safety measures among workers in General Hospital in Ondo Town. Mailu (2016) noted that many injuries stem from poor laboratory and facility keeping. Slips, trips, and falls are very common but easily avoided. Start with safe and organized storage areas. Material storage should not create hazards. Bags, containers, bundles, etc., stored in tiers should be stacked, blocked, interlocked, and limited in height so that they are stable and secure against sliding or collapse. Keep storage areas free from an accumulation of materials that could cause tripping, fire, explosion, or pest harborage. Research facilities inherently have significant physical hazards present that include electrical safety hazards, ergonomic hazards associated with manual material handling and equipment use, handling sharps, and basic housekeeping issues (Sepkowitz & Eisenberg, 2005). National Occupational Research Agenda (2001) opined that many operations in the lab can result in lab workers assuming sustained or repetitive awkward postures. Examples are eluting a column in a fume hood, working for extended periods in a biosafety cabinet, or looking at slides on a microscope for extended periods. What is found acceptable for brief or occasional use may become problematic if performed for long durations or very frequently. Pain is a good indicator that something is wrong. Conduct work with a neutral, balanced posture.

### Conclusion

1. Risk of exposure to biological hazards will be an effect of non-compliance with public health safety measures among workers in General Hospital in Ondo Town.
2. Risk of exposure to chemical hazards will be an effect of non-compliance with public health safety measures among workers in General Hospital in Ondo Town.
3. The risk of exposure to physical hazards will be a result of non-compliance with public health safety measures among workers in General Hospital in Ondo Town.

### Recommendation

Based on the conclusion drawn from the study, the following recommendations were made: Hospital Management should intensify health education campaigns focusing on the prevention of hospital-acquired infection to raise more awareness about infection prevention, hygiene practices. The study further recommends that hospitals must be adequately stocked with essential PPEs such as respirators and goggles, and that stringent adherence measures be taken to store chemicals safely and ensure proper ventilation when working with chemicals. Implementation of engineering control, such as the use of physical barriers, ventilation systems, reduction in the quantity of hazardous materials handled, regular machine inspection to prevent malfunction, and ensuring safe operations.

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## PERCEIVED EFFECTS OF NOISE POLLUTION ON WELL-BEING OF WORKERS IN DANGOTE FLOUR MILL FACTORY, ILORIN, KWARA STATE, NIGERIA.

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### Abstract

This study investigates the perceived effects of noise pollution on the well-being of workers in Dangote Flour Mill Factory, Ilorin, Kwara State. A descriptive research design of the survey type was used for the study. The population for the study comprised all Dangote Flour Mill factory workers, Ilorin, Kwara State. Multi-stage sampling technique was used to select 420 respondents. A researcher designed a questionnaire, which was validated by the supervisor and three other experts from the Departments of Health Promotion and Environmental Health Education, University of Ilorin was used. A reliability coefficient of  $r = .70$  was obtained through a test-retest method using Pearson Product-Moment Correlation. Questionnaires were administered and collected by the researcher with three trained research assistants. Descriptive statistics of frequency counts and percentages were used to analyse the demographic data, while the inferential statistics of Pearson Product-Moment Correlation were used to test the null hypotheses set for the study at 0.05 alpha level. The findings of the study revealed that hearing loss with (calculated  $r$  value = 0.477 > critical  $r$  value = 0.082 degree of freedom = 418), sleep pattern with (calculated  $r$  value = 0.521 > critical  $r$  value = 0.082 degree of freedom = 418) and mental health with (calculated  $r$  value = 0.618 > critical  $r$  value = 0.082 degree of freedom = 418). The study concluded that hearing loss, sleep patterns, and mental health are significant perceived effects of noise pollution on the well-being of workers in Dangote Flour Mill, Ilorin, Kwara State. Based on the conclusion, the following recommendations were made: The use of hearing pad to prevent hearing loss should be enforced among the factory workers, and those already suffering from hearing loss should go for proper medical care. Factory workers should not live near factory areas to have better and more restful sleeping patterns. Finally, factory workers should be given time to rest at intervals of hours to allow them to have mental alertness, and for workers already having mental health problems, job security and adequate mental health care should be provided for them.

### Introduction

The basic working definition of well-being proposed by White (2020) includes doing well, a material dimension referring to standards of living; feeling good, the subjective perception; as well as a dimension of doing good and feeling well, incorporating the idea of living a good life, which emphasises the importance of people's relationships with others. The framework also considers three interdependent dimensions of well-being: material, relational, and subjective. Shargorodsky et al. (2020) reported that \$1.3 billion in Veterans Administration tinnitus-related disability compensation was expended in 2010. Subjective tinnitus following noise-induced hearing loss is the most common form of chronic tinnitus. Temporary tinnitus was far more common than chronic tinnitus. Nearly everyone has experienced a temporary ringing in the ears after intense sound exposure, such as a loud concert or a gunshot. Although noise-induced temporary tinnitus does not pose the debilitating health concerns that chronic tinnitus does, it may share critical mechanisms with chronic tinnitus caused by noise-induced hearing loss. A second prominent field of noise study has been sleeping disturbance patterns. In part, this has been of interest because noise during sleep disrupts sleep and may produce increased annoyance through remembered awakenings (Basner et al., 2024). About 450 million people suffered from mental health disorders as a result of being exposed to excessive noise pollution, according to estimates given in the WHO's World Health Report (2020). One person in four will develop one or more mental or behavioural disorders during their lifetime (WHO, 2021).

In Nigeria, the problem of noise pollution is widespread because it is regarded as one of the major environmental pollutions that has direct effects on human performance (Debasish & Debasish, 2024). Thus, the survival and healthy existence of man, according to Otukong (2022), depend largely on the enabling environment where he/she resides, as disruption in the conducive environment may lead to dysfunction in his health status. Noise is derived from the Latin word "nausea," implying 'unwanted sound' or 'sound that is loud, unpleasant, or unexpected and it is considered as pollution because of the noxious and unwanted sound it emits into the environment (Singh & Davar, 2024). According to Berman et al. (2023), noise originates from human activities, especially the urbanisation and the development of transport and industry. Consequently, pollution, according to Yilmaz and Ozer (2021), is the introduction of contaminants into the natural environment that cause adverse change. They submitted that pollution can take the form of chemical substances or energy such as noise, heat, or light.

Noise pollution in Nigerian cities is relatively high when compared to recommended levels by the World Health Organization (Oyedepo, 2022). Geetha and Ambika (2020) define noise pollution as a series or more noise that may damage activity or human life. They observed that construction equipment, jet planes, road traffic, garbage trucks, and manufacturing processes are some of the major sources of noise pollution. They opined that noise pollution is of two types: the first is noise hazards,

which leads to permanent hearing loss and neural stress, while the second type of noise pollution is noise nuisance, which encompasses mental stress, irritability, sleep interference, hearing loss, and loss of concentration. Meanwhile, noise-induced hearing loss is seen as the major source of concern to factory workers: Well-being due largely to its health for Noise Noise-induced hearing loss is defined as injury to the inner ear caused by prolonged exposure to loud noise (Bredenkamp & Schoenfeld, 2024). Occupational noise-induced hearing loss develops slowly in response to frequent exposure to excessive noise and affects a considerable number of factory workers (Muhammed et al., 2025; Concha-Barrientos et al., 2024).

Nigerian cities are environmentally noise-polluted: Road traffic, industrial machinery, and generators are the major sources of noise pollution in the country (Oyedepo, 2012). Therefore, Hakeem (2024) affirmed that there is a need for proper implementation of rules and regulations, public enlightenment, education, and sensitisation on the hazards, dangers, and human health problems associated with noise pollution. Consequently, emphasised that the non-auditory effects of noise on humans are viewed as being generally stress-related, following observations that noise exposures endanger physiological reactions typical to those of stress. Noise seems to have a negative effect on performance, and it appears that the longer the exposure, the greater the effect (Goines & Hagler, 2023). It is well accepted that noise pollution has a negative effect on the physical, mental, and social health of individuals who are exposed to constant noise, which is because individuals do not make use of health information disseminated to them on the dangers of the harmful effects of noise on their health (Nicholsen & Smitherman, 2019; Sule et al., 2021).

According to Haines et al. (2022), permanent hearing loss, muscle tension, high blood pressure, increased aggression, headaches, migraine, irritability, insomnia, and psychological disorders are the health hazards caused by noise pollution. The effects of noise on conscious subjects are insidious and result in increased psychosocial stress that may influence subsequent stress among factory workers (Akorede et al., 2021; Babisch et al., 2023). The researchers, therefore, investigate the perceived effects of noise pollution on workers' well-being: A case study of Dangote factory, Ilorin, Kwara State, Nigeria. Studies have shown that noise levels in metropolitan cities exceed the standard limits (Miller et al., 2021). The equivalent environmental noise level of 70 dB(A) Laeq, 24h has been recommended by WHO for industrial, commercial, shopping, and traffic areas, indoors and outdoors areas to prevent impairments (Oyedepo, 2022). Defining well-being is especially challenging because of the different ways in which the concept is understood in different contexts and by different people. However, rather than being driven by a definition, researchers have focused on dimensions and descriptions (Dodge et al., 2022).

### **Statement of the Problem**

Noise pollution is a slow and subtle killer. Noise pollution has become worrisome and a very serious concern because of its effects on workers' health it creating a public health problem that may lead to hearing impairment and low quality of life. Industrial employees are exposed to noise from a variety of sources, such as noise from industrial engines, stationary vehicles inside the industry, compressors and pneumatic tools in garages, workshops, and maintenance areas, hand-held power tools, heavy machinery and other equipment, ventilation systems operating at substandard levels, and human sources such as co-workers. Ahmed, Dennis, Badran, Ismail, Ballal, Ashoor & Jerwood (2023) affirmed that exposure to high occupational noise, which may result in health risks, is commonly encountered in a variety of industrial processes. Its effects depend not only on the intensity but also on exposure time, frequency, and the type of noise. Interaction with the factory workers reveals that noise pollution has negative effects on their well-being and auditory system, which has resulted in hearing loss, poor sleeping patterns, and mental health issues. Based on the above, the researcher embarks on the investigation on the perceived effect of noise pollution on the well-being of the workers in Dangote Flour Mill Factory Workers Ilorin, Kwara State, Nigeria.

### **Research Questions**

The following Research Questions were raised to guide the study;

1. Will hearing loss be a perceived effect of noise pollution on the well-being of workers in Dangote Flour Mill, Ilorin, Kwara State, Nigeria?
2. Will sleep pattern be a perceived effect of noise pollution on the well-being of workers in Dangote Flour Mill, Ilorin, Kwara State, Nigeria?
3. Will mental health be a perceived effect of noise pollution on the well-being of workers in Dangote Flour Mill, Ilorin, Kwara State, Nigeria?

### **Research Hypotheses**

The following Research Hypotheses were tested.

1. Hearing loss will not significantly be a perceived effect of noise pollution on the well-being of Workers in Dangote Flour Mill, Ilorin, Kwara State, Nigeria.
2. Sleep pattern will not significantly be a perceived effect of noise pollution on the well-being of Workers in Dangote Flour Mill, Ilorin, Kwara State, Nigeria.
3. Mental health will not significantly be a perceived effect of noise pollution on the well-being of Workers in Dangote Flour Mill, Ilorin, Kwara State, Nigeria.

### **Methodology**

The research design that was adopted for this study is descriptive research of a survey type. This method was chosen because the study required the researcher to collect personal and general information for the research. The population for the study was all factory workers at Dangote Flour Mill, Ilorin, Kwara State, with a total of four thousand two hundred and two (4,202)

(Dangote Flour Mill Bulletin, 2016). A multistage sampling technique was used for the study. A proportionate sampling technique of 10% was used to select four hundred and twenty (420) respondents. While simple random sampling technique was used to select the respondents. The research instrument used for this study was a structured questionnaire developed by the researcher. The instrument was validated by three experts and the researcher’s supervisor in the Department of Health Promotion and Environmental Health Education, University of Ilorin, Kwara State. The reliability was carried out at Groove Food Processing Mill Factory, Ilorin, Kwara State, which has a similar geographical location to the place of research work, using test re-test method using twenty respondents. The result obtained was subjected to statistical analysis of Pearson Product-Moment Correlation, and a correlation coefficient of 0.70 was obtained. This was high enough to make the research instrument reliable enough for the study. The researcher, together with three trained research assistants, administered the instrument to the respondents. Their consents were sought for the study. The content of the questionnaire was explained in detail to the respondents to rule out ambiguity or lack of understanding of the questionnaire that was used for the study. The instrument was retrieved immediately to avoid loss. The data collected for this study were subjected to inferential statistics of Pearson Product-Moment Correlation to analyze the data collected for the study at 0.05 alpha level.

**Results**

**Hypotheses Testing**

Ho<sub>1</sub>: Hearing loss will not significantly be a perceived effect of noise pollution on the well-being of Workers in Dangote Flour Mill, Ilorin, Kwara State, Nigeria.

**Table 1: Pearson ‘r’ Correlation Analysis on the effect of Noise Pollution on Hearing Loss.**

Variable	N	$\bar{X}$	S. D	df	Calculated r value	Critical r value	Remark
Noise Pollution and Hearing Loss.	420	26.51	3.612	418	0.477	0.082	Ho rejected
		19.11	2.301				

@ 0.05 alpha level

The result of the analysis shows the calculated r value of 0.477 is greater than the table r value of 0.082 with degrees of freedom 418 at 0.05 alpha level. Hence, the null hypothesis was rejected. This implies that hearing loss is a significant perceived effect of noise pollution on the well-being of workers in Dangote Flour Mill, Ilorin, Kwara State, Nigeria.

Ho<sub>2</sub>: Sleep pattern will not significantly be a perceived effect of noise pollution on the well-being of Workers in Dangote Flour Mill, Ilorin, Kwara State, Nigeria.

**Table 2: Pearson ‘r’ Correlation Analysis on the effect of Noise Pollution on Sleep Pattern.**

Variable	N	$\bar{X}$	S. D	df	Calculated r value	Critical r value	Remark
Noise Pollution and Sleep Pattern.	420	12.01	2.612	418	0.521	0.082	Ho rejected
		10.17	2.141				

@ 0.05 alpha level

The result of the analysis shows the calculated r value of 0.521 is greater than the table r value of 0.082 with degree of freedom 418 at 0.05 alpha level. Hence, the null hypothesis was rejected. This implies that sleep pattern is a significant perceived effect of noise pollution on the well-being of workers in Dangote Flour Mill, Ilorin, Kwara State, Nigeria.

Ho<sub>3</sub>: Mental Health will not significantly be a perceived effect of noise pollution on the well-being of Workers in Dangote Flour Mill, Ilorin, Kwara State, Nigeria.

**Table 3: Pearson ‘r’ Correlation Analysis on the Effect of Noise Pollution on Mental Health.**

Variable	N	$\bar{X}$	S. D	df	Calculated r value	Critical r value	Remark
Noise Pollution and Mental Health	420	26.01	1.212	418	0.618	0.082	Ho rejected
		24.11	1.101				

@ 0.05 alpha level

The result of the analysis shows the calculated r value of 0.618 is greater than the table r value of 0.082 with degree of freedom 418 at 0.05 alpha level. Hence, the null hypothesis was rejected. This implies that mental health is a significant perceived effect of noise pollution on the well-being of workers in Dangote Flour Mill, Ilorin, Kwara State, Nigeria.

**Discussion of Findings**

The finding in hypothesis 1 revealed that hearing loss is a significant perceived effect of noise pollution on the well-being of workers in Dangote Flour Mill in Ilorin, Kwara State, Nigeria. This finding is in line with Nondahl et al. (2022) and Shargorodsky et al. (2020), who reported that \$1.3 billion in Veterans Administration tinnitus-related disability compensation was expended in 2010. Subjective hearing loss following noise-induced hearing loss is the most common form of chronic hearing loss. Temporary deafness is far more common than chronic deafness. Nearly everyone has experienced a temporary ringing in the ears after intense sound exposure, such as a loud concert or a gunshot.

Although noise-induced temporary deafness does not pose the debilitating health concerns that chronic tinnitus does, it may share critical mechanisms with chronic hearing loss caused by noise-induced hearing loss. The reversibility of temporary deafness offers practical experimental advantages, such as the ability to compare brain activity. Although noise-induced

temporary hearing loss does not pose the debilitating health concerns that chronic hearing loss does, it may share critical mechanisms with chronic deafness caused by noise-induced hearing loss. The reversibility of temporary hearing loss offers practical experimental advantages, such as the ability to compare brain activity when the animal is or is not experiencing hearing loss. For example, temporary hearing loss produced by high doses of salicylate alters both driven and spontaneous activity levels and inhibitory function at multiple levels of the auditory system, including the cochlear nucleus, inferior colliculus, and auditory cortex (Holt et al., 2020).

Hypothesis 2 revealed that sleep pattern is a significant perceived effect of noise pollution on the well-being of workers in Dangote Flour Mill, Ilorin, Kwara State, Nigeria. This finding is in line with Prematunga (2022), who suggested that for most people, sound is an important and meaningful contributor to the experience of their environment and their daily activities. However, unwanted sound may interrupt sleep patterns where quiet is desirable, distract concentration, reduce the quality of communication, and contribute to the stress of individuals (Berglund, 2020). Much research has focused on addressing the fairly clear quality-of-life effects associated with annoyance by intrusive noises during sleep. A second prominent field of noise study has been the sleeping disturbance pattern. In part, this has been of interest because noise during sleep disrupts sleep and may produce increased annoyance through remembered awakenings (Basner et al., 2024).

