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Acknowledgements

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Book:
Park K. Park's Textbook of Preventive and Social Medicine. 20th ed. Jabalpur, India: M/s Barnasidas Bhanot; 2009.

Book chapter:
Hancock B. Vesico-vaginal and rectovaginal fistula. In: von Beekhuizan H, Ukels R (editors). A Textbook of Gynecology for Less-Resourced Locations. 1st ed. London, UK: Sapien Publishing Ltd; 2012: 233-274.

Website:
United Nations Children's Fund (UNICEF). Fact Sheets, HEALTH, Nigeria. Available from: https://www.unicef.org/nigeria/factsheets_HEALTH_low.pdf [Last accessed on 2018 September 6].
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Original Articles

Perception of illness and health seeking behavior among Fulani in Wamakko Local Government Area of Sokoto State, Nigeria

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ABSTRACT

Background: Several studies have established strong links between individual's health seeking behavior and perception of illness, as well as accessibility to healthcare services. **Aim**: This study aimed to assess the perception of illness, and health seeking behavior of Fulani in Wamakko Local Government Area, Sokoto State, Nigeria. **Materials and Methods:** A cross-sectional study conducted among 390 semi-normadic Fulani (selected by multistage sampling technique) in rural communities of Wamakko LGA, Sokoto State, Nigeria. A semi-structured pretested interviewer-administered questionnaire was used to obtain information on the research variables. Data were analyzed using IBM SPSS version 17 statistical computer software package. **Results**: More than two-thirds 270 (69.2%) of the 390 respondents had no formal education. Two hundred and thirty-nine (61.3%) wrongly perceived illness to be from God, while 145 (37.2%) and 167 (42.8%) sought care in health facilities for themselves and their children respectively. Of the 172 female respondents, only 37 (21.5%) and 32 (18.6%) had their pregnancy supervised and their last delivery in a health facility respectively, with the main obstacles being financial constraints, poor physical access, and lack of approval by their husbands. Most 282 (72.3%) of the 390 respondents did not take their youngest child to the hospital for immunization at all. **Conclusion**: Majority of the respondents in this study wrongly perceived illness to be naturally from God, and utilization of healthcare services was poor among them. Government should give education of the Fulani girl child top priority and make healthcare services more accessible to this vulnerable population.

Keywords: Perception of illness, health seeking behavior, Fulani

INTRODUCTION

Health is essential for social and economic development; it is seen as a resource for everyday living and sought after by all.[1] Health seeking behavior has been defined as a sequence of remedial actions that individuals undertake to rectify perceived ill health.[2] The link between health and human behavior is a major area of interest in public health. An abundance of descriptive studies on health seeking behavior, demonstrate the complexity of influences on an individual's behavior at a given time and place.[3] Studies have also shown that there are numerous influences on an individual's health seeking behavior namely; past experience with health services, perception about quality and efficiency of health services and influences at the community level.[4] In the WHO conceptualization model, lifestyle is a way of life, a socioeconomic phenomenon arising from interaction between patterns of behavior and specific situations rather than individual decision to avoid or accept certain health risks.[5] Considering this, health seeking practices are shaped by values and beliefs learned in specific cultures and by opportunities and constraints defined by specific social and economic situations.[5] Health and disease are interrelated and their concept varies from culture to culture and people to people, especially in tribal communities, because their concept of health and health seeking behavior is a part of their culture.[6]

The perception or recognition of illness is the first important stage in the sequence of healthcare. According to Suchman[7] problem identification occurs at this stage and without that identification no healthcare would be sought. A study in Mexico and another in Nepal in 2004 have all identified symptom recognition and perception as a barrier to care-seeking.[8] First the person has to

assume the sick role, acceptance into this role for a child, as noted by a study on childhood illness in Nepal in, depends primarily upon maternal recognition of certain signs and symptoms of child illness, such as illness severity.[9]

Health care-seeking is a complex behavioral phenomenon. Literature suggests that the choice of care depends upon distance to facility, cost involved, and quality of care provided. However, care-seeking in presence of all these obstacles is also defined by illness-related factors, such as severity or nature of morbidity. Differential use of health services is also shaped by other factors, including socioeconomic status and gender.[10] The perception on illness varies enormously with different ethnic groups. By and large, a general view on illness is found as any incapacitation in the performance of normal activities, such as, working in the field, doing domestic works, going outside for business etc. due to physical discomfort. Illness may be identified in terms of biological parameters such as pain in different part of the body, loss of appetite, headache, loss of body weight, lose eyesight etc. However, few conceptualize illness in terms of broader cosmological explanation involving the interaction of spirits, supernatural forces and ominous power of nature.