Hypothesis 3 revealed that hearing loss is a significant perceived effect of noise pollution on the well-being of workers in Dangote Flour Mill, Ilorin, Kwara State, Nigeria. This finding is in line with WHO (2023), which reported that mental and behavioural disorders are not exclusive to any special group: they are found in people of all regions, all countries, and all societies. About 450 million people suffer from mental health disorders as a result of being exposed to excessive noise pollution. According to estimates given in the WHO's World Health Report (2021). One person in four will develop one or more mental or behavioural disorders during their lifetime (WHO, 2023). Mental and behavioural disorders are present at any point in time in about 10% of the adult population worldwide, especially those working in the factory.

### Conclusions

Based on the findings of this study, it was concluded that;

1. Hearing loss is a significant perceived effect of noise pollution on the well-being of workers in Dangote Flour Mill, Ilorin, Kwara State, Nigeria.
2. Sleep pattern is a significant perceived effect of noise pollution on the well-being of workers in Dangote Flour Mill, Ilorin, Kwara State, Nigeria.
3. Mental health is a significant perceived effect of noise pollution on the well-being of workers in Dangote Flour Mill, Ilorin, Kwara State, Nigeria.

### Recommendations

The following recommendations were made based on the findings of the study;

1. The use of hearing pads to prevent hearing loss should be enforced among factory workers, and those already suffering from hearing loss should go for proper medical care.
2. Factory workers should not live near factory areas to have better sleeping patterns.
3. Factory workers should be given time to rest at intervals of hours to allow them to have mental alertness, and for workers already having mental health problems, job security and adequate mental health care should be provided for them.

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## STRESS COPING TECHNIQUES FOR NIGERIAN WOMEN IN SPORT

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### Abstract

Stress refers to pressure, tension, or worries arising from problematic situations in an individual's life. There has been an influx of women into the labour force; this is due to the far-reaching changes in sports activities for women all over the world, and in Nigeria in particular. The sport sector in Nigeria has experienced changes in the increment number of women entering the profession in recent years. This study explored the sources of stress and use of coping styles and techniques among Nigerian women in sport. Common sources of stress identified were injury and illness, pressures of competition, the referee, conflict with the coach, and spectators. Studies suggest that interventions designed to reduce stress should seek to increase the use of avoidance and approach styles to cope with stress.

**Keywords:** Stress, Sport, Coping style, Techniques, Nigeria.

### Introduction

Stress can be conceptualised as a response to a challenge or threat. The purpose of stress dates back to one of the most basic animal responses: fight or flight. Stress is essentially a response that alerts and prepares your body in the event of potential psychological or physical danger. In the most primitive form, stress is used as a catalyst for protection. While stress generally has a negative connotation, it is essential for survival as well as growth. The fight or flight response is linked to the sympathetic nervous system. When faced with a stressful situation, a part of the brain called the amygdala will activate, sending a signal to the hypothalamus, which is composed of two parts: the sympathetic and parasympathetic nervous systems. As stated by Harvard Health Publications (2011), the parasympathetic nervous system triggers increased production of the chemicals called epinephrine (more commonly known as adrenaline), cortisol, and norepinephrine. The most widely known of these chemicals, adrenaline, "triggers the release of blood sugar and fat from temporary storage sites in the body (Harvard Health Publications, 2011). Drawing on these nutrients gives the body a surge of energy. Initially, this was the function of stress. However, over a prolonged period of time, stress can be very detrimental to the body's health. Stress can act negatively by suppressing the immune system, increasing the likelihood of muscle cramps, headaches, heart problems, and sleeping difficulties (Medical News Today, 2015).

Psychologically, stress can cause many shifts in people's thoughts and feelings, such as anxiety, insecurity, irritability, restlessness, anger, and fatigue (Akorede et al., 2021). People also undergo negative behavioural changes. In the highest level of any sport, where competitors have all put countless hours into perfecting technique and strategy, anything can tip the scales. The world of competitive sports is often conducive to a stressful atmosphere. Athletes must handle both the short-term stress during competition and the long-term stress of results and expectations. It is especially important when high-level athletes must control their bodies with the highest precision. Just like in everyday life, stress can induce a fight or flight response during competition. In sports, the "flight" can refer to nervousness or fear. Oftentimes, fear is recognised when an athlete starts to make "comfortable" or "safe" plays instead of sticking to a game plan. It can be seen in basketball, when a player opts to pass instead of taking the open shot, in tennis, when a player backs off from the net after being in an advantageous position, or in volleyball, when the wing spiker hesitates to call for a shot.

Every sport has moments where a certain amount of risk is required to win. Athletes must confront the natural "flight" instinct to make the right decision. The phrase "play to win, don't play not to lose" is not only a grammatical mess, but a phrase that many coaches will use to encourage their players. As a contrast to "flight", the "fight" function in sports is the instinct to embrace a challenge. The "fight" instinct in sports is not as similar to the primal "fight" instinct (I think "flight" is more similar to its original meaning). The fight instinct is activated when the prospect of a challenge really excites the athlete. There are times when an athlete just craves competition. When all of the negative stressors become fuel for the "fight" instinct, athletes generally perform better. Uncertainty of the outcome can turn into a thrill. Taking risks becomes easier. It is in that instant that pressure is a privilege. Even though winning a competition doesn't seem nearly as weighty as trying to survive, the biological response is the same. In both instances, a lot of effort must be used to fight for something of importance.

Assuming that athletes are at a similar level, the ones who can deal with critical moments are most likely to succeed. That's why many sports refer to certain moments in a game as "pressure" moments. Pressure is often the greatest source of stress in sports. Athletes also use terms such as "choking" or getting "tight". Biologically, stress is known to tighten the muscles and increase the heart rate. All of the terms mentioned above are used when athletes know that they have failed to cope with the stress of the moment. Dealing with stress for an athlete means handling all of the baggage that comes with being stressed out: the emotional ups and downs, the changes in behaviour, the inability to control the body correctly, and many more. While it is okay in everyday life to blow off some steam or take a breather, athletes are constantly in situations where there is no room for error. Dealing with stress means that the athlete has to instantly deal with hormonal or chemical changes in their bodies

that they have no control over (Harvard Health Publication, 2011). While stress causes the emotions of anger and frustration, the most successful athletes appear calm and collected. The concept is very simple; the one who wins is the one who gets the job done despite the circumstances. It is often the case that two athletes are very similar in talent and skill level in practice, but there is a huge gap in their level during competition. One prime example is tennis. Many of the top professional players hire hitting partners to do drills with them. Of course, these hitting partners have to have a certain level of competency.

To people on the sidelines, it may look as if both players are about equal on the practice court. However, the difference can be as great as being ranked number one versus being ranked two hundred. In some instances, stress can be a motivator as well as a tool to help get things done. On the other hand, the wrong kind of stress can make an athlete lose focus, feel discouraged, and feel overwhelmed. Stress can also be divided into two categories: internal and external. Internal stress is generated by the athlete. Expectations for oneself are an example of internal stress. Examples of external stressors would be expectations from others, monetary issues, or other athletes. Many different factors can bring stress into an athletic career. First, there is the idea of self-worth. This is an internal factor that can cause a substantial amount of stress when an athlete feels the pressure to meet his or her own expectations. Because the training is so intensive, it is normal for athletes to invest almost everything into their craft. The result is that many athletes will tend to judge their self-worth through the results of their matches. Taking this kind of all-or-nothing approach can create an overwhelming amount of stress during competition. Athletes who can separate their results from their self-worth are more likely to be able to bounce back from a bad loss. Linking very closely to self-worth, another type of stress is purely results-based. Fear of losing/failure is very simple but a very deadly stressor (Cohn, 2015).

Skills and practice time can help athletes gain confidence, which minimizes this kind of stress. However, when athletes are too results-oriented, it takes away from the way that they should perform (Cohn, 2015). Because results are the only things that are set in stone, many athletes perceive their performance based on wins or losses. Being really focused on the present is good, but only if it does not take away the potential to improve in the future. External stressors can vary greatly depending on the situation. Growing up, one of the biggest external stressors I experienced while playing tennis was my parents. While my parents were nurturing, they also put immense pressure on me to perform at my best every tournament. In the case of a lot of maturing athletes, their parents are the sole investors in their sports careers. Along with all of the time, money, and effort, athletes have to shoulder their parents' expectations as well. In a study done by Scanlan and Lewthwaite, coaches and parents were found to be very influential on their child's enjoyment of competition (Scanlan & Lewthwaite, 2008). In turn, this enjoyment contributes to confidence and better performance (Scanlan & Lewthwaite, 2008). Famous athletes have the added stress of being under a microscope. The press, fans, team organization, and coaches can put players in stressful situations both on and off the playing field. Interviews and fan speculation are a prime cause of rumours surrounding famous athletes, the reason being that the body will release chemicals that alter the body indiscriminately during stress (Harvard Health Publication, 2011).

Stress does not just disappear once an athlete enters competition mode. Even supportive fans can cause a lot of stress to an athlete. It was found in a study done by Baumeister and Steinhilber (2014) that the presence of supportive audiences might be detrimental to performance in some circumstances. It was found that "specifically, the imminent opportunity to claim a desired identity in front of a supportive audience might engender a state of self-attention that could interfere with the execution of skillful responses" (Baumeister & Steinhilber, 2014). An example is when archival data from championship series for baseball and basketball is used. It was found that in both series, the home team would win early games but lose decisive games," (Baumeister & Steinhilber, 2014). All of these are stressors that can deter an athlete from focusing on what needs to be done. Despite the negative connotation of stress, the top athletes use it as fuel to get closer to their goals. As noted earlier, stress is a catalyst for preparing the body for oncoming challenges. Athletes who feel the stress of other athletes catching up in skill level can be motivated to work even harder. An optimal amount of stress and pressure can let muscles perform at the highest level. While no athlete can perform at one hundred percent while completely relaxed, being too tight is detrimental as well. How an athlete copes with negative stress and feeds on positive stress can define his or her career. Just like in a survival setting, athletes need stress to be cognizant of what is negatively affecting their career. Once an athlete steps onto his or her competitive stage, all of the stress in their lives does not just disappear. Whether the stress is related to competition or not, every kind of stress will somehow affect the performance of the athlete. It is a misconception that the greatest athletes in the world are unaffected by stress. The athletes who produce the best results are simply the best at suppressing the negative effects. During the course of the competition, there is even the added stress of unexpected events. Bad judgment from the referee or foul play from the other players can add to the mountain of stress that is already built up. The most difficult part is that in the midst of competition, all of the senses and emotions are enhanced so that even a nagging annoyance can be blown out of proportion. The most important thing to realise is that stress is a natural survival instinct. Since it is originally designed to increase the survival rate, it is better to formulate a way to put stressors into perspective rather than trying to avoid them.

### Stress Coping Techniques

**Preparation.** Being well prepared can give an athlete peace of mind. Not only can being prepared give an athlete confidence, but it can also leave the athlete more accepting of the result. When an athlete feels unprepared, his or her performance can be affected if the athlete feels hesitant in performing a skill that wasn't practised adequately. Nutrition, mental state, quantity of sleep, and physical care are also part of the preparation process. Even though it is impossible to mitigate all of the stress, many of the unnecessary stressors, such as regret, can be avoided. Aside from the physical aspects of preparation, there are many psychological pre-match coping strategies that athletes can use to lessen the effects of some negative stressors.

**Confidence.** "I learned to believe," is what Djokovic said when he was asked about his success at a 2011 news conference. 2011 is the year the current number one tennis player began his domination. The competitive sports world is laden with stress factors. One way to counteract the stress of competition is to have enough confidence to tackle the situation. Confidence, in psychological terms, is closely interchangeable with self-efficacy. Self-efficacy is a term coined by Albert Bandura to describe

“people's internal beliefs about their ability to have an impact on events that affect their lives” (Dombeck, Mills & Reiss, 2008). Research has demonstrated that the amount of self-efficacy a person has can have a significant impact on how that person is affected by negative stress. The book *Self-Efficacy: Thought Control of Action* by Ralf Schwarzer (2002) states that “high self-efficacy buffers the experience of stress, whereas low self-efficacy puts individuals at risk for a dramatic increase in threat and loss appraisals.” The article by Dombeck, Mills, and Reiss also stated that “possessing high levels of self-efficacy acts to decrease people's potential for experiencing negative stress feelings by increasing their sense of being in control of the situations they encounter,” (Dombeck, Mills & Reiss, 2008). There are several ways people can perceive an upcoming challenge. Some of the different perspectives are: an opportunity to prove themselves, a task where there is a chance to fail, a neutral task that just needs to get done, a task that is beyond their abilities, or a task that is too easy. Of these options, the most positive one is for the athlete to see a challenge as an opportunity to prove him or herself. Because these opportunities usually present themselves at a time of importance, where the spotlight might be on the athlete, there will almost always be a significant amount of uncertainty.

However, according to the literature above, a more confident athlete will have a higher likelihood of perceiving a challenge as an opportunity instead of thinking about what there is to lose. Regardless of the actual difficulty of the challenge, confidence can create a placebo effect that increases the level of performance by negating some stress factors. A study done by Pollo et al. (2008) showed that there was an increase in muscle work and a decrease in muscle fatigue when participants were administered a placebo. If the same theory is applied, it would be extremely beneficial for an athlete to somehow train or get used to being confident. This may result in the athlete focusing on more positive outcomes rather than worrying about negative stressors. The pinnacle of an athlete's performance is when they are in what is called “the zone”. Psychologist Mihaly Csikszentmihalyi calls being in the zone “flow”. In his book, *Flow: The Psychology of the Optimal Experience*, Csikszentmihalyi describes the flow as being “completely absorbed in an activity, especially an activity which involves their creative abilities. During this ‘optimal experience’ they feel 'strong, alert, in effortless control, unselfconscious, and at the peak of their abilities.” He goes on to explain that some characteristics of flow are losing track of time and external concerns or stimuli, feeling connected to something greater than oneself, and feeling challenged but not overwhelmed in terms of the ability and attention needed to complete a task. Although getting into the “flow” isn't as easy as it sounds, confidence is still a crucial component. As pointed out earlier in Ralf Schwarzer's (2002) book, confidence helps buffer negative stressors. Since part of being in the “flow” is losing track of external concerns (concerns largely being stressors), the right amount of confidence should produce more consistently high levels of performance.

**Confidence Building.** Confidence-building is a crucial part of being prepared. The most effective way to build confidence is to win. However, it is impossible for anyone to never experience loss. Since confidence is crucial to perform well, it is important for athletes to mentally prepare themselves to have a confident mindset. Building confidence is very important. An article by Costas Karageorghis (2010) categorises the sources of confidence into six groups. The groups are: performance accomplishments, being involved with the success of others, verbal persuasion, imagery experiences, physiological states, and emotional states. “

1. **Performance Accomplishments-** As an athlete becomes increasingly successful at a task or skill, his or her confidence level in that skill should increase. The scale doesn't really matter. Any accomplishment, whether it be learning a new skill or winning a national title, will lead to positive emotions. (Karageorghis, 2010)

2. **Being Involved with the Success of Others-** Being involved with the success of others helps one reinforce that what he or she is doing is correct. People receive positive feedback if others are successful using a method that they taught them. It also confirms that the method is more likely to be correct. (Karageorghis, 2010)

3. **Verbal Persuasion-** Words have more power than one expects. It is easy to say “I am terrible” without fully meaning it after making a mistake. However, these seemingly harmless words can be destructive. All of the words a person says to him or herself will continuously shape the overall mindset. One technique that a lot of athletes use is *self-talk*, which will be explained later. (Karageorghis, 2010)

4. **Imagery Experiences-** If an athlete can visualise winning, their stress level goes down and their confidence goes up. Many athletes undergo *visualisation* training, a technique in which the athlete visualizes the successful completion of an action. Visualisation will also be explained more later on. (Karageorghis, 2010).

5. **Physiological States-** Being in shape not only improves physical performance but also instills confidence. Athletes are all highly cognizant of the physiological state that they are in. Being injured or unfit can alter the way the athlete performs. Going into a competition physiologically hampered can negatively impact confidence. It is also common that the athlete can be overwhelmed by a situation. Physiological states that can negatively impact confidence are tight

muscles, “butterflies” in the stomach, and an increased rate of breathing. (Karageorghis, 2010).

6. **Emotional States-** Emotional states are regarded as emotions that are induced by competition. Nervousness, anxiety, excitement, etc, are all examples of emotional states. These emotions can both be positive and negative. Positive emotions can include motivation, determination, and enjoyment. A critical part of an athlete's success is their ability to control these emotions. (Karageorghis, 2010). Confidence-building should start before the competition. Athletes should be confident right when they step out onto the playing field. The start of a competition can set the mood for the rest of the match. Even if an athlete starts out performing badly, projecting confidence is important as a message to oneself as well as to the opponent.

**Self-Talk and Body Language.** As stated above, the many comments that athletes mutter to themselves can have a big impact on their performance. And whether athletes realise it or not, they are adding a large amount of stress by using negative self-talk during practice and during competition. Constantly saying positive things about an athlete's ability will reaffirm that they

can perform. There are four different kinds of self-talk: positive, negative, instructional, and neutral. A study done by Antonis Hatzigeorgiadis, Nikos Zourbanos, Evangelos Galanis, & Yiannis Theodorakis (2011) concludes that “self-talk strategies can make a valuable contribution to skill acquisition, learning, and task performance enhancement in sport. Furthermore, examination of potential moderators revealed that the effectiveness of self-talk strategies may vary depending on the appropriate matching of task and type of self-talk, on task novelty, and on the implementation of training in self-talk interventions.” So, according to the results of this meta-analysis, positive self-talk is helpful in many aspects of sports performance. Another study done by Hatzigeorgiadis, Zourbanos, and Theodorakis tested motivational and instructional self-talk on water polo players. The study included a group of water polo players who were recruited for two tasks. The first task was to hit a target. The second task was to throw for distance. The study concluded that instructional self-talk increased performance in the accuracy task (first task) and motivational self-talk increased performance in the power task (second task).

In another study by Landin & Herbert (2009), college-level female tennis players were taught self-talk strategies as they tried to complete a volley task. The study showed that using self-talk to bring about cues for what the player needed to do (instructional self-talk) increased the level of volley performance. In this experiment, self-talk is being used as a learning tool to get the body to do what the mind wants (Landin & Herbert, 2001). Being able to generate positive self-talk is not as simple as it may seem. The majority of athletes actually employ negative self-talk, even if they know it is detrimental to them. Reasons for negative self-talk may be: having unrealistic expectations, having low self-confidence, or frustration at careless mistakes. It is actually pretty easy to fall into the spiral of negativity. So, practising positive self-talk is a must. Learning positive self-talk starts on the practice court. Players need to establish ways to internalise a bad outcome and vocalise it as an opportunity to improve. An example would be if a tennis player missed an easy shot and said “Only I could miss that shot,” when instead, the player should say a positive thing like, “I will focus more and make it next time. Another alternative can be giving oneself an instruction self-talk. An example using the previous situation would be for the tennis player to tell oneself, “move your feet with more intensity and you will make it next time.” Thought Stopping is a good technique that is used to replace negative with positive self-talk. Thought Stopping starts by identifying instances where negative self-talk is most likely to occur. Once those instances are recognised, the next step is to come up with a positive rephrasing of the self-talk. Finally, when the athlete catches him or herself about to say a negative phrase, the athlete will stop that negative thought process and say the positive one. Learning to constantly bring positivity into the competitive atmosphere will greatly help any athlete.

**Meditation.** World number one tennis player Novak Djokovic is known for his attention to detail during his preparations. Among his strict diet and hours spent stretching, he puts a big emphasis on meditation. So, what does meditation do for athletes? At the most basic level, meditation is a technique that is used to train the mind. During meditation, an individual will try to reach a state of consciousness to focus on what is needed. Djokovic himself says that the way he uses meditation is not to escape from everyday stressors. Meditation can help clear the mind of negative thoughts so the athlete can focus on the goal. An article by the Mind & Sport Institute talks about the benefits of meditation, claiming that athletes who meditate experience [“focus & concentration. Confidence & optimism. Optimal body mind integration, coordination, and mastery. Increased ability to enter peak awareness & slowing of time. Heightened intuition resulting in greater team cohesion & anticipation. Untapped Energy & vitality. Deepened relaxation & lasting well-being.” (Sports Mind Institute, 2015). Mind-body integration refers to when a person’s mind and body are in the same state. Peak awareness is when the athlete can pick up many details and process them without thinking. Heightening intuition results in greater team cohesion because the chemistry of the team will be better. This results in the team moving as one instinctive unit. Since meditation seems to yield many positive results, how does one go about meditation? First, it is important to understand what mindfulness means. Mindfulness (paying precise, nonjudgmental attention to the details of our experience as it arises and subsides) doesn't reject anything. Instead of struggling to get away from experiences we find difficult, we practice being able to be with them.” (Wegela, 2010).

One basic meditation method is to sit comfortably with the legs crossed. A person’s posture should be upright but not too stiff during meditation. An article by Wegela explains that the three main components of basic meditation are: body, breath, and thoughts. Therefore, it is very important to maintain an upright, yet natural posture. Breathing should be as natural as possible. It is very common for someone to worry about whether their breathing is natural or not. Just let it be. Practising mindfulness includes accepting whatever thoughts come into the mind. Mindfulness is not an escape from reality. Observe the thoughts from a non-subjective standpoint. By simply thinking and observing thoughts instead of judging them, it becomes possible to be mindful of the situation in its entirety. While basic mindfulness meditation can be helpful in sports as well, there are also specific meditation techniques that can be used for more sports-specific benefits. Dr Kristen Race, founder of Mindful Life, and an expert on brain-based mindfulness solutions, suggests meditation-based techniques to employ the morning before a competition.

**1. Mindful Breathing-** The main focus of mindful breathing is to regulate breathing so the body can enter a more relaxed state. This type of meditation is not used to think about problems. However, mindful breathing enables the mind to think clearly once it is used successfully. It is done in a comfortable sitting position. The person will then close his or her eyes, followed by inhaling and exhaling fully. It is important to focus on your breath entering and leaving your body. Start with five-minute increments. (Yu, 2014).

**2. Body Scan-** Body Scan is primarily used to bring awareness to the body in a systematic way. The process also helps quiet the mind and release tension. The person will lie on his or her back with the palms facing up. The totally relaxed position will make it easier to isolate each limb during the scan. With eyes closed, the person will then focus on each part of the body. Starting from the toes, focus all attention on the sensations that the body part is feeling. For example, notice if the toe is feeling tight or if it is hot or cold. Take time on each body part while breathing to try to release any stress on that body part. (Yu, 2014).



The study by John, Verma, and Khanna (2011) tested the effects of meditation on the Salivary Cortisol (a physiological response in reducing pre-competition stress). Ninety-six elite shooters were taught meditation techniques. The result was that levels of Salivary Cortisol had decreased, which resulted in less pre-competition stress. This resulted in the shooters performing better (John, Verma & Khanna, 2011). Meditation is not the one defining factor that could propel an athlete to guaranteed success. However, there are many benefits that athletes can glean from meditation. Stress coping is one of them.

**Rituals.** Some elite athletes are known to have quirky rituals that they must perform before competition. Rituals can range from modest, such as listening to the same song before every competition, to borderline bizarre; Michael Jordan wearing his college basketball shorts under his NBA uniform for every game. One extreme example is tennis player Rafael Nadal, who gives a whole new meaning to the word ritual. A Men's Fitness article points out that "Nadal takes a cold shower 45 minutes before every match, he towels down after every point (even for aces and double faults), he points the labels of his drinking bottles toward the end of the court he's about to play from, and he never stands up from his chair before his opponent. If you're not this neurotic, that's why you've never made it to the Wimbledon Final". So, there might be a method to this ritualistic madness. The last sentence of the quote about being neurotic directed its attention to a tennis-specific goal, but it may apply to all forms of competition. Rituals do not have to be flashy or weird. Habits are a form of rituals as well. By repeatedly enacting pre-match rituals and in-game rituals, athletes not only promote meticulousness but also consistency. While there are many rituals whose functions are clearly beneficial to athletes (such as taking deep breaths to relieve stress), there are rituals that, at first glance, seem purely superstitious. So why do so many elite athletes bother with them? An article written by Nick & Nauert (2011). states that a recent study done by David Eilam, which was published in the *Journal of Neuroscience and Biobehavioral Reviews*, talks about how "ritualistic behaviour in both humans and animals evolved as a method to induce calm and relieve stress." Dr Eilam goes on to describe free-throw shooting in basketball. He explains it as "The routine they perform in the moments before shooting the ball is a method to focus their full concentration and control their actions," and continues by saying, "It's also an essential part of sports psychology. If players feel that completing their repetitive actions will enhance their performance, they tend to be more successful, whether it is locker room antics or LeBron James' pre-game chalk toss." (Nauert, 2011) Regardless of whether the ritual directly affects the outcome of the next action, if the athlete can believe that the ritual will contribute to his or her success, there might be a placebo effect in boosting performance. By having a routine, people bring in an aspect of the situation that they can control. A ritual brings familiarity into an uncertain situation. Performing a familiar action can act as a stimulus to help remind the body that it has executed the following action countless times before. Because of the familiarity of a ritual, it can lower stress levels as well. Meticulously performing a ritual shows the athlete's will to succeed. It shows that they care. Rituals are tailored to each individual. There are no set guidelines for what a ritual should entail. Even though rituals are in the preparation section, rituals are versatile enough that they can be used in any situation the athlete has time.

**Goal Setting.** The type of goals set forth by an athlete is actually very important to an athlete's development. Setting the wrong type of goals can also cause undue stress to an athlete. Athletes must also be careful to set goals that are independent of other people's expectations. If they aren't meeting your expectations, they are adding extra pressure to you. In his book *Fundamentals of Sports and Exercise Psychology*, Alan Kornspan defines different types of goals.

1. **Subjective Goals** are not based on any measurable performances. A subjective goal might be for an athlete to try his or her best. Another example is for an athlete to never give up (Kornspan, 2009).
2. **Objective Goals** are based on performance results. "For example, an objective goal of decreasing time by 2 seconds in the 50-meter freestyle event is focused on what needs to be done to become more successful at a specific sport. This specific objective goal would then help the athlete be more focused on the task at hand to improve technical and tactical skills," (Kornspan, 2009).
3. **Outcome Goals** are based on the results of the competition. Usually, the goal is to win a certain amount during competition. It is good for the athlete to know how much he or she is expected to win; however, outcome goals can potentially deter the player from performing his or her best. If a player is looking at a goal that is too far away, he or she will not be able to focus on the moment (Kornspan, 2009).
4. **Performance Goals** are goals that focus on a certain aspect of the sport but will also aid in the overall outcome. Examples are: raising the first serve percentage in tennis from thirty to forty percent, shooting a higher percentage of open shots from beyond the arc in basketball, or completing a higher percentage of long passes in football (Kornspan, 2009).
5. **Process Goals** are related to performance goals in the sense that both are more focused on one aspect of the game. The example that Kornspan gives is "in addition to setting a performance goal of increasing the number of greens hit in regulation by 10 per cent, a golfer may also set a goal to go through the same routine before every shot" (Kornspan, 2009). Goal setting is not as simple as picking an activity and deciding that you want to be good at it. For competitive athletes, there are specific approaches to goal setting that can maximise an athlete's potential. The consensus among experts is that it is better to set process and performance goals rather than outcome goals. While it is okay for an athlete to know where they want to end up, outcome goals do not gauge performance.

Only having an outcome goal, such as winning a national title, does not guarantee achieving it. There is also no way to tell if the athlete is on the way to fulfilling a long-term outcome goal. It is also possible that the outcome is an inaccurate placeholder of skill. Performance and process goals are more accurate in determining if an athlete has improved in skill level. Because performance and process goals are more specific than outcome goals, it is within the athlete's ability to control them. The athlete can then see visible improvement step by step. For example, if a basketball team's goal is to work on their passing, setting the process goal of passing three times per possession will help them work on it and improve as a team. If the outcome goal was just to win, many factors could skew the outcome. First, the team could have had a good passing day, but the other

team played better defense, and the team lost the game. In another scenario, the team could have passed horribly, but their opponent was much weaker, so they won anyway. In the first scenario, the team accomplishes the passing goal, but it will have a negative effect if they are too concentrated on winning. The only takeaway the team might have from the game is that they lost; instead of realizing that they can build off of the good passing. In the second scenario, the team is rewarded with a win even though they played poorly. The loss in the first scenario punishes good behaviour, while the win in the second scenario enforces bad behaviour. Focusing too much on outcome goals also puts the athlete at risk of not making use of their full potential. In tennis, many parents and children emphasise winning at too young an age. The result is that kids (ages 8-14) are very successful early on, but the game that they developed to beat younger kids no longer works once everyone gets bigger and stronger. Process goals develop skills that will be useful once the athlete has matured. One of the most important roles of process and performance goal setting is that it relieves pressure from the athlete. Winning is dependent on many uncertain factors. Athletes can perform much better if they focus on the things they can do to improve their chances of winning instead of the result. The athlete will see his or her goals as something within control. The result is lessened anxiety about the uncertainty of winning. Focusing on the process will also help an athlete block out external stressors not related to the competition.

#### **Do different sports have stress coping techniques?**

In every single sport, it is important to be mentally tough. The response to this has been many techniques researched by sports psychologists to deal with the stress that happens during competition. However, it still isn't set in stone that every sport should be approached from the same mental standpoint. In a study cited earlier by Hatzigeorgiadis, Zourbanos, & Theodorakis (2004). The effects of positive self-talk were tested on water polo players. It was found that different types of self-talk yielded different effects depending on the type of task. The water polo players who were trying to throw for distance were more positively affected by motivational self-talk than instructional self-talk. The group that was trying to throw for accuracy was more positively affected by instructional self-talk. In this example, there were two kinds of actions: power and precision. There are also other factors in other sports, such as reaction time or stamina. Some skills require a mixture of factors. (Example: Serving in tennis requires both accuracy and power.) Just going by this study, there is a very high chance that different methods of stress coping suit different sports. Many variables can go into deciding which stress coping technique works best. One example can be preparing for a sprint. Is using a ritual like listening to pump up music any different from meditating to loosen up the muscles? While both might relieve some stress, it seems unproductive to use meditation when a sprinter wants his or her body to be on edge. Incorporating these future topics of research will be really important to preventing athletes from falling into habits that might potentially hurt their performance. All of the stress coping techniques are helpful, but only if applied correctly.

#### **Do different personality types benefit from different coping techniques?**

Every athlete has a set of skills that uniquely defines his or her "playing style." It is important to master the fundamentals, but at the same time, many top athletes approach the sport with distinctive winning strategies. There are playing styles that are more suited for some people; people with different personality types may benefit more from different stress coping techniques. Different personality types respond to stress differently in daily social life. It is not only important to research which instances in competition are best to use certain stress coping techniques, but also which personality types they benefit. This research could lead to more athletes being able to integrate stress coping techniques into their games because they could be matched with the stress coping techniques that are more natural for them. In matching stress coping techniques to an athlete's personality type, there is the potential for new stress coping techniques to be found as sports psychologists explore different ways to accommodate the different personalities.

#### **Conclusion**

Sports psychology is becoming an increasingly acknowledged field for boosting the capabilities of athletic performance through training the mind. Stress, which is a critical component in competition, can either push athletes to grow or cause them to perform below their capabilities. Through studies and the research of the most elite athletes, learning stress coping techniques, whether they are pre-match, during a match, or post-match, is critical. What matters is not the athlete's overall performance, but the level of the athlete during the most crucial points in competition. Through methods such as adequate preparation, meditation, rituals, positive self-talk, confidence building, goal setting, and more techniques that might not have been discovered yet, athletes can increase the likelihood of performing well. Because of the positive results of stress coping techniques, further research should be done so that, in the future, there will be a systematic training system that incorporates mental toughness training for young athletes. Studies should also be done to determine whether stress coping techniques can be used for all sports in the same manner. Different coping techniques might work better for different sports. Determining if different coping techniques will be better suited to different personalities is important as well. Just because all of the techniques are proven to relieve stress, it doesn't mean that the process of using these techniques will not affect each athlete differently. Allowing young athletes to incorporate these techniques more seamlessly into their sports routines will produce a generation of athletes who can remain calm in critical situations because of the stress-coping techniques that were practised from a young age.

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## EVALUATING THE SOCIOECONOMIC BENEFITS OF COMMUNITY-BASED GREEN ENERGY PROJECTS IN ZARIA METROPOLIS: IMPLICATIONS FOR SUSTAINABLE LIVELIHOODS FOR PUBLIC HEALTH EQUITY

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### Abstract

This study evaluates the socioeconomic benefits of community-based green energy projects in Zaria Metropolis and their implications for sustainable livelihoods and public health equity. A correlational research design was adopted, targeting a population of 300 households across selected communities, from which 295 respondents were sampled using a stratified random technique. A structured questionnaire served as the main instrument, while data were analysed with descriptive statistics and Pearson Product-Moment Correlation. Findings revealed strong and significant positive relationships between green energy access ( $r = 0.652$ ), socioeconomic participation and employment ( $r = 0.490$ ), and infrastructure-driven health access ( $r = 0.653$ ) with sustainable livelihoods, all at  $p = 0.000$ . These results confirm that community-based renewable energy projects enhance income generation, employment opportunities, and health service delivery. The study concludes that decentralised green energy promotes public health equity and sustainable development, recommending community engagement, policy support, vocational training, and strategic investment for maximum impact.

**Keyword:** Sustainable health equity, energy access, socioeconomic, Infrastructure- health access

### Introduction

Globally, renewable energy deployment has shown significant socio-economic potential, especially in developed and emerging economies. Countries such as Germany, China, and Brazil have witnessed large-scale job creation, GDP growth, and improved environmental and health outcomes from transitioning to renewables (Okedele et al., 2024; Nazarov et al., 2024). IRENA (2017a) estimated that meeting global renewable targets under the Paris Agreement could yield a cumulative economic gain of USD 19 trillion by 2050, driven by strong policy frameworks, reliable infrastructure, and investments in energy efficiency and innovation. By contrast, many developing nations, particularly in sub-Saharan Africa, face barriers in realising similar outcomes (Agoundedemba et al., 2023; Zickafoose et al., 2024). In Zaria Metropolis, Nigeria, community-based renewable energy projects such as solar mini-grids and biogas systems are often underfunded and underutilised (Isma'il, 2016). While these initiatives could transform livelihoods, health, and education, weak infrastructure, low community participation, and limited fiscal incentives hinder progress. Unlike in high-income countries, renewable energy in Nigeria often substitutes unreliable grid electricity rather than driving economic diversification and job creation. Organizations like Renewables in Africa (RiA) illustrate how targeted renewable projects in Kenya and Nigeria improved household incomes and women's entrepreneurship through rural solar mini-grids (RiA, 2025). However, the scale and institutional support differ widely from Western contexts. Romero-Lankao et al. (2023) stress that renewable adoption requires not only technology but also equity, participation, and trust. Their findings show that inclusive, community-driven planning—common in Western transitions—is often missing in Nigerian projects, which are largely top-down and donor-driven. Thus, while evidence confirms renewable energy's socio-economic benefits, achieving them in Zaria requires localised engagement, policy alignment, and community capacity building.