The word Fulbe was first used by the German writers to refer to the Fulanis in 1945.[11] The Fulani (known by different names such are Peul in Wolof, Fula in Bambara, Felaata in Kanuri and Fulani in Hausa) are majorly pastoralists and reside in the rural populations of the West African countries, including Nigeria, where less than 15% of the populace have access to medical services. Even among the rural dwellers, the Fulani pastoralists are disadvantaged in getting medical services; this obviously explains the high morbidity and mortality among them as one of ten Fulani children born alive die within the first birth day, one of five Fulani children does not reach the age of six, and the likelihood of a Fulani child living up to the age of fifty years is only forty-six percent.[11]

A cause for concern is the fact that of all Nigerians, the Fulani are the most vulnerable to diseases and natural hazards.[11] Although they contribute to the national economies of their countries and are the major producers of milk, meat and other animal products in many African countries[12] they have less access to health care, safe drinking water and formal education and are more exposed to diseases such as Malaria than the settled population.[13] The mobility of the Fulani exposes them to extremes of temperatures and allergies

associated with dust, weeds, and animals; and they drink water that is polluted with dirt and decomposing matter. Their unprotected bodies are exposed to injuries (including cuts from thorns, tree branches, falling trees and accidental gun shots by hunters) and bites or stings from bees, snakes, scorpions, mosquitoes and flies. It is therefore not surprising that the pastoral Fulani are plagued by diseases such as malaria, filariasis, dysentery, gangrene wounds, liver flukes, bilharziasis, asthma, rabies, sleeping sickness, hyperthermia, skin disorder, tuberculosis, constipation, and exhaustion.[11]

In a study carried out among Nomadic Fulani, it was reported that they perceived intermittent fever (which is believed to be their most common health problem, and is called "pabboje" in their local language) to be due to environmental factors including early rains; and despite its interference with their normal duties such as herding, rather than seek orthodox medical care (which they considered to be unnecessary), they routinely use traditional medicines, or perform some rituals to reduce its severity or prevent a recurrence. Although modern antimalarials may make the severity of subsequent pabboje episodes worse, nomads seek treatment in private health facilities against fevers that are persistent using antimalarial medicines. It was concluded that understanding nomadic Fulani beliefs about pabboje is useful for planning an acceptable community participatory fever management among them.[14]

Another study carried out by among Fulani of Karfi Village in Northern Nigeria on perception and beliefs about mental illness showed that the most common symptoms proffered by respondents as manifestations of mental illness included aggression/destructiveness (22.0%), loquaciousness (21.2%), eccentric behavior (16.1%) and wandering (13.3%). Although about a third of respondents (34.3%) identified drug abuse as a cause, close to a fifth of them attributed it to divine wrath/Gods will (19.0%), and magic / spirit possession (18.0%). Less than half of respondents (46.0%) preferred orthodox medical care for the mentally sick, while about a third (34.0%) preferred spiritual intervention. The study emphasized the need to organize community educational programs aimed at demystifying mental illness across Nigeria.[15]

Various factors are known to intervene in the process of using health services once the need for care is perceived, whether because of illness or the threat of it or because of a desire to maintain present levels of health. Such intervening factors include individual predisposing factors (e.g. demographic characteristics or individual

attitudes) and enabling factors, derived from the socioeconomic environment including the extent to which access to health services is contingent upon the ability to defray expenses of the extent and nature of insurance provisions.[2] A study conducted among rural Yoruba and Fulani residents of two local governments in Oyo State, Nigeria, to determine differences in health seeking behavior reported that Fulani residents more commonly used private facilities during a recent illness, while Yoruba residents more commonly used government facilities.[16] Similarly, a study that assessed the health seeking behavior of nomadic Fulani at the Gongola-Benue valley in Northeastern Nigeria reported that they patronize private health facilities but hardly public ones; and the major reasons given were the flexible and negotiable payment condition in the private health facilities, the closeness of the facilities to their camps, satisfaction with the services provided, and the politeness of the health care providers working in the private health facilities as compared to the public ones.[14]