Sustainable livelihoods and public health equity refer to the long-term ability of individuals and communities to generate income, access essential services, and secure equitable health outcomes regardless of location or status. Chambers and Conway (1992) defined livelihoods as the capabilities, assets, and activities needed to sustain living while recovering from shocks. Later interpretations emphasised systems-thinking, considering dynamic interactions among economic, social, and ecological components that enable or constrain resilience (Serrat, 2017). Contemporary approaches also integrate participatory and rights-based perspectives, aligning with global sustainability and equity agendas. In Zaria, this includes reliable energy for income-generating activities, access to clean water, and health facilities powered by renewables. Public health equity focuses on fair distribution of health resources, reducing disparities linked to geography or wealth (Braveman et al., 2011). Together, these dimensions form a lens for assessing community well-being in both economic opportunity and health fairness. This study argues that green energy, if implemented through inclusive community-based models, can strengthen energy access, socioeconomic participation, and health infrastructure.

Community-based green energy access involves localised deployment and socially embedded management of systems such as solar mini-grids, solar-powered boreholes, and electrified health centres, tailored to underserved populations. Unlike

centralised utility models, these solutions are user-focused, affordable, and participatory (Adamu et al., 2020). In Zaria, where public power supply is unreliable, they are essential. Pearce (2020) notes that such systems stimulate local economies, reduce dependence on harmful fuels, and enhance resilience through community ownership. Examples from Toto and Petti demonstrate how integrating mini-grids with productive use of energy (PUE) activities improves rural mobility and economic outcomes (Golden et al., 2023). The IEA (2021) estimates that mini-grids may account for up to 40% of future electrification in sub-Saharan Africa. Initiatives by AECF and ENEA Consulting (2022) emphasise public-private partnerships, innovative financing, and enabling policies to sustain mini-grids. Beyond infrastructure, these systems foster inclusive development, gender empowerment, and decentralised governance. Socioeconomic participation and employment refer to opportunities for households to engage in income generation, vocational training, or jobs linked to renewable energy. As the sector grows, it demands technical and entrepreneurial skills, creating roles for technicians, installers, and entrepreneurs. In Nigeria, green energy projects have stimulated informal cooperatives and women-led enterprises in solar boreholes and clean cookstoves (Ikwuoma et al., 2024). These boost incomes while encouraging gender-inclusive participation.

Oyedepo and Babalola (2016) argue that decentralised renewable systems in rural areas reduce energy poverty, lower youth unemployment, and foster community stability. Capacity-building initiatives further enhance long-term resilience, reinforcing household investments in health and education. Thus, socioeconomic integration of renewables transforms livelihoods while promoting equity. Infrastructure-driven health **access** highlights how renewable energy enables continuous operation of healthcare systems, including vaccine cold chains, delivery room lighting, sterilisation, and digital platforms. Akorede et al. (2022) and Isma'il (2016) showed that solar-powered clinics improved maternal health outcomes in peri-urban Nigeria by ensuring lighting and refrigeration. In Zaria, many clinics use solar systems for electricity and water supply, reducing disease spread and easing burdens on women and children (Alfa & Ahmadu, 2021). Maccido (2014) emphasised that health underpins productivity, reinforcing the need for resilient systems. Supporting healthcare professionals with sustainable energy magnifies their community impact. Globally, solar energy is increasingly deployed for health services. Soto et al. (2024) found that solar infrastructure in developing nations addresses operational and economic barriers while improving care delivery. However, challenges such as limited technical expertise remain. International collaborations like UNICEF's Solar for Health, active in over 80 countries, demonstrate how partnerships can scale solutions (Sharma et al., 2024). While Nigeria often relies on community or NGO initiatives, global platforms can institutionalise solar health programs. From vaccine storage to safe deliveries, solar systems improve efficiency, equity, and reliability in healthcare.

Together, community-based energy access, socioeconomic participation, and infrastructure-driven health access interact to strengthen livelihoods and reduce disparities. Energy access provides foundational services; employment ensures economic empowerment; and health infrastructure delivers equitable well-being. Empowered communities managing renewable energy systems become more resilient, inclusive, and sustainable (UNDP, 2021). This study contributes to debates on energy justice and climate-resilient health systems by examining how decentralised renewable energy intersects with health and economic well-being in Zaria Metropolis.

### **Statement of the Problem**

Zaria Metropolis, once known for its vibrant agricultural economy, educational institutions, and artisan livelihoods, thrived on a balanced ecosystem supported by stable environmental conditions and modest but functional infrastructure. Communities relied on traditional energy sources and limited grid electricity to sustain households, businesses, and public services like health and education. This fragile balance enabled predictable livelihoods, low energy dependency, and shared access to services. Over the past two decades, however, Zaria has faced severe environmental and infrastructural decline. Rapid urbanisation, population growth, and unreliable electricity have strained energy and health systems. Many households now depend on diesel generators and wood fuels, worsening pollution and health risks. Healthcare centres struggle with erratic power, undermining vaccine storage, emergency services, and general care. At the same time, lack of energy access and technological empowerment has deepened unemployment and inequality, particularly for women, youth, and rural dwellers. Despite Zaria's vast solar potential, community-based renewable energy initiatives remain limited. Projects such as solar mini-grids and biogas systems are underfunded, poorly integrated into local development, and hindered by weak socioeconomic participation, minimal employment links to green sectors, and inadequate energy infrastructure for health services. Consequently, the transformative potential of green energy for livelihoods and health equity remains untapped. This study addresses these overlapping challenges by examining how renewable energy initiatives can promote sustainable livelihoods and public health equity. It emphasises the need for inclusive, climate-resilient strategies that extend beyond power provision to empower communities economically, improve health outcomes, and provide replicable models for Northern Nigeria and beyond.

### **Research Questions**

The study is guided by the following research questions:

- i. What is the relationship between Community-based green energy access on sustainable livelihoods and public health equity in Zaria Metropolis?
- ii. What is the relationship between socioeconomic participation and employment, sustainable livelihoods, and public health equity in Zaria Metropolis?
- iii. What is the relationship between Infrastructure-driven health access and sustainable livelihoods and public health equity in Zaria Metropolis?

### **Objectives of the Study**

The main objective of this study is to evaluate the Socioeconomic Benefits of Community-Based Green Energy Projects in Zaria Metropolis: Implications for Sustainable Livelihoods and Public Health Equity. While the specific objectives are:

- i. To examine the relationship between Community-based green energy access and sustainable livelihoods and public health equity in Zaria Metropolis.
- ii. To investigate the relationship between socioeconomic participation and employment and sustainable livelihoods, and public health equity in Zaria Metropolis.
- iii. To determine the relationship between Infrastructure-driven health access and sustainable livelihoods and public health equity in Zaria Metropolis.

**Research Hypotheses**

The following null hypotheses were formulated to guide the study:

- i. There is no significant relationship between Community-based green energy access and sustainable livelihoods and public health equity in Zaria Metropolis.
- ii. There is no significant relationship between socioeconomic participation and employment and sustainable livelihoods, and public health equity in Zaria Metropolis.
- iii. There is no significant relationship between Infrastructure-driven health access and sustainable livelihoods and public health equity in Zaria Metropolis.

**Methodology**

This study adopted a descriptive survey research design to examine the socioeconomic benefits of community-based green energy projects in Zaria Metropolis and their implications for sustainable livelihoods and public health equity. The design enabled the collection of quantitative data on community access to green energy, participation in renewable energy-related activities, and access to health-supporting infrastructure powered by renewables. The target population comprised 300 households and stakeholders, including household heads, small business owners, health workers, and energy beneficiaries across wards where solar mini-grids, solar-powered boreholes, and health facility electrification had been implemented or proposed. A multi-stage stratified random sampling technique was employed to ensure fair representation across zones. From each of the 10 stratified wards, 30 respondents were randomly selected, giving a total of 300 participants. Of the questionnaires administered, 294 were properly filled out and returned, yielding a 98% response rate. The main instrument was a researcher-designed questionnaire titled *Evaluating the Socioeconomic Impact of Community-Based Renewable Energy Projects on Livelihoods and Health Equity in Zaria Metropolis*. It consisted of four sections—Green Energy Access, Socioeconomic Participation and Employment, Infrastructure-Driven Health Access, and Sustainable Livelihoods and Health Equity—each with five items measured on a 4-point Likert scale. Validity was ensured through expert review by professionals in Environmental Economics, Public Health, and Renewable Energy Policy from the Federal University of Education, Zaria. A pilot test with 30 respondents outside the sample frame produced a Cronbach’s Alpha reliability coefficient of 0.872, confirming strong internal consistency. Ethical compliance was observed through consultations with community leaders, informed consent, and respondent anonymity, with a research assistant supporting completion where necessary. Data were analysed using descriptive and inferential statistics: frequencies and percentages for demographics, means and standard deviations for research questions, and Pearson’s correlation to test hypotheses at the 0.05 significance level.

**Results**

**Research Question One**

**Table 1: What is the relationship between Community-based green energy access on sustainable livelihoods and public health equity in Zaria Metropolis?**

Items	Strongly Disagree	Disagree	Agree	Strongly Agree
My community has access to at least one form of green energy (e.g., solar).	33.9% 100	27.1% 80	16.9% 50	22.0% 65
Green energy systems (solar mini-grids, boreholes) meet our local needs.	16.9% 50	13.6% 40	35.6% 105	33.9% 100
I was involved in decision-making on renewable energy projects.	23.7% 70	30.5% 90	32.2% 95	13.6% 40
The community energy system is affordable and user-friendly.	30.5% 90	20.3% 60	25.4% 75	23.7% 70
Green energy access has reduced our dependence on generators.	16.9% 50	20.3% 60	32.2% 95	30.5% 90

**Field survey 2025**

Table 1 results represent the views of respondents on the relationship between community-based green energy access and sustainable livelihoods and public health equity in Zaria Metropolis. On the first item, 33.9% (100) of respondents strongly disagreed and 27.1% (80) disagreed that their communities had access to at least one form of green energy, while 16.9% (50) agreed and 22.0% (65) strongly agreed, indicating that although some communities benefit, access is still uneven. Building on this, responses to the second item show a more positive trend, as 35.6% (105) agreed and 33.9% (100) strongly agreed that green energy systems such as solar mini-grids and boreholes meet their local needs, compared to 16.9% (50) who strongly disagreed and 13.6% (40) who disagreed, suggesting these systems have a tangible impact on livelihoods. However, when asked about involvement in decision-making, 23.7% (70) strongly disagreed and 30.5% (90) disagreed, while 32.2% (95) agreed and only 13.6% (40) strongly agreed, showing limited participation of community members in project planning. In terms of affordability and usability, 30.5% (90) strongly disagreed and 20.3% (60) disagreed that the energy systems are affordable and user-friendly, while 25.4% (75) agreed and 23.7% (70) strongly agreed, reflecting mixed experiences across

households. Finally, responses to the fifth item revealed that 32.2% (95) agreed and 30.5% (90) strongly agreed that green energy access has reduced their dependence on generators, whereas 16.9% (50) strongly disagreed and 20.3% (60) disagreed, emphasising noticeable though not universal improvements. The results demonstrate that community-based green energy initiatives in Zaria Metropolis positively contribute to sustainable livelihoods and public health equity, particularly through meeting local needs and reducing reliance on generators; however, challenges of equitable access, affordability, and community involvement in decision-making remain critical areas requiring policy and implementation attention.

**Research Question Two**

**Table 2: What is the relationship between socioeconomic participation and employment, and sustainable livelihoods and public health equity in Zaria Metropolis?**

Items	Strongly Disagree	Disagree	Agree	Strongly Agree
Green energy projects have created job opportunities in my community.	50 16.9%	70 23.7%	80 27.1%	95 32.2%
I or someone I know is earning income through solar energy-related work.	70 23.7%	95 32.2%	75 25.4%	55 18.6%
Access to green energy has enhanced my ability to run a business.	60 20.3%	70 23.7%	85 28.8%	80 27.1%
Youth and women are involved in green energy jobs in this area.	50 16.9%	55 18.6%	90 30.5%	100 33.9%
Skills training related to renewable energy is available in my area.	45 15.0%	65 21.7%	85 28.3%	105 35.0%

**Field survey 2025**

Table 2 results represent respondents’ views on the relationship between socio-economic participation, employment, and sustainable livelihoods and public health equity in Zaria Metropolis. On the first item, 16.9% (50) strongly disagreed and 23.7% (70) disagreed that green energy projects had created job opportunities, while 27.1% (80) agreed and 32.2% (95) strongly agreed, suggesting that such projects are already providing noticeable employment opportunities in some communities. Item two shows weaker outcomes in direct income generation, as 23.7% (70) strongly disagreed and 32.2% (95) disagreed that they or someone they knew earned income through solar-related work, compared with 25.4% (75) who agreed and only 18.6% (55) who strongly agreed, pointing to limited but emerging economic benefits. Furthermore, on whether green energy access has enhanced respondents’ ability to run a business, 20.3% (60) strongly disagreed and 23.7% (70) disagreed, while 28.8% (85) agreed and 27.1% (80) strongly agreed, reflecting that access contributes to business operations, though benefits are not evenly spread. Turning to inclusiveness, 16.9% (50) strongly disagreed and 18.6% (55) disagreed that youth and women were involved in green energy jobs, whereas 30.5% (90) agreed and 33.9% (100) strongly agreed, indicating growing but not universal participation of marginalised groups. Finally, skills training availability showed more positive responses, with 28.3% (85) agreeing and 35.0% (105) strongly agreeing, compared with 15.0% (45) strongly disagreeing and 21.7% (65) disagreeing, highlighting expanding but still uneven training opportunities. Green energy projects in Zaria Metropolis are generating employment, supporting business growth, and increasingly involving youth and women, gaps remain in income generation and equitable access to skills training. Strengthening training programs and broadening participation could enhance the long-term contribution of green energy to sustainable livelihoods and public health equity.

**Research Question Three**

**Table 3: What is the relationship between Infrastructure-driven health access and sustainable livelihoods and public health equity in Zaria Metropolis?**

Items	Strongly Disagree	Disagree	Agree	Strongly Agree
Solar power is used in our local health centre or clinic..	95 32.2%	100 33.9%	35 11.9%	65 22.0%
Healthcare delivery has improved due to a consistent power supply.	55 18.6%	40 13.3%	90 30.5%	110 37.3%
There is solar-powered water or sanitation infrastructure in use.	100 33.9%	90 30.5%	45 15.3%	60 20.3%
Health workers can now store vaccines reliably due to solar power.	90 30.5%	105 35.6%	20 6.8%	80 27.1%
Access to renewable-powered health services has reduced travel time.	70 23.5%	95 32.2%	80 27.1%	50 16.9%

**Field survey 2025**

Table 3 results represent respondents’ perceptions of the relationship between infrastructure-driven health access and sustainable livelihoods and public health equity in Zaria Metropolis. On the first item, 32.2% (95) strongly disagreed and 33.9% (100) disagreed that solar power is used in their local health centres or clinics, while only 11.9% (35) agreed and 22.0% (65) strongly agreed, indicating that solar power adoption in healthcare facilities is still limited across the metropolis. Item two, 18.6% (55) strongly disagreed and 13.6% (40) disagreed that healthcare delivery had improved due to consistent power supply, whereas 30.5% (90) agreed and 37.3% (110) strongly agreed, reflecting that in locations where solar power is operational, healthcare delivery has indeed improved, item three reveal that 33.9% (100) strongly disagreed and 30.5% (90) disagreed that solar-powered water or sanitation infrastructure is in use, while 15.3% (45) agreed and 20.3% (60) strongly



agreed, suggesting a shortage of renewable-powered sanitation facilities in many communities. Similarly, 30.5% (90) strongly disagreed and 35.6% (105) disagreed that health workers could now store vaccines reliably due to solar power, with only 6.8% (20) agreeing and 27.1% (80) strongly agreeing, indicating inconsistent access to reliable solar-powered cold chain facilities. Finally, on the fifth item, 23.7% (70) strongly disagreed and 32.2% (95) disagreed that renewable-powered health services reduced travel time, compared with 27.1% (80) agreeing and 16.9% (50) strongly agreeing, reflecting uneven distribution of such services across communities. The findings highlight that while renewable energy infrastructure has improved healthcare delivery in some areas of Zaria Metropolis, its adoption in clinics, sanitation systems, and vaccine storage remains inconsistent, thereby limiting its full potential to reduce travel time and advance public health equity. Strengthening investment and expanding equitable deployment of solar-powered health infrastructure could significantly enhance sustainable livelihoods and health outcomes.

**Hypotheses Testing**

**Hypothesis One**

**H<sub>01</sub>:** There is no significant relationship between Community-based green energy access and sustainable livelihoods for public health equity in Zaria Metropolis.

**Table 4: Descriptive analysis and Pearson Correlation between Green Energy Access and Sustainable Livelihoods**

Variables	N	Mean	SD	r	p-value	Remark
Green Energy Access	295	2.86	1.65	.652	0.000	Significant
Sustainable Livelihoods	295	2.44	1.02			

Table 4 results represent the relationship between community-based green energy access and sustainable livelihoods for public health equity in Zaria Metropolis. The mean scores for green energy access (M = 2.86, SD = 1.65) and sustainable livelihoods (M = 2.44, SD = 1.02) indicate moderate levels of both variables among respondents. The Pearson correlation coefficient (r = .652, p = 0.000) shows a strong, positive, and statistically significant relationship between the two variables at the 0.05 level. This implies that improved community-based access to green energy significantly enhances sustainable livelihoods and supports public health equity in Zaria Metropolis. Thus, the null hypothesis is rejected.