Understanding the health seeking behavior of the Fulani is therefore important in designing appropriate strategies for improving both their access to health care services and their health status. Currently, there is a dearth of literature on the health seeking behavior of the Fulani in Nigeria, and there is no documentation on the health seeking behavior of the semi-nomadic Fulani in North-Western Nigeria. This study was conducted to assess the perception of illness, and health seeking behavior of Fulani in Wamakko Local Government Area, Sokoto State, Nigeria.

MATERIALS AND METHODS
Study Design, Population and Area
A cross-sectional study was conducted among semi-nomadic Fulani (i.e., whose living habits are largely nomadic but also plant some crops at temporary camps) living in Wamakko Local Government Area of Sokoto State, Nigeria, in October 2012. All consenting permanent residents of the selected settlements ≥ 18 years of age were considered eligible for enrollment into the study, while their visiting relatives who do not reside in the settlements were excluded.

Sample Size Estimation and Sampling Technique
The sample size was statistically estimated at 384 (and then adjusted to 426 in anticipation of a 90% response rate) and the eligible participants were selected by multistage sampling technique. At the first stage, 2 of 11

Wards in Wamakko Local Government were selected by simple random sampling using the ballot option. At the second stage, line listing of all the settlements in the selected Wards was done, and 2 settlements were selected in each of the selected Wards by simple random sampling using the ballot option. At the third stage, the population of Fulani in the selected settlements was obtained and proportionate allocation of respondents was done; houses were then selected in the respective settlement by systematic sampling technique. One of every 3 houses was selected, and an adult ≥ 18 years in each selected house was interviewed. In a house with more than one adult, one was selected by simple random sampling using the ballot option, and if no adult was found in a selected house, the next house was done. This was continued until the desired sample size was obtained (430 subjects were enrolled into the study).

Data Collection and Analysis
A semi-structured interviewer-administered questionnaire with open and closed questions was used to obtain information on the participants' socio-demographic characteristics, perception of illness, and health seeking behavior. Thirty students of the School of Nursing, Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto, Nigeria, assisted in data collection after a two-day training that focused on various aspects of research, community entry, use of survey instrument, and the entire conduct of the study. The questionnaire was pretested on 20 Fulani in one of the Wards that were not selected for the study, and the necessary modifications were made based on the observation made during the pretesting. Data were analyzed using the IBM SPSS version 20 computer statistical software package. Quantitative variables were summarized using mean and standard deviation, while categorical variables were summarized using frequencies and percentages.

Ethical Consideration
Ethical approval was obtained from the Research and Ethics Committee of Sokoto State Ministry of Health, Sokoto, Nigeria. Permission to conduct the study in the selected settlements was obtained from the administration of Wamakko Local Government Area, Sokoto State, Nigeria, and informed written consent was obtained from the study participants before data collection.

RESULTS

Socio-demographic characteristics of respondents

Three hundred and ninety out of the 430 questionnaires administered were adequately completed and found suitable for analysis, giving a response rate of 90.7%. The mean age of respondents was 39.1±16.4 years. All the 390 respondents were Muslims; and most of them 327 (83.84%) were married. Majority of respondents 218 (55.9%) were males and more than two-thirds 270 (69.2%) had no formal education (Table 1).