**Hypothesis Two**

There is no significant relationship between socioeconomic participation and employment for sustainable livelihoods for public health equity in Zaria Metropolis.

**Table 5: Descriptive analysis and Pearson Correlation between Socio-economic participation and employment and sustainable livelihoods for public health equity in Zaria Metropolis.**

Variables	N	Mean	SD	r	p-value	Remark
Socio-Economic Participation	294	3.0475	1.46	.490	0.00	Significant
Sustainable Livelihoods	294	2.44	1.02			

Table 5 results represent the relationship between socio-economic participation and employment and sustainable livelihoods for public health equity in Zaria Metropolis. The mean score for socio-economic participation (M = 3.05, SD = 1.46) indicates a relatively high level of involvement, while sustainable livelihoods recorded a moderate mean (M = 2.44, SD = 1.02). The Pearson correlation coefficient (r = .490, p = 0.00) reveals a moderate, positive, and statistically significant relationship between the two variables at the 0.05 level. This suggests that increased socio-economic participation and employment through green energy initiatives contribute meaningfully to sustainable livelihoods and public health equity. Therefore, the null hypothesis is rejected.

**Hypothesis three**

There is no significant relationship between Infrastructure-driven health access and sustainable livelihoods for public health equity in Zaria Metropolis.

**Table 6: Descriptive analysis and Pearson Correlation between Infrastructure-driven health access and sustainable livelihoods for public health equity in Zaria Metropolis.**

Variables	N	Mean	SD	r	p-value	Remark
Infrastructure-driven health access	295	3.7581	1.216	.653	0.000	Significant
Sustainable Livelihoods	295	3.76	1.23			

Table 6 results represent the relationship between infrastructure-driven health access and sustainable livelihoods for public health equity in Zaria Metropolis. The mean score for infrastructure-driven health access (M = 3.76, SD = 1.22) and sustainable livelihoods (M = 3.76, SD = 1.23) both reflect a high level of agreement among respondents on the positive impact of renewable-powered health services. The Pearson correlation coefficient (r = .653, p = 0.000) shows a strong, positive, and statistically significant relationship between the two variables at the 0.05 level. This indicates that improved renewable-powered health infrastructure enhances sustainable livelihoods and health equity. Thus, the null hypothesis is rejected.



## Discussion

The findings from the three hypotheses collectively underscore the critical role of community-based renewable energy systems in enhancing sustainable livelihoods and promoting public health equity in Zaria Metropolis. The first hypothesis revealed a strong and statistically significant positive relationship between green energy access and sustainable livelihoods ( $r = 0.652$ ,  $p = 0.000$ ,  $df = 294$ ), supporting the view that decentralised energy systems such as solar mini-grids and boreholes empower communities economically and socially (Adamu et al., 2020; Pearce, 2020). The second hypothesis confirmed a moderate but significant correlation between socioeconomic participation and employment and sustainable livelihoods ( $r = 0.490$ ,  $p = 0.000$ ,  $df = 245$ ), aligning with research showing that renewable energy projects facilitate local job creation, entrepreneurship, and vocational training, especially among marginalised groups (Ikwooma et al., 2024; Oyedepo & Babalola, 2016). The third hypothesis showed the strongest relationship, with a significant correlation between infrastructure-driven health access and sustainable livelihoods ( $r = 0.653$ ,  $p = 0.000$ ,  $df = 294$ ), affirming the role of solar-powered healthcare infrastructure in improving health service delivery, reducing health disparities, and strengthening the resilience of public health systems (Alfa & Ahmadu, 2021; Sharma et al., 2024). Together, these findings validate the central argument that renewable energy, when implemented through inclusive, community-driven models, can significantly transform livelihoods and health outcomes (Romero-Lankao et al., 2023; UNDP, 2021). Remarkably, the consistent statistical significance across all three relationships demonstrates that community-based renewable energy access is not only an environmental imperative but also a foundational driver of socioeconomic empowerment and health equity in developing urban centres like Zaria.

## Conclusion

This study demonstrates that community-based renewable energy systems significantly contribute to sustainable livelihoods and public health equity in Zaria Metropolis. Strong positive correlations were observed between green energy access ( $r = 0.652$ ), socioeconomic participation ( $r = 0.490$ ), and infrastructure-driven health access ( $r = 0.653$ ) with sustainable livelihood outcomes, all at a high level of statistical significance ( $p = 0.000$ ). These results confirm that decentralised renewable energy systems support income generation, improve healthcare access, and reduce social disparities. The findings align with global research highlighting the transformative power of renewables when guided by inclusive, locally driven models (Pearce, 2020; Sharma et al., 2024). Moreover, the evidence reinforces the importance of linking energy interventions with livelihood and health goals to maximise impact in low-resource urban settings. Thus, community-centred renewable energy initiatives should be prioritised as a strategic tool for achieving equitable and sustainable development in Nigeria.

## Recommendations

1. Policymakers and stakeholders should promote participatory planning in energy projects to align technologies with local needs and ensure ownership and sustainability.
2. Programs should integrate skill development to increase local capacity in installing, maintaining, and managing renewable systems, especially for youth and women.
3. Solar technologies should be prioritised for primary health centres to ensure continuous service delivery, particularly in off-grid areas.
4. Governments and development partners should establish innovative funding mechanisms, such as public-private partnerships, to scale community-based energy.
5. National and local policies must be harmonised to support decentralised energy deployment through incentives, subsidies, and regulatory frameworks (UNDP, 2021).
6. Regular assessments should be conducted to track the socioeconomic and health outcomes of renewable projects and inform evidence-based adjustments.

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## ANALYTICAL STUDY OF THE TEACHINGS OF ISLAM AND CHRISTIANITY ON OPEN DEFECATION AND ITS IMPLICATIONS TO HUMAN HEALTH AND SOCIETY

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### Abstract

Open defecation (OD) remains a major global public health and environmental challenge, imposing significant social, economic, and health burdens on communities worldwide. Despite advances in sanitation infrastructure, millions of people still practice OD, resulting in the spread of diarrheal diseases, stunting in children, helminth infections, and environmental contamination. The research problem addressed in this paper is the persistence of OD despite clear religious injunctions in Islam and Christianity that emphasize cleanliness, privacy, and the prevention of harm. The objective of this paper is to analyze the teachings of Islam and Christianity on sanitation and environmental stewardship, and to integrate them with contemporary public-health evidence in order to provide faith-informed strategies for eliminating OD. The significance of this study lies in its contribution to both religious scholarship and public-health interventions. By drawing on Qur’anic injunctions (e.g., Qur’an 2:222) and Biblical teachings (e.g., Deuteronomy 23:12–14), as well as prophetic and Christian ethical principles, the study demonstrates how religious values can reinforce scientific efforts toward improved sanitation and societal well-being. Findings indicate, first, that both Islam and Christianity strongly align with modern sanitation principles by promoting cleanliness, privacy, and harm-prevention. Second, faith leaders play a crucial role in influencing community behavior, making religious engagement essential for effective sanitation campaigns. In conclusion, integrating religious teachings with public-health strategies can accelerate the elimination of OD by shaping community norms, enhancing compliance, and fostering holistic well-being. Recommendations include, first, that religious leaders incorporate sanitation messages into sermons and community outreach, thereby linking faith with practical hygiene practices. Second, policymakers and development partners should partner with faith-based institutions to design community-owned sanitation programs that are culturally sensitive and sustainable.

**Keywords:** Open defecation; Sanitation; Islam; Christianity; Public health

### Introduction

Open defecation (OD) is defined as the disposal of human feces in fields, forests, water bodies, or other open spaces rather than in improved sanitation facilities (WHO/UNICEF, 2023). Despite being recognized as a basic human rights and development challenge, it remains a widespread practice, especially in many low- and middle-income countries where access to safe water and sanitation is limited. OD is more than just an issue of infrastructure—it represents a multifaceted public health and social concern. It contributes substantially to fecal–oral disease transmission, including diarrhea, cholera, typhoid, and soil-transmitted helminth infections, which continue to account for significant morbidity and mortality, especially among children under five years of age (Abdulbaqi et al., 2019; Akorede et al., 2023; Prüss-Ustün et al., 2014). Beyond health, OD undermines human dignity, contaminates the environment, reduces productivity, and perpetuates cycles of poverty (Amin et al., 2024; Hutton, 2015).

Religions, long before the advent of modern science and public health, established norms related to cleanliness, privacy, and communal well-being. Both Islam and Christianity emphasize human responsibility toward self-care, social responsibility, and environmental stewardship. In Islam, purity (*tahārah*) is not only a prerequisite for worship but also a moral and social duty. The Qur’an praises those “who purify themselves” (*Qur’an* 2:222) and commands the removal of impurities from one’s body and environment (*Qur’an* 74:4; 9:108). Prophetic traditions (hadith) also emphasize that relieving oneself should be done in private, away from paths, water sources, and shaded areas, thereby directly discouraging practices akin to open defecation. The Islamic legal maxim *lā ḍarar wa lā ḍirār* (no harming and no reciprocating harm) further reinforces the prohibition of behaviors that endanger human health and society.

Similarly, Christianity grounds sanitation practices in the ethic of love and stewardship. In the Old Testament, explicit instructions were given to the Israelites to designate a place outside the camp for waste disposal and to cover excreta (Deuteronomy 23:12–14). These teachings highlight the link between sanitation, holiness, and communal health. In the New Testament, the command to “love your neighbor as yourself” (Mark 12:31) and the principle that the body is the “temple of the Holy Spirit” (1 Corinthians 6:19–20) imply that sanitation and hygiene are essential acts of respect toward oneself, others, and God’s creation.

Thus, both religions converge on principles that align with contemporary sanitation goals: privacy, dignity, cleanliness, and protection of public health. While modern science emphasizes epidemiological risks and economic costs of OD, faith traditions

underscore moral obligations and divine accountability. This dual framework provides a powerful foundation for mobilizing individuals and communities to eliminate OD.

This paper, therefore, seeks to analyze the convergences and distinctive emphases of Islamic and Christian teachings on sanitation, and to examine their implications for eliminating OD in contemporary societies. It gives particular attention to how these teachings can be integrated into policy formulation, educational curricula, and community engagement strategies. By bridging the wisdom of religious traditions with modern public-health evidence, the paper advocates for a holistic, faith-informed approach to ending open defecation and promoting sustainable sanitation practices.

### Open Defecation

Open Defecation is the act of passing stool in the open, such as in fields, bushes, rivers, streets, or other open spaces, rather than in designated toilet facilities. According to WHO/UNICEF (2023), open defecation is the practice of human feces disposal in fields, forests, bushes, bodies of water, beaches, or other open spaces without using proper sanitation systems. It is a major cause of fecal–oral disease transmission, environmental pollution, and social indignity (Akorede et al., 2023; Nofiu et al., 2021; Solomon et al., 2025).

### Sanitation

Sanitation is the process of keeping places clean and free from dirt, waste, and harmful substances to maintain health and hygiene. According to WHO (2018) defines sanitation as the provision of facilities and services for the safe disposal of human urine and feces, as well as the maintenance of hygienic conditions through services such as garbage collection and wastewater disposal. In public health, sanitation is a cornerstone of preventing disease transmission.

### Islam

Islam is the Arabic word Islam literally means “submission” or “surrender” to the will of Allah (SWT). Islam is a monotheistic Abrahamic religion revealed to Prophet Muhammad (SAW) through the Qur’an, emphasizing submission to Allah, moral conduct, purification, and communal responsibility. In the context of sanitation, Islam provides guidelines on cleanliness (*taharah*), prohibiting harm (*la darar wa la dirar*), and promoting hygiene as an act of worship and social duty.

### Christianity

The word Christianity derived from the Greek word *Christianos*, meaning “follower of Christ.” It refers to those who adhere to the teachings of Jesus Christ. Christianity is a religion based on the life, teachings, death, and resurrection of Jesus Christ as recorded in the Bible. It emphasizes love of God and neighbor, stewardship of the body and environment, and service to others. In relation to sanitation, Christianity promotes hygiene and cleanliness as expressions of respect for the body as the “temple of God” (1 Corinthians 6:19–20) and as an act of love toward others by preventing harm.

### Public Health

Public Health is the health and well-being of the general population. According to the CDC (2021), public health is the science and practice of protecting and improving the health of communities through promotion of healthy lifestyles, research for disease and injury prevention, and control of infectious diseases. In the context of this research, public health involves strategies and policies aimed at eliminating open defecation, ensuring sanitation, and integrating religious perspectives to achieve holistic well-being.

### Theological Foundations in Islam

Islam places purification at the heart of worship and daily life. The Qur’an states:

إِنَّ اللَّهَ يُحِبُّ التَّوَّابِينَ وَيُحِبُّ الْمُتَطَهِّرِينَ

“Indeed, Allah loves those who are constantly repentant and loves those who purify themselves” (*Qur’an* 2:222.).

According to *Tafsīr Ibn Kathīr* (2000), this verse emphasizes both spiritual purification through repentance (*tawbah*) and physical purification through cleanliness. The mention of *mutatahirīn* (those who purify themselves) was revealed in the context of personal hygiene after menstruation but is generally understood as encouraging ritual and environmental cleanliness, thereby supporting modern sanitation ethics. Similarly, Allah (SWT) commands the Prophet (SAW) in the following verse:

وَيَا بَنِي إِسْرَائِيلَ خُذُوا زِينَتَكُمْ كُلُّهَا إِذْ تَخْرُجُونَ مِنَ الْمَسْجِدِ لِلدُّعَاءِ وَأَكَلْتُم مَّا رَزَقْنَاكُمْ فَأَغْرَسْتُمْ فُؤَادَكُمْ يَوْمَ الْاُخْرَىٰ فَذُكِّرْتُمْ بَلْ يَسْتَخْفُونَ بِكُمُ الَّذِينَ كَفَرُوا هُمْ يُسَبِّحُونَ بِحَمْدِ اللَّهِ أَكْثَرَ مِنْ مَا تَسْبِّحُونَ لَكُمُ اللَّهُ يَوْمَ الْقِيَامَةِ خَزَائِنًا لِمَا كَفَرْتُمْ وَلَكُمُ اللَّهُ يَوْمَ الْقِيَامَةِ خَزَائِنًا لِمَا كُنتُمْ تَعْمَلُونَ

“And purify your garments” (*Qur’an* 74:4.).

*Al-Ṭabarī* (2001) interprets this verse as a directive to maintain physical cleanliness as a symbol of spiritual purity. The command to purify one’s garments points to an obligation for Muslims to avoid najāsah (impurities) in their daily lives and worship, which aligns with modern concerns about hygiene and waste management. And Allah (SWT) praises a mosque whose foundation was built upon piety, saying:

فِيهِ رِجَالٌ يُحِبُّونَ أَنْ يَتَّطَهَّرُوا وَاللَّهُ يُحِبُّ الْمُتَطَهِّرِينَ

“...within it are men who love to purify themselves; and Allah loves those who purify themselves” (*Qur’an* 9:108.).

This verse refers to the people of Qubā', whose practice of cleansing themselves with water after relieving themselves was praised by Allah (Ibn Kathīr, 2000). Scholars regard this as a direct Qur'anic endorsement of proper sanitation, linking ritual practice with public health and community hygiene.

These verses collectively illustrate that cleanliness is not only a spiritual act but also a communal obligation in Islam. Prophet Muhammad (SAW) provided detailed guidance on sanitation. He instructed Muslims to seek privacy when relieving themselves and to avoid polluting water sources, pathways, and shaded areas where people rest:

انْفُوا اللَّعْنَيْنِ قَالُوا وَمَا اللَّعْنَانِ يَا رَسُولَ اللَّهِ قَالَ الَّذِي يَتَخَلَّى فِي طَرِيقِ النَّاسِ أَوْ فِي ظِلِّهِمْ

*“Beware of the two acts that cause curses: relieving oneself in the pathways of people or in their shade”* (Muslim, *Ṣaḥīḥ Muslim*, Kitāb al-Ṭahārah, no. 262; also in Ibn Mājah, *Sunan Ibn Mājah*, no. 328).

According to al-Nawawī (1996), the “curse” here refers to public condemnation and divine displeasure that results from causing harm to others through unhygienic practices. He explains that the hadith establishes a principle of public rights, showing that sanitation is not merely an individual duty but a communal obligation tied to *ḥifẓ al-naḥs* (preservation of life), one of the objectives of Islamic law. He further emphasized:

انْفُوا الْمَلَعِينَ الثَّلَاثَةَ: الْبَرَازَ فِي الْمَوَارِدِ، وَالظِّلِّ، وَقَارِعَةَ الطَّرِيقِ

*“Beware of the three acts that cause you to be cursed: relieving oneself in shaded places, in the middle of pathways, or in water sources”* (Abū Dāwūd, *Sunan Abī Dāwūd*, no. 26).

Ibn Hajar al-ʿAsqalānī (1997) explains that this narration identifies specific public spaces whose pollution would directly inconvenience or harm others. He argues that it demonstrates Islam’s preventive approach to health hazards, centuries before modern epidemiology, by protecting water sources and social spaces from contamination. Contemporary jurists extend this ruling to modern sanitation infrastructure, prohibiting practices that lead to pollution of drinking water and residential areas.

Moreover, the Prophet (peace be upon him) declared:

إِمَاطَةُ الْأَذَى عَنِ الطَّرِيقِ صَدَقَةٌ

*“Removing harmful things from the road is an act of charity”* (al-Bukhārī, *Ṣaḥīḥ al-Bukhārī*, no. 298).