Table 1: Socio-demographic characteristics of respondents

Variables	Frequency (%) n = 390
Age group (years)	
18-27	120 (30.8)
28-37	74 (19.0)
38-47	69 (17.7)
48-57	56 (14.3)
58-67	53 (13.6)
>68	18 (14.6)
Religion	
Islam	390 (100)
Marital status	
Single	33 (8.5)
Married	327 (83.8)
Separated / divorced	30 (7.7)
Sex	
Male	218 (55.9)
Female	172 (44.1)
Education level	
None	88 (22.5)
Quranic only	182 (46.7)
Primary	51 (13.1)
Secondary	28 (7.2)
Tertiary	41 (10.5)

Respondents' perceived causes of illness

About two-thirds 239 (61.3%) of the 390 respondents believed that illness was from God, while only less than a third 109 (27.9%) perceived illness to be caused by germs (Figure 1).
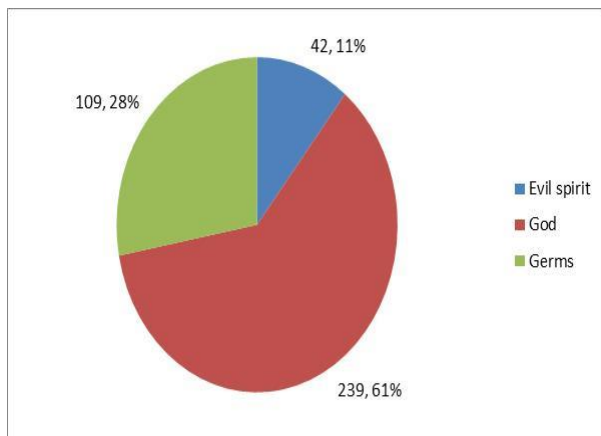

Figure 1: Respondents' perceived causes of illness

Respondents' preference of source of health care

Less than half 145 (37.2%) of the 390 respondents sought care in a government hospital or health facility, and only a few 13 (3.3%) sought care in a private hospital during their last illness. Close to two-thirds 232 (59.5%) of the 390 respondents sought care through other sources (including drug vendors, traditional healers and spiritual homes) instead of a hospital. Of the 158 respondents that sought care in a hospital when ill, less than half of them 72 (45.6%) did so promptly, while about a third 48 (30.4%) did so only after home remedy failed. Among the 232 respondents that did not seek care in a hospital when ill, most 169 (43.3%) did not do so because they could not afford the charges, while the other reasons given were hospital being far from home (21.1%), attitude of hospital staff (21.1%), and lack of approval from husband (16.5%) as shown in Table 2.

Table 2: Respondents' preference of source of health care

Variables	Frequency (%)
Where care was sought during the last illness (n = 390)	
Government owned hospital or health facility	145 (37.2)
Private hospital	13 (3.3)
Other sources (drug vendors, traditional healers, spiritual homes)	232 (59.5)
When hospital care was sought (n = 158)	
Immediately symptoms were felt	72 (45.6)
When there was no relief of symptoms after some time	48 (30.4)
When home remedy failed	38 (24.0)
Main reason for not going to a hospital or health facility (n = 232)	
Treatment charges not affordable	169 (43.3)
Hospital was far from home	74 (19.1)
Attitude of hospital staff	82 (21.1)
Husband did not give approval	64 (16.5)

Supervision of pregnancies and deliveries among female respondents

Only about a fifth 37 (21.5%) of the 172 female respondents had their last pregnancies supervised. Of these, majority 26 (70.3%) had their pregnancies supervised at home, but most of them 35 (94.6%) had their pregnancies supervised by a midwife. Among the 135 female respondents whose pregnancies were not supervised, the most commonly cited reason was not being able to afford the charges (49.6%), while the other reasons given were lack of approval from husband (18.5%), hospital being far from home (16.3%), and lack of female care givers (18.5%). Less than a fifth 32 (18.6%) of the 172 female respondents had their last deliveries in a hospital (Table 3).