These narrations collectively underscore Islam’s proactive concern for public hygiene, safety, and dignity. Al-Ghazālī (2013) interprets this hadith as part of the wider Islamic ethic of *iḥsān* (benevolence) and social responsibility. He observes that acts like clearing waste from pathways embody the principle of public benefit (*maṣlahah*), which is a foundational value in Islamic law. In this light, sanitation is not only a physical necessity but also a form of worship, as maintaining public cleanliness protects life and dignity.

The Islamic legal maxim *lā ḍarar wa lā dirār* (لا ضرر ولا ضرار), “no harming and no reciprocating harm”, serves as a universal principle for communal protection against environmental hazards (Ibn Mājah, *Sunan Ibn Mājah*, no. 2340). This maxim is widely applied by jurists to prohibit practices that may cause harm to individuals or communities, including open defecation, which contaminates shared resources and spreads disease.

Classical and contemporary jurists connect these teachings to the *maqāṣid al-sharīʿah* (objectives of Islamic law), which include preservation of life (*ḥifẓ al-naḥs*), intellect (*ḥifẓ al-aql*), progeny (*ḥifẓ al-nasl*), and wealth (*ḥifẓ al-māl*) (Auda, 2008; al-Qaradawī, 1997). By this reasoning, OD clearly contradicts Islamic objectives since it endangers health, spreads diseases, impairs children’s development, and imposes social and economic costs (Prüss-Ustün et al., 2014).

### Christian Perspectives on Sanitation and Neighbor-Love

The Hebrew Bible provides explicit guidance on sanitation. God commanded the Israelites:

*“Designate a place outside the camp where you can go to relieve yourself. As part of your equipment have something to dig with, and when you relieve yourself, dig a hole and cover up your excrement”* (Deuteronomy 23:12–14, NIV).

This shows a direct connection between hygiene, holiness, and communal well-being.

In the New Testament, sanitation and bodily care are framed within the broader ethic of stewardship and love. Paul teaches that the body is the “temple of the Holy Spirit” (1 Corinthians 6:19–20), thus requiring cleanliness and dignity, while Jesus commanded: “Love your neighbor as yourself” (Mark 12:31). Together, these teachings establish sanitation as an act of justice, love, and respect for both God and humanity.

Historically, churches have promoted hygiene by leading campaigns for clean water, building latrines, and teaching personal hygiene in missionary schools. Today, faith-based organizations continue to leverage their moral authority and extensive networks to promote sanitation, making them key stakeholders in the elimination of OD (UNICEF, 2016).

### Public-Health and Environmental Evidence on Harms of OD



Epidemiological studies confirm the negative impacts of OD on health and development. Unsafe sanitation contributes significantly to diarrheal diseases, soil-transmitted helminth infections, and child growth failure (Akorede & Toyin, 2020; Akorede et al., 2023; Prüss-Ustün et al., 2014; Mara et al., 2010; Spears, 2013). Fecal contamination of soil and water exacerbates outbreaks of cholera and typhoid and is increasingly linked to the spread of antimicrobial resistance (Abdulbaqi et al., 2019).

The economic costs are equally high. Households and governments bear increased healthcare expenses, reduced productivity, and high rates of school absenteeism. Analyses consistently show that sanitation interventions are cost-effective and yield significant returns on investment (Hutton, 2015). Socially, women and girls face disproportionate risks, including sexual violence due to lack of privacy, as well as barriers to education during menstruation (WHO, 2019).

### **Convergence Between Faith Teachings and Modern Science**

Islamic and Christian teachings converge strongly with WHO/UNICEF recommendations for safely managed sanitation, handwashing with soap, and protection of water resources (WHO/UNICEF, 2023). Scriptural imperatives, such as the Qur'anic command to purify oneself (*Qur'an* 74:4), prophetic prohibitions against defiling water sources (Muslim, *Ṣaḥīḥ Muslim*, Kitāb al-Ṭahārah), and Biblical laws on covering excreta (Deuteronomy 23:12–14), are in harmony with modern hygiene promotion, latrine use, and fecal-sludge management.

Classical *Tafsīr* works, such as *Tafsīr Ibn Kathīr*, highlight the spiritual and social value of *ṭahārah* (purity) in both private and public spaces (Ibn Kathīr, 2000). Similarly, Christian stewardship views sanitation as an act of love and care for God's creation and for the vulnerable, resonating with contemporary environmental health ethics.

### **Implementation Pathways: Faith-Informed Community-Led Sanitation**

Community-Led Total Sanitation (CLTS) approaches can be made more effective when reinforced by mosque–church partnerships. Religious leaders can mobilize congregations to reject OD as both a sin and a public danger, embed sanitation teachings in sermons and homilies, and promote compliance with community bylaws (Curtis & Cairncross, 2003; UNICEF, 2016).

Friday sermons (*khuṭbah*), Sunday homilies, madrasa and Sunday-school curricula can integrate WASH (Water, Sanitation, and Hygiene) messages with Qur'anic verses and Hadith. For example, reminding communities that “Purity is half of faith” (Muslim, *Ṣaḥīḥ Muslim*, no. 223) and that Jesus commanded love for neighbor (Mark 12:31) can inspire both Muslims and Christians to embrace safe sanitation.

Faith leaders can further advocate for inclusive designs—child-friendly toilets, disability-accessible latrines, safe fecal-sludge management, and handwashing stations near places of worship. Partnerships with local government strengthen these efforts by ensuring sustainable financing, regular monitoring, and alignment with national WASH policies (WHO, 2019).

### **Findings**

1. Islamic and Christian sources both prohibit practices that harm others and explicitly or implicitly require safe, private feces disposal (*Qur'an* 2:222; Deuteronomy 23:12–14).
2. OD is causally linked with diarrheal disease, helminth infections, environmental contamination, and child stunting (Prüss-Ustün et al., 2014; Spears, 2013).
3. Women, girls, and persons with disabilities are disproportionately affected by OD through safety, privacy, and dignity constraints (WHO, 2019).
4. Sanitation investments yield favorable cost–benefit ratios and productivity gains (Hutton, 2015).
5. Engagement of imams, pastors, and faith-based organizations accelerates behavior change and community compliance with anti-OD norms (UNICEF, 2016).

### **Conclusion**

Eliminating open defecation is both a moral and scientific necessity. Islamic principles of *ṭahārah* and harm-prevention and Christian commandments of stewardship and neighbor-love converge with the best public-health evidence. Integrating faith teachings with CLTS, inclusive design, and municipal services can transform norms, protect the environment, and improve human health. Universities and Departments of Education can equip teachers, religious leaders, and students with interdisciplinary WASH competencies rooted in local beliefs and global standards.

### **Recommendations**

1. Develop sermon guides and religious-studies modules linking *Qur'an* 2:222; 9:108; 74:4 and Deuteronomy 23:12–14 to everyday sanitation practices.
2. Form local interfaith committees to champion OD-free bylaws, latrine coverage targets, and handwashing campaigns aligned with national policy.
3. Prioritize safe, private, accessible toilets for women, girls, persons with disabilities, and schools; ensure safe fecal-sludge management (WHO, 2019).
4. Track OD-free status with community scorecards and recognize congregations and neighborhoods achieving sustained OD elimination (WHO/UNICEF, 2023).



5. Mobilize zakat/waqf and church social funds alongside public budgets; train faith leaders and teachers in WASH messaging and basic maintenance (Auda, 2008; UNICEF, 2016).

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## TRENDS IN ABUSE AND MISUSE OF PRESCRIPTION DRUGS IN NIGERIA: A CALL TO ATTENTION FOR HEALTH EDUCATORS

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### Abstract

Difficulty of utilizing drugs or chemicals for the purpose of treatment and relief from discomfort has led to misuse and abuse of medical drugs which has become a concern. Consequently, urgent attention is required from the society since its dimension has necessitated banning of some pharmaceutical drugs by the Nigeria Federal Ministry of Health in order to stop patronage by drug abusers, thereby denying those in need of the drugs legitimately access to treatment. Banned importation of selected drugs such as pain killer tramadol, cough syrups containing codeine has not decreased level of drug abuse and constitutes challenges not only to the government but also health organizations, health promoters and the society at large. This article provides insight to emerging trend in the abuse and misuse of medical drugs within the country with Opioids as the second most commonly abused drugs. This article explored three main prescription drugs commonly misused including reasons and consequences of abuse. Also, discussed is influence of social media, information and communication technology (ICT) on the use of prescription drugs including the roles of the Health Ministry and Agencies for drug protection. The paper explored the roles of health educators in the prevention of misuse and abuse of prescription drugs; and therefore, concluded that there is need to intensify drug education an aspect of health education to curb the abuse and misuse of prescription drugs using various strategies and media of health communication. It was recommended that routine checks at various points where suspected drugs could be abused such as pharmacy, clubs and hotels. Provision of valid identity cards to all residents in the country including minors to minimize the rate of drug abuse and that Nigerian Government should work closely with the internet service providers of different telecommunication agencies to restrict certain information from teenagers.

**Keywords:** Abuse, Drug, Education, Misuse, Prescription

### Introduction

Generally, drugs are regarded as medicines used to alleviate pains, suffering and achieve healing or cure for various ailments whether acute, sudden or chronic in nature. Drugs are normally prescribed by healthcare providers or practitioners and sometimes got Over The Counter (OTC) in Patent Medicine shops popularly known as 'Chemists' usually manned trained Dispensers in our communities. In recent times drugs have been defined by scholars to mean: any substance other than food that provides nutritional support) that, when inhaled, injected, smoked, consumed, absorbed via a patch on the skin, or absorbed under the tongue, causes physiological and often psychological changes in the human body (Alorfí, 2023).

The advent of information and communication technology through the use of Smartphone, Laptops and other gadgets has continued to increase the level of inquisitiveness of Nigerians to enquire more about emerging issues without seeking professional advice especially from medical experts. The issue of drugs has not been left out as some adolescents and young adults have the eagerness to try new things based on information via the media, friends and society thereby causing maladjusted behaviours, mental disorder, crime, violence, rape, accidents, and deaths among others. This has made users consume drugs via personal experimentation in order to satisfy their urge (Jatau et al., 2021).

Manchikanti et al. (2010) confirmed that the reason for the abuse of prescription drugs varies by gender and mainly attached to ease of access. These days, drugs can be purchased from online stores without stepping into the Pharmacy. Ozor (2016) reported that ninety percent of road accidents were as a result of drug abuse. The increasing rate of medical complications such as addiction among Nigerians due to the illicit use of prescription drugs has led to the ban of drugs such as Tramadol and Cough syrups with codeine.

Rang et al. (2011) described drugs as substances that cause a change in physiology and psychology of a person when consumed. Drugs are not categorized as food and substances that provides nutritional support. Drugs are consumed through mouth, inhalation, injection, absorption. Drugs are chemical substances that produce a biological effect on a person when administered. A pharmaceutical drug is called a medication or medicine which is a chemical substance used in the treatment, cure, prevention or diagnosis of a disease in order to promote well-being. Locally, drugs are obtained through extraction from

medicinal plants but recently through organic synthesis. These drugs are being used within limited time while others are used on regular basis for chronic diseases (Atanasov et al., 2015).

Egbejule (2016) reported that the National Agency for Food, Drug Administration & Control (NAFDAC) classified drugs as stimulants, hallucinogens, narcotics, tranquilizers, sedatives and miscellaneous, which includes solvents and other mixtures. Misuse of prescription drugs involves consumption of a medication in a manner that has not been prescribed by a medical doctor such as taking prescriptions given to other persons irrespective of it being a legitimate complaint such as for pain relief; or consumption of medications to feel euphoric (Ifeadi & Agodi, 2024).

According to Ifeadi and Agodi (2024), non-medical use of prescription drug have been classified into three categories of most commonly misused as follows: Opioids prescribed to treat pains; Depressant prescribe to depress the central nervous system (CNS) such as tranquilizers, sedatives, and hypnotics which are used to treat sleep disorders and anxiety; and stimulants often prescribed to treat attention-deficit hyperactivity disorder (ADHD). Consuming drugs without prescription or following prescription can lead to harmful effects on the consumers leading to illness, disability, suicide attempts and deaths.

According to the recent world drug report-2019 by the United Nations Office on Drugs and Crime (UNODC), 271 million (5.5) out of the total global population (between 15 and 64 years old) had used a drug in the past year. There has also been an estimated figure of 35 million people who will be undergoing drug use disorders (United Nations Office on Drugs and Crime (UNODC), 2019). More so, according to Global Burden of disease Study 2017, in 2017, one out of five hundred and eighty-five thousand (585,000) people were reported dead by drug use, worldwide (UNODC, 2019).

Drug use was most common among those who were between the ages of 25 and 39 years, while the rates of past year use were lowest among those who were below 24 years of age. Cannabis was the most commonly used drug followed by opioids, mainly the non-medical use of prescription opioids and cough syrup. A dichotomy in the past year prevalence of drug use was found between the North and South geopolitical zones. Highest past-year prevalence of drug use was found in the southern political zones: South-East, South-West, and South-South zones (past year prevalence ranging between 13.8–22.4 percent of the population, compared to the North ranging between 10–14.9 per cent of the population (Center for Behavioral Health Statistics and Quality, 2015).

Studies have shown that, majority of the Nigerian youths ignorantly depend on one form of drug or the other for their various daily activities-social, educational and political. Studies on young person's vulnerability revealed that most of the drug addicts started smoking from their youths. As they grow older, they seek new thrills and gradually go into hard drug abuse, (Oshodiet al., 2010). A nationwide survey of high school students reported that 65 percent used drugs to have good time with their friends, 54 percent wanted to experiment to see what it is like, 20 percent to 40 percent used it to alter their moods, to feel good, to relax, to relive tension and to overcome boredom and problems (Abudu, 2008). No single factor could be defined as solely responsible for the abuse of drugs but the following are some of the causes of young people vulnerable to drug abuse in Nigeria (Oluremi, 2012; Desalu, et al., 2010; Ajibulu, 2011). According to them, the followings are some of the reasons why some youths take drugs; curiosity and desire to find out the effectiveness of a particular drug: curiosity to experiment the unknown facts about drugs thus motivates youths into drug use. The first experience in drug abuse produces a state of arousal such as happiness and pleasure which in turn motivate them to continue. Some time, youths take drugs in order to find out their effectiveness of a particular drug and if they find out that the drug is effective, they continue using such drugs (Awesu, 2018).

Kazeem (2018) reported the claim of Nigeria's senate of about three million bottles of codeine consumed daily by only two northern states. The misuse of prescription drugs since the last 15 years has reflected increase in emergency room visits; overdose deaths are associated with prescription drugs. Rudd et al., 2016). Addicts are said to frequently visit pharmacies to threaten staff in order to sell the free drugs provided by government. This drastically reduces the dosage available to patients who genuinely need them. These actions were as a result of weak laws that could not control the kind of drugs people purchase from the pharmacies and medical outlets. Centers for Disease Control and Prevention (2018) reported that treatment admissions for prescription drug use disorders with the most severe form to be an addiction. Overdose deaths involving prescription opioids were reported to be five times higher in 2016 compared to the year 1999.

### **Prescription Drugs Commonly Misused**

#### **Opioids**

Dowell et al. (2016) confirmed that Opioids are medications that act on opioid receptors in both the spinal cord and brain to reduce the intensity of pain signal perception. They also affect brain areas that control emotion, which can further diminish the effects of painful stimuli that has been used for centuries to treat pain, cough, and diarrhea. The most common modern use of opioids is to treat acute pain. However, since the 1990s, they have been increasingly used to treat chronic pain, despite sparse evidence for their effectiveness when used for long term. Indeed, some patients experience a worsening of their pain or increased sensitivity to pain as a result of treatment with opioids, a phenomenon known as Hyperalgesia (Hart & Ksir, 2012).

### **Central Nervous System (CNS) Depressants**

Gunja (2013) observed that CNS depressants, a category that includes tranquilizers, sedatives, and hypnotics, are substances that can slow brain activity. This property makes them useful for treating anxiety and sleep disorders. Benzodiazepines, non-benzodiazepine sleep medications and Barbiturates are among the medications commonly prescribed for these purposes.

### **Stimulants**

Stimulants increase alertness, attention, and energy, as well as elevate blood pressure, heart rate, and respiration. In the case of stimulants, 45.3% lifetime and current use, 69.2% lifetime and 15.6% lifetime were reported in South East, North Central and Southwest Nigeria respectively (Duru et al., 2017; Babalola et al., 2014). Historically, stimulants were used to treat asthma and other respiratory problems, obesity, neurological disorders, and a variety of other ailments. But as their potential for misuse and addiction became apparent, the number of conditions treated with stimulants has decreased (Scammell, 2015). Now, stimulants are prescribed for the treatment of only a few health conditions, including attention-deficit hyperactivity disorder (ADHD), narcolepsy, and occasionally treatment-resistant depression (Saliba, 2016).

### **Reasons for Abuse and Misuse of Prescription Drugs**

Kazeem (2018) reported on the quest for teenagers and young adults to access cheap drugs like syrups with codeine that can make them high with a price of one-thousand-naira equivalent to an estimate of 3 dollars. The purchase of the prescription drug is illegal but were widely available in the market. This opioid syrup was consumed as a whole at once for immediate effect of being mixed with other kind of drinks be it soft or hard at various homes, small gatherings, local clubs and parties.

The problem is more acute in Nigeria's vast north where millions of young adults are unemployed. Its prevalence is also rooted in culture: with the sale of alcohol banned across most northern states mainly for religious reasons, young adults and teenagers often turn to cheap opioid-based drugs, especially codeine cough syrups, as an alternative. Those who cannot afford codeine syrups turn to more extreme options including lizard dung and cobwebs (Kazeem, 2018).

Molobe (2018) in a study on drug abuse and unsafe abortion among teenage girls in Nigeria revealed that the most abortion substances used by the teens were herbal mixtures which constitutes 38 percent among participants, 25.6 percents used synthetic substances and also for psychotropic drugs while 10.2 percent used prescribed drugs. This showed that most girls illegally make use of prescription drugs to induce abortion.

### **Other reasons why people take drugs**

Other reasons why people use drugs vary greatly among individuals. Some persons trying to fix issues within their lives usually see drugs as the solution. A young person may be trying to fit in with their peers and views use of alcohol drugs as a means of feeling "a part of." In contrast, many individuals use drugs as a way to self-medicate, from chronic pain to mental health disorders, while many people use drugs to alleviate symptoms of an ailment

The National Institute on Drug Abuse, (NIDA, 2014) attributed some reasons for taking drugs to include the following:

**Experimenting:** Very curious people experiment with drugs or alcohol. It is a scenario that often starts with a young person using alcohol or marijuana out of curiosity. Young persons consider these harmless, adolescents' experiment with drugs and alcohol are more likely to develop substance use disorder (National Institute on Drug Abuse, 2014).

**Family History/Genetics:** A family history of drug addiction, you may have a genetic predisposition to develop an addiction to drugs or alcohol. It is stated that about 30% – 70% of a person's risk for addiction is linked to the genes they are born with along with other social factors.

**Prescription Drugs:** A popular misconception holds that any medication prescribed by a doctor is safe. Unfortunately, that is not always the case. Doctors prescribe medications to alleviate symptoms of physical or mental health issues.

Poor health information on the risks of medications constitutes a problem in the communities. Chronic pain is often managed through opioid medications, which are highly addictive. Dependent upon the amount used and other factors, someone may require a medical detoxification just to stop using opioids. Likewise, those suffering from anxiety and depression get prescription of addictive medications to ease symptoms. Non-addictive medication and/or pain recovery services are often available.

**Loneliness:** An individual could feel lonely or isolated from friends and family. They turn to drugs and alcohol thinking that it will fill a void that they have been living with. People lacking positive daily interaction may choose to use substances to feel happy or content. In addition, users may begin to alienate themselves further if they fear being judged or that help is not available to them.

**Peer pressure:** The term applies to adolescents or young adults when individuals have need belong or associate. While others may feel the need to participate in difficult activities that must be done under influence alcohol or chemical substance. Occasionally, the pressure of being around others who are abusing drugs or alcohol can push someone to follow suit.

**Beliefs that Drugs and Alcohol produce Good Feelings:** There is a popular quote in the Big Book of Alcoholics Anonymous that states: 'Men and women drink essentially because they like the effect produced by Alcohol' while this seems obvious, some people like the effect so much that they are unable to stop. It may be difficult for an individual to see the harm in something that makes you feel good.

**Mental Health Disorders:** Depression, anxiety, can put individuals at higher risk of developing addiction. Using substances to cope with difficult feelings may seem like an easier path for some. Though they may seem crippling at times, there is help available to anyone struggling with a mental health disorder. Non-narcotic medications are often available for most mental health disorders. It's worth researching with a doctor to see if there is an alternative to addictive medications.

**Recreation:** Individuals who prefer to unwind or relax under the influence of drugs are called Recreational drug users. Most of whom are at risk addiction if drug use becomes more frequent especially if the substance in use is a highly addictive substance.

**Alcohol Isn't Enough:** When a few bottles of Beer after work or having drinks with friends at a local bar does not have the same effect that it used to. Some individuals end up "chasing a buzz" that they were once able to attain with a few drinks. This usually leaves someone powerless over alcohol and unable to quit drinking.

**Self-Medicating:** Individuals struggling with multitude of ailments may turn to drugs or alcohol to ease their pain. Mental health disorders and chronic pain leave people seeking solutions on their own. Alcohol or other substances can alleviate symptoms and seem like a short-term solution. Other factors that affect the likelihood and speed of developing an addiction include: Family history of addiction, drug addiction is more common in some families and likely involves genetic predisposition, lack of family involvement, early use and taking a highly addictive drug.

#### **Harmful Effect of Misuse and Abuse of Prescription Drugs**

Kazeem, (2018) asserted that thousands of young Nigerians already addicted are at risk of suffering from effects of sustained opioid abuse ranging from schizophrenia to organ failure. In addition to relieving pain, opioids also activate reward regions in the brain causing the euphoria that underlies the potential for misuse and substance use disorder. Chemically, these medications are very similar to heroin, which was originally synthesized from morphine as a pharmaceutical in the late 19th century. These properties confer an increased risk of substance use disorder even in patients who take their medication as prescribed. However, overdose is another significant danger with opioids, because these compounds also interact with parts of the brain stem that control breathing. Absorbing too much of an opioid can suppress breathing enough to suffocate the user (Jones et al., 2016).

#### **Other Complications of Drug Misuse and Abuse**

Legal or illegal, drug abuse results in the following medical consequences: cancers, cirrhosis of the liver, heart disease and stroke, HIV, hepatitis and lung disease, to name a few. According to the National Center on Addiction and Substance Abuse at Columbia University, untreated addiction and risky use of drugs causes or contributes to more than 70 conditions requiring medical treatment. These effects of drug abuse are also responsible for 20 percent of drug related mortalities/deaths. Disrupted cognition, particularly in the domains of attention, working memory, and response inhibition, is a core phenotype of nicotine withdrawal and is clinically significant with respect to risk for relapse. During the first few days of the consumption of a depressant, a person usually feels sleepy and uncoordinated, but as the body becomes accustomed to the effects of the drug and tolerance develops, these side effects begin to disappear. When a person uses these drugs for a long time, he or she may need larger doses to achieve the therapeutic effects. Continued use can also lead to dependence and withdrawal when use is abruptly reduced or stopped. This is because CNS depressants work by slowing the brain's activity, when an individual stops taking them, there can be a rebound effect, resulting in seizures or other harmful consequences (Gunja, 2013).

McCabe and West, (2013) reported that with the stimulant category, such as cocaine, people are likely to become dependent on or addicted to prescribed stimulants. Withdrawal symptoms associated with discontinuing stimulant use include: fatigue, depression and disturbed sleep patterns. Repeated misuse of some stimulants can lead to feelings of hostility or paranoia, or even psychosis. High doses of a stimulant may result in dangerously high body temperature and an irregular heartbeat with potential for cardiovascular failure or seizures.

Molobe, (2018) observed that most teenagers who committed unsafe abortion experience post abortion syndrome because such abortions took place through the abuse of prescription drugs. They therefore pass through physical and emotional trauma and resort to further abuse of drugs including educational setback. Also, individuals who attempt to abort their babies through the use of psychotropic medications and other substances led to birth of deformed baby. Usually, the male partner responsible for the unwanted pregnancy influences the use of these drugs for induced abortion.

Studies in Nigeria reported different social consequences of drug use such as in family lives, loss in productivity and legal problems as consequence of drug use in their communities. Also, nearly 1 in 8 persons in the general population had experienced consequences of drug use by other people in families, workplace and communities (UNODC, 2018).



### **Social Media, Information and Communication Technology (ICT) and Misuse of Prescription Drugs**

Kazeem, (2018) reported that use of codeine has become “cool” as pop culture references about the opioid have proliferated, particularly in the booming Afrobeats scene. “Diet”, an Afrobeats song with the refrain, “on a Codeine diet” has become a big hit for three of Nigeria’s biggest pop stars while the ‘Risqué’ music video for Science Student by Olamide was banned by Nigerian media regulators. Codeine references also litter American hip hop as several big-name artists, including rapper Lil’ Wayne, have released codeine-inspired tracks.

According to Molobe (2018), it was also found that teen surf on the internet to discover abortion pills and have been able to purchase these pills from the pharmacy shops without doctor’s prescription. This confirms that the internet, through the use of Smart phones and other gadgets made easy access prescription drugs to source information in order abort pregnancy

### **Ministry and Agencies for Drug Protection**

The National Drug Law Enforcement Agency (NDLEA) and the National Agency for Food Drugs Administration and Control (NAFDAC) are the main federal agencies saddled with the responsibilities on drug prevention. In order to intensify efforts on the prevention of drug abuse and misuse, various units have emerged to carryout health promotions on the prevention of Drug abuse (NAFDAC, 2024, Abuchi et al., 2019). The formation of some of these agencies such as NAFDAC formed in 1992 under the Federal Ministry of Health, work in line with the 1988 World Health Assembly resolution that requested countries to help fight the global health threat posed by counterfeit pharmaceuticals (NAFDAC, 2024). In the quest for combating the issues of fake drugs NAFDAC adopted the use of Mobile Authentication Service (MAS) in order to authenticate pharmaceutical products through the consumers but did not pay adequate attention on the type of consumers that utilizes these drugs after authentication through text messages with the telecommunication networks (Khilae, 2016).

### **Roles of Health Educators in the Prevention of Misuse and Abuse of Prescription Drugs**

The National Institute on Drug Abuse (2014) highlights the administration of screening and brief assessment tools by medical professionals in order to detect drug use before it becomes a serious problem. This assessment can be effective by collaborating with health educators to actualize the focus on prevention rather than cure through the other aspects as highlighted by the Institute such as provision of intervention, referral to substance abuse treatment for extensive assessment and care, follow up and medication if need. Health Awareness programme to sensitize drug users and educate community member on dangers and signals of drug misuse, abuse and addiction.

Curriculum enrichment and introduction of school-based health education is an effective medium to curb the misuse and abuse of drugs (Momanyi, 2024). Education for drug use and abuse prevention should be seen to include both formal and informal health curricula. Educators can pass appropriate information to students to create awareness on the implications of drug misuse using various strategies; there exist a safe and supportive school environment with clear policies that provides support and care with a counseling unit (Alarcó-Rosales et al., 2021). This can be fully achieved through the involvement of the family and community in the planning and delivery system. There should be a continuous monitoring mechanisms and review.

The use of mass media is also important for health educators in the campaign for prevention of drug abuse (Thorley, 20023). Mass media campaigns addressing existing knowledge and beliefs of the target audience, incentives or benefits for adopting desired behaviour that builds on existing motives, needs and values of the target audience should be communicated (Ngigi & Busolo, 2018). Emotional arousing fear appeal should be approached with great caution. Campaign messages directed to preteens and adolescents should capitalize on important themes in the development of adolescent identity, including freedom, autonomy, and peer group acceptance (Pfeifer & Berkman, 2018). In moving from childhood to adulthood, youth are in the process of developing an identity that is distinct from that of their parents (Kaniušonytė, & Žukauskienė, 2018). They therefore seek independence and autonomy, often manifested as a rejection of parental values and a thwarting of authority and conventional society. Campaigns should explore the use of “image” or “lifestyle” advertising to promote an active and healthy lifestyle that excludes substance use (Opesemowo & Taiwo, 2025).

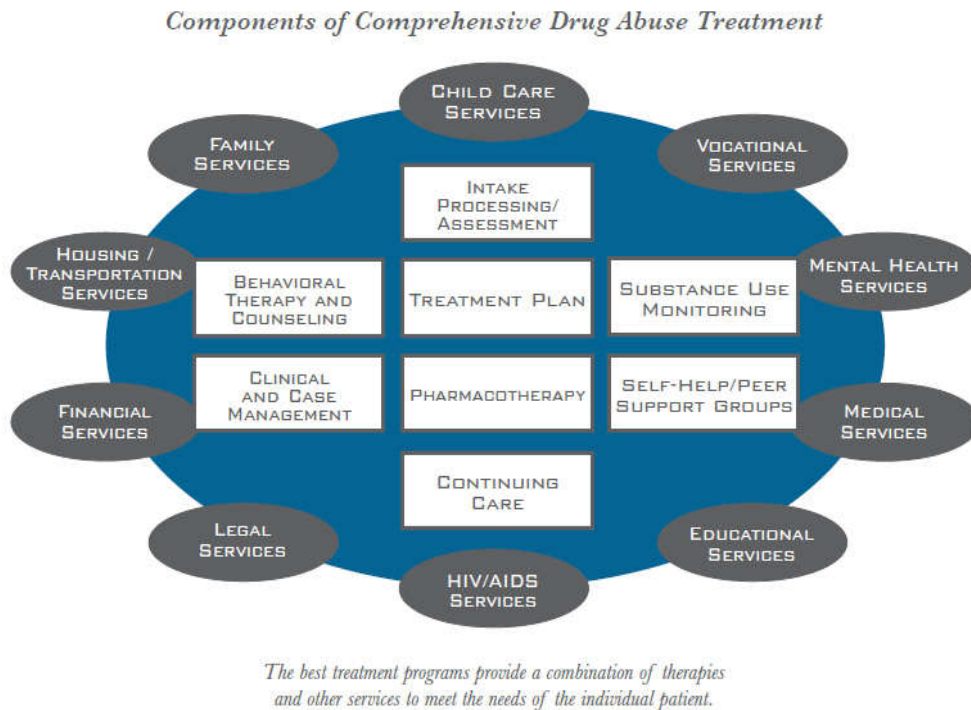
Detoxification is normally the first step in treatment. This involves clearing a substance from the body and limiting withdrawal reactions. In 80 percent of cases, a treatment clinic will use medications to reduce withdrawal symptoms, according to the Substance Abuse and Mental Health Services Administration (SAMHSA, 2019)

### **The Stages of Recovery: What Are They and Why Are They Important?**

- i. Pre-contemplation: As addiction worsens in severity, so do its consequences and their frequency. The individual does not realize he has a problem or need attention at all.
- ii. Contemplation: The individual begins to realise the need for behaviour change.
- iii. Preparation: The individual accepts to commence treatment to come off drugs. A first step of Counselling accepts to commence a Detoxification treatment.
- iv. Action: The individual submit self for a Drug withdrawal programme. Detoxification involves clearing a substance from the body and limiting withdrawal reactions. Which is followed by the five stage treatment



- v. Maintenance: Five stages include: Intake process Assessment; Behavioural therapy: Clinical and Case management; Substance use monitoring; Self – Help Peer Support groups. Some clients could decide to stop treatment at any of the stages or continue and complete the programme.
- vi. Termination. If the client stops. Treatment has been Terminated but can decide to Continue treatment/ Care. The Treatment plan also involve Pharmacotherapy as considered necessary.



**Figure 1:** Components of Comprehensive Drug Abuse Treatment

**Source:** Substance Abuse and Mental Health Services Administration (SAMHSA, 2019)

Drug addiction treatment can include medications, behavioural therapies or a combination. There are a variety of evidence-based approaches to treating addiction. Drug treatment can include behavioral therapy (such as cognitive-behavioral therapy or contingency management), medications, or their combination. The specific type of treatment or combination of treatments will vary depending on the patient’s individual needs and, often, on the types of drugs they use.

Behavioral therapies can help motivate people to participate in drug treatment, offer strategies for coping with drug cravings, teach ways to avoid drugs and prevent relapse, and help individuals deal with relapse if it occurs. Behavioral therapies can also help people improve communication, relationship, and parenting skills, as well as family dynamics.

Many treatment programs employ both individual and group therapies. Group therapy can provide social reinforcement and help enforce behavioral contingencies that promote abstinence and a non-drug-using lifestyle. Some of the more established behavioral treatments, such as contingency management and cognitive-behavioral therapy, are also being adapted for group settings to improve efficiency and cost-effectiveness. However, particularly in adolescents, there can also be a danger of unintended harmful (or iatrogenic) effects of group treatment sometimes group members (especially groups of highly delinquent youth) can reinforce drug use and thereby derail the purpose of the therapy. Thus, trained counsellors should be aware of and monitor for such effects (SAMHSA, 2019).

The keys to finding the best addiction treatment for the client:

**No treatment works for everyone.** Everyone’s needs are different. Whether there is a problem with illegal or prescription drugs, addiction treatment should be customized for unique situation. It’s important that the programme feels right.

**Treatment should address more than just drug abuse:** Addiction affects the whole life, including relationships, career, health, and psychological well-being. Treatment success depends on developing a new way of living and addressing the reasons

why the person turned to drugs in the first place. For example, if drug dependency may have developed from a desire to manage pain or to cope with stress, in which case a person needs to find a healthier way to relieve pain or to handle stressful situations.

**Commitment and follow-through is important:** Drug addiction treatment is not a quick and easy process. In general, the longer and more intense the drug use, the longer and more intense the treatment needed. And in all cases, long-term follow-up care is crucial to recovery.

**There are many places to turn for help;** Not everybody requires medically supervised detox or an extended stint in rehab. The care you need depends on a variety of factors, including your age, drug-use history, medical or psychiatric conditions. In addition to doctors and psychologists, many clergy members, social workers, and health counsellors offer addiction treatment services.

**Substance abuse and mental health:** As you seek help for drug addiction, we need to get treatment for any other medical or psychological issues the individual is experiencing. The best chance of recovery is by getting combined mental health and addiction treatment from the same treatment provider or team.

## Conclusion

Drugs of any kind are available in the communities and provide access for teenagers and young adults who are at risks of health complications in future due to the exploration, exposure and access to information that can lead to the abuse and misuse of drugs through the social media which majorly entails the use of Smart phones and Laptops. Mass media such as television with access to adult shows, unscrupulous and illicit music that promotes drugs also influence the minds of the masses to consume drugs so as to fulfill their lustful pleasures and demand rendering them to be an addict.