Table 3: Supervision of pregnancies and deliveries among female respondents

Variables	Frequency (%)
Had her last pregnancy supervised (n = 172)	
Yes	37 (21.5)
No	135 (78.5)
Place where pregnancy was supervised (n = 37)	
Home only	26 (70,3)
Home and hospital	4 (10.8)
Hospital only	7 (18.9)
Pregnancy supervisor (n = 37)	
Family member	2 (5.4)
Midwife	35 (94.6)
Reasons for pregnancies not being supervised (n = 135)	
Hospital far from home	22 (16.3)
Hospital charges not affordable	67 (49.6)
No female caregiver	21 (15.6)
Husband did not give approval	25 (18.5)
Place of last delivery (n = 172)	
Home	140 (81.4)
Hospital	32 (18.6)

Preferred place of treatment for children and acceptance of immunization

Less than half 167 (42.8%) of the 390 respondents have ever sought care in a hospital when their youngest children were ill. About a quarter 100 (25.6%) sought care from traditional healers, while 54 (13.9%) and 47 (12.1%) sought care from drug vendors and traditional healers respectively. Less than a third 108 (27.7%) of the 390 respondents have ever taken their youngest children to a hospital for immunization. Of these, less than half 38 (35.2%) were immunized ≥ 5 times. Among the 282 respondents who have never taken their youngest children to a hospital for immunization, the most commonly cited reasons were fear of the vaccines causing harm to their babies, and their relatives being against it., while the other reasons given were not considering it as necessary 59 (20.9%), and fear of their babies developing fever after being vaccinated 47 (16.7%) as shown in Table 4.

DISCUSSION

This study assessed the perception of illness and health seeking behavior among Fulani in Sokoto. Majority (55.9%) of the respondents in this study were males, this is in contrast with the study conducted by Otusanya et al.[16] among Fulani Herders and Yoruba farmers in Oyo where majority of respondents (52.4%) were females. This could be due to the fact that whereas this study was conducted among a homogenous population of Fulani, the other latter study involves two ethnic groups with different cultures. It is not surprising that all the respondents in this study were Muslims considering the fact that Islam is the predominant religion in the study

area, and also, the Fulani ethnic group mainly practices Islam. This is similar to the finding in a study among Fulani nomads in Enugu, Nigeria which reported that all the respondents were Muslims.[17] More than two-thirds (69.2%) of the respondents in this study had no formal education; this is in agreement with the finding in a study on utilization of maternity services in Gidan Igwai Sokoto, by Oche et al.[18] which showed that 71.3% of respondents had no form of formal education. This could be due to the prevalent practice of withdrawal of Fulani girls for early marriage, while the males are made to take care of the family herd instead of going to school.[19]

.Table 4: Preferred place of treatment for children and acceptance of immunization

Variables	Frequency (%)
Where care was sought when youngest child was ill (n = 390)	
Hospital	167 (42.8)
Drug vendors	54 (13.9)
Traditional healers	100 (25.6)
Home treatment	47 (12.05)
No response	22 (5.64)
Youngest child ever taken to hospital for immunization (n = 390)	
Yes	108 (27.7)
No	282 (72.3)
Number of times youngest child was immunized (n = 108)	
< 5	70 (64.8)
≥ 5	38 (35.2)
Main reason for not immunizing youngest child (n = 282)	
It is not necessary	59 (20.9)
Fear of harm to the child	110 (39.0)
Fear of child developing fever	47 (16.7)
Relatives were against it	66 (23.4)

Majority (61.3%) of the respondents in this study wrongly perceived illness as being naturally from God. This could be related to their low educational attainments as less than a third of them (27.9%) were aware of transmission of diseases by germs. This finding is comparable to the finding in a study on health seeking behavior among semi-nomadic Lohar Gadiyas which showed that 62.2% of respondents believed that illness is caused only by the mercy of God.[6] Majority of the respondents in this study (59.5%) sought care from other sources (including drug vendors, traditional healers and spiritual homes) instead of a hospital. This could be related to the ease of access to these sources, particularly the cheaper fees charged by them. Patent medicine vendors are present in every locality in Nigeria, and they constitute the major source of care for the populace.[20] In relatively low utilization of private hospitals (3.3%) as compared to government owned hospitals (37.2%) by the respondents in this study is in contrast to the finding

in a study by Akogun et al.[14] in which the respondents showed preference for private hospitals and avoided government owned hospitals. This may be due to the limited number of private hospitals in the study area.

The finding of the main common reasons for not seeking care in a hospital being inability to afford the charges (43.3%) and attitude of hospital staff (21.1%) is in consonance with the finding in a study by Iro[11] who reported that financial constraints and attitude