Drug education which is an aspect of health education is an effective means to curb the abuse and misuse of prescription drugs. This can be achieved through aggressive actions of Health Educators, utilizing various medias and strategies to prevent further increase in the abuse and misuse of drugs which will further minimize health complications. Health educators are expected to provide health information on drug use, misuse, abuse, prevention and complications to schools, colleges, tertiary institutions to reduce drug involvement among students.

## Recommendations

The following are recommendations for combating the illicit use of prescription drugs:

1. Drug abuse prevention exercise should be intensified by Government and Non-Governmental organizations using various health education media and strategies to make target audience such as the use of audio-visual media in order to see the aftermath effect of drug abuse to minimize or stop the use of drugs indiscriminately.
2. There should be routine check-ups at various points where suspected drugs could be abused such as pharmacy, clubs, hotels and so on.
3. Provision of valid Identity cards to all residents in the country including minors so as to identify drug abusers at points of surveillance
4. Nigerian Government should work closely with the internet service providers of different telecommunication agencies within the country so as to adequately retrieve information of phone users particularly teenagers so as to restrict certain information from them to minimize the problems of drug abuse and misuse.

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## EFFECT OF LOW-INTENSITY INTERVAL TRAINING ON BLOOD GLUCOSE LEVEL AMONG PATIENTS OF TYPE-II DIABETES MELLITUS IN SELECTED ENDOCRINE CLINICS ZARIA METROPOLIS, NIGERIA

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### Abstract

This study investigated the efficacy of a structured low-intensity interval training (LIIT) program on blood glucose levels in patients diagnosed with Type II Diabetes Mellitus (T2DM) within selected endocrine clinics in Zaria, Nigeria. Employing a one-group repeated measures pre-test/post-test design, the research purposively sampled fifteen (15) participants from 108 patients with age limit of 28-56 years and above of T2DM patients who met predefined inclusion criteria and demonstrated readiness for physical activity. The intervention spanned nine weeks, with training sessions held three times weekly (Thursday, Friday, and Saturday) between 4:00 PM and 5:30 PM. Each session was carefully structured to last between 30 and 45 minutes, incorporating essential warm-up and cool-down phases. The intensity of the LIIT progressively increased, starting at 20% of maximum heart rate (HR<sub>max</sub>) for the initial three weeks, advancing to 30% HR<sub>max</sub> for weeks 4-6, and culminating at 40% HR<sub>max</sub> for weeks 7-9. Blood glucose levels were meticulously monitored at four distinct time points: baseline (week 0), week 3, week 6, and week 9, utilizing a glucometer kit, with treadmill exercise serving as the primary mode of intervention delivery. Data were subjected to descriptive statistical analysis, and hypotheses were rigorously tested using a one-way analysis of variance (ANOVA) with repeated measures, at a predetermined significance level of  $P < 0.05$ . The findings unequivocally demonstrated a statistically significant reduction in blood glucose levels observed from the 3rd, 6th, and 9th weeks of the intervention ( $P < 0.000$ ). This compelling evidence leads to the conclusion that a 3-to-9-week low-intensity interval training regimen is highly effective in decreasing blood glucose levels among Type II Diabetes Mellitus patients attending endocrine clinics in Zaria, Nigeria. Consequently, it is strongly recommended that LIIT be integrated and sustained as a practical and beneficial approach for the ongoing management of blood glucose in this patient population within the Zaria metropolis.

**Keywords:** Blood glucose level, Endocrine Clinic, Interval training, Low intensity interval training, Type-II diabetes mellitus

### Introduction

Type 2 Diabetes Mellitus (T2DM) is a chronic disease with a growing global prevalence, affecting a large portion of the population and significantly impacting overall health (Yach et al., 2006). The World Economic Forum's Global Risk Report estimated a substantial increase in diabetes cases, from 108 million in the 1980s to 422 million by 2014, with cases continuing to rise (da Rocha Fernandes et al., 2016). Bennett et al. (2018) projected a 72% increase in diabetes prevalence between 2010 and 2030, with an estimated 642 million people affected by 2040 (Chin et al., 2021). These epidemic places a heavy burden on health systems, with treatment costs for individuals aged 20-79 reaching \$776 million (Cho et al., 2018).

In Nigeria, the reported prevalence of T2DM among adults is 1.7% (Adeloye et al., 2017). However, these figures, based on data from other countries, are widely believed to be an underestimation of the true burden (Uloko et al., 2018). Glucose, a primary energy source for cells, is transported with the help of insulin (Mukhtar et al., 2020). Normal fasting blood glucose levels are typically between 70 and 99 mg/dL (Awuchi et al., 2020). High blood glucose, or hyperglycaemia, occurs when the body does not produce enough insulin or cells do not respond to it properly. Untreated hyperglycaemia can lead to serious complications, including nerve, kidney, and eye damage (Awuchi et al., 2020).

Weight reduction and exercise are crucial for managing T2DM. The American Diabetes Association (2013) and American College of Sports Medicine (2014) recommend at least 150 minutes of moderate-to-vigorous physical activity per week. Even a single session of high- or low-intensity exercise can improve endothelial function and lower glycaemic levels within 24 hours (Francois et al., 2016). Low-intensity exercise, in particular, has been shown to improve insulin sensitivity and glycaemic control (Howden et al., 2018). The rise in insulin sensitivity is linked to a decrease in abdominal fat and enhanced glucose metabolism (Bartlett et al., 2013).

T2DM is characterized by reduced insulin production, which impairs the regulation of blood glucose (Boukabous et al., 2019). Long-term hyperglycaemia can lead to serious complications such as cardiovascular diseases, kidney disease, and neuropathy (Awuchi et al., 2020). Health professionals are vital in providing patients with the necessary information for effective self-management (Marcotte-Chénard et al., 2021).

A study by Chaturvedi et al. (2021) examined the effect of Low-Intensity Interval Training (LIIT) on glycated hemoglobin (HbA1c) in 40 women with T2DM. The study found that regular LIIT significantly improved HbA1c levels compared to a control group, indicating its effectiveness as an alternative to aerobic training for glycaemic control. Similarly, another study by Chaturvedi et al. (2021) demonstrated that LIIT can improve glucose regulation and cardiovascular well-being.

Regular physical activity improves overall health, boosts cardiorespiratory fitness, and helps manage complications like T2DM and obesity (Collin, 2021). Exercise enhances insulin sensitivity for up to 48 hours and improves glycaemic regulation. The benefits of exercise depend on its intensity, duration, and type. Interval training, especially at high speeds, can maximize improvements in  $VO_{2max}$  and mitochondrial density (Chori et al., 2022). Low-intensity exercise during recovery periods can also help excrete lactate after strenuous activity (Brooks et al., 2022). A study by Podvigina et al. (2022) concluded that LIIT enhances glycaemic regulation and pancreatic beta-cell function in T2DM patients, reinforcing the role of physical activity in glucose homeostasis for both healthy and diabetic individuals.

## Methodology

One group repeated trials research design was used, which the participants were measured more than two (2) times repeatedly over a period of time on the same dependant variable as suggested by Cho et al. (2020). In this design, one group response outcomes were measured on the same experimental unit at different condition (Rachel et al., 2023). The sample size for this study consisted of fifteen (15) female Patients which were drawn from 108 population for the study with T2DM. To arrive at this sample size for this study, the purposive sampling technique was used, this was because the participants met certain criteria set for the study (Campbell et al., 2020). Participants with age limit of 28-56 and above years constitute the study, and a one group pretest and posttest repeated analysis measure of variance was used. The baseline was used as a pre-training measure, while the measurement of the 3<sup>rd</sup> week, 6<sup>th</sup> week and 9<sup>th</sup> week measurements were the experimental manipulations for nine (9) weeks. The design was to measure how the treatment affected each individual. An ethical approval was sought from the Ahmadu Bello University Committee on Use of Human Research Subjects (ABUCUHSR/2023/025), similarly, a letter of introduction from the Department of Human Kinetics and Health Education, Faculty of Education Ahmadu Bello University Zaria was issued to the Chief Medical Directors of the Selected Endocrine Clinics Zaria Metropolis, Nigeria, for approval to use its clinic for the requirement of participants for the study, and also for the permission to use its gymnasium for the training.

### Training Procedure

Glucose level was measured using a kit called glucometer, which was applied by pricking a finger with a lancet, using a lancing pen, the deposit of blood sample on a test strip was inserted in the meter. The readings on the test strip were displayed in units of mg/dL or mmol/L. participants undergoing interval training on a treadmill which were T2DM patients for nine (9) weeks. The pre-training participants were asked to follow general lifestyle recommendation, including brisk walking at least three (3) times for a minimum of thirty (30-40) minutes as a placebo. The data collected served as the baseline. As for the control, the subjects that undergone training, training session commenced shortly after the participants' physical characteristics were measured in order to obtain their body composition which were used as a guideline for the exercise prescription, such as frequency, intensity, duration and mode of activity. The participants were exposed to 9-week low-intensity training at frequency of 2 - 3 days per week. At the beginning of the training programme, the intensity was 20%  $HR_{max}$  1 - 3<sup>rd</sup> week, 30%  $HR_{max}$  4<sup>th</sup> - 6<sup>th</sup> week, and 40%  $HR_{max}$  7<sup>th</sup> - 9<sup>th</sup> week. The time assigned for each training session was 30 minutes. The programme was of low intensity considering the fitness level of the participants. As recommended by Kilhede (2020), the intensity of low intensity training should start with walking at a working heart rate of 20% of estimated  $HR_{max}$  (108 bpm) at 0 - 3<sup>rd</sup> week, increased to 30%  $HR_{max}$  (117 bpm) at 4<sup>th</sup> - 6<sup>th</sup> week progressively to 40%  $HR_{max}$  (126 bpm) at 7<sup>th</sup> - 9<sup>th</sup> week. But for this study the rate of increment will be individual based due to their health conditions.

### Instruments

The test were performed on a Trim line 7800 Treadmill USA were the interval training exercise. The Blood glucose level was measured using Glucometer kit, VivaChek™ Eco BGMS blood glucose meter (VivaChek Biotech (Hangzhou) Co., Ltd.) with strips and lancets needles. A Stopwatch: Six stopwatches digital port-spring model 015. Manufactured by a jewel sports company, Britain was used for monitoring the duration of the intervals training exercise. (Jackson, 2017).

## Results



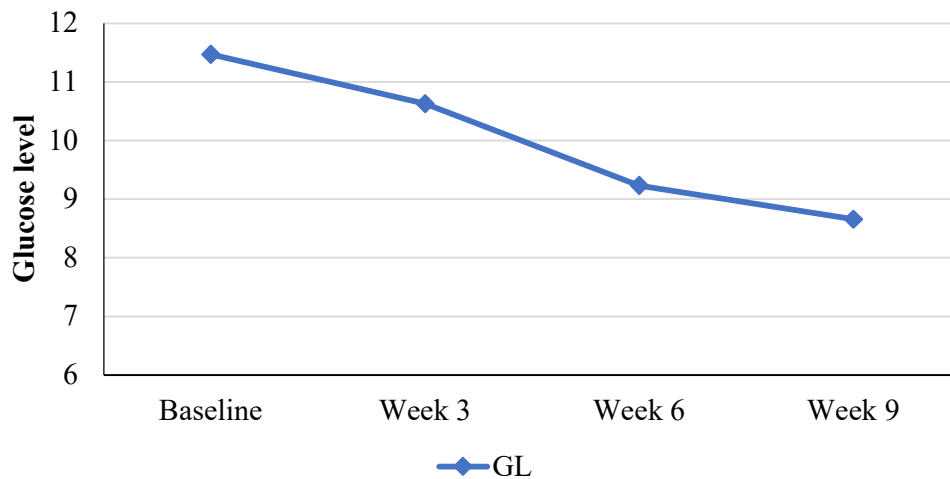
To examine sub-hypothesis, a repeated one-way analysis of variance (ANOVA) test was conducted on the blood glucose level (GL) of the participants. The results of this analysis are presented in Table 1.

**Table 1: Effects of low-intensity interval training on the GL of participants**

Source		type-III Sum of Squares	df	Mean Square	F	Sig.
GL	Sphericity Assumed	74.597	3	24.866	48.136	.000
	Greenhouse-Geisser	74.597	1.141	65.395	48.136	.000
	Huynh-Feldt	74.597	1.175	63.482	48.136	.000
	Lower-bound	74.597	1.000	74.597	48.136	.000
Error (GL)	Sphericity Assumed	21.696	42	.517		
	Greenhouse-Geisser	21.696	15.970	1.359		
	Huynh-Feldt	21.696	16.451	1.319		
	Lower-bound	21.696	14.000	1.550		

Table 1 displays the results of the repeated one-way analysis of variance (ANOVA) that investigated the effects of low-intensity interval training on the blood glucose level (GL) of the participants. The obtained results,  $F(3, 42) = 48.136$ , indicated the effect of the training programme on the GL of the participants. Furthermore, table 4.8 revealed the Mean and the Standard deviation of the Low-intensity interval training on the (GL). However a Bonferroni pairwise comparison post hoc test was conducted and the results of the findings revealed that the Mean and Standard deviation of (GL) of the participants was significantly decreased from  $11.47 \pm 0.96$  at baseline to  $10.63 \pm 0.96$  at the 3<sup>rd</sup> week, furthermore, the training programme led to a further significant decreased in the average GL of the participants to  $9.23 \pm 0.68$  at 6<sup>th</sup> week at  $p = 0.002$ , and was subsequently decreased significantly to  $8.65 \pm 0.67$  at 9<sup>th</sup> week,  $p < 0.000$ . An observation of this results revealed that low-intensity interval training slightly reduces the blood glucose levels of the participants at the 3<sup>rd</sup> week of low-intensity interval training and more significantly at the 9<sup>th</sup> week of low-intensity interval training. Consequently, the null hypothesis, which states that there is no significant effect of low-intensity interval training on the blood glucose level among patients with type-II diabetes mellitus (T2DM) in the selected endocrine clinics of Zaria Metropolis, Nigeria, is rejected because, the P-calculated ( $P=0.000$ ) was less than the statistical level of significance  $P>0.05$ .

The variation of participant’s GL during the course of the study is as presented in Figure 1.



**Figure 1: Variation of participant’s GL during low-intensity interval training**

**Discussion**

The finding of this study revealed that Low-intensity interval training significantly decreased the blood glucose level among type 11 diabetes mellitus patients. The results of the findings coincided with those of Feng, et al.,2019; Laursen and Buchheit (2019), who found and reported that low-intensity interval training of 30 minutes enhanced glucose metabolism. However, low-intensity interval training reduced insulin resistance because of a reduction in blood glucose levels among the experimental group. Similarly, Boukabous, et al., 2019); Sugandh, et al.,(2022) stressed that moderate-intensity continuous training has a lesser effect on fasting insulin level than low-intensity interval training, with a reduction of 31% and 9%, respectively. The pancreas produces two hormones: insulin and glucagon, which help to assert blood glucose levels. Exercise reduces the insulin requirements of T2DM patients by 30–5 percent, and insulin sensitivity improves, which lasts for one or two days before

reaching pre-exercise levels. Thus, T2DM patients need to exercise regularly to maintain enhanced insulin sensitivity. However, Yannon (2022) shows that there are improvements in long-term glucose control due to regular exercise in T2DM patients. The results of the findings supported the findings of Gibala, *et al.*, (2014), who suggested that low-intensity interval training (low-intensity interval training) can increase glucose regulation and cardiovascular well-being in individuals with T2DM at  $p = 0.002$  in a pre-test post-test group design among a sample size of 45 participants.

However, it should be noted that exercise and regular physical activity have a great influence on health; they also promote overall health and individual state of mind for all ages with better changes in energy balance, psychological well-being, and immune function. However, it was concluded that low-intensity interval training should be used to regulate blood glucose levels and insulin resistance, as well as promote and control T2DM. The study also agreed with Mahmoudi, *et al.*, (2018), who showed that 8 weeks of HIIT led to a significant decrease in blood plasma glucose. Sports activities increase the number of glucose carriers and, as a result, increase the entrance of sugars into muscles. The consumption of sugars during sports activities has an insulin-like effect and sends a lot of glucose into the cell to spend on energy production. In this study, blood glucose levels in the diabetic group were significantly lower than in patients who received metformin, which suggested that intense physical activity may be a good alternative to medication to reduce glucose. Similarly, to the findings of Rynder *et al.* (2014), who stated that acute high-intensity exercise compared with the no-exercise control group was significantly different from the control HIE (0.6,  $P \leq 0.05$ ) and moderate-intensity exercise with MIE (0.4) effectively improved the late-phase postprandial glucose and insulin responses to an oral glucose tolerance test, Both MIE and HIE are beneficial for improving postprandial insulin sensitivity, measured 1 hour after the cessation of exercise. Although the differences between exercise conditions did not reach statistical significance, they suggested that HIE conveys greater postprandial benefits compared with an isocaloric bout of MIE.

### Conclusion

These findings therefore indicate that low-intensity interval training is an effective approach for managing blood glucose level in individuals with type-II diabetes mellitus. The study further highlighted the importance of exercise in the prevention and management of diabetes-related health complications and emphasizes the need for proper guidance and techniques in exercise programmes for individuals with type-II diabetes mellitus. It was concluded that there was significant decreased in the blood glucose level among type-II diabetes mellitus patients who participated in the programme.

### Recommendation

Based on the findings of the study, it was recommended that Low-intensity interval training should be sustained to regulate the blood glucose level among type II diabetes mellitus patients in Zaria clinics. Exercise and sports scientist, physiotherapist should recommend moderate and low intensity training to help patients with type-II diabetes mellitus in Zaria Metropolis. |

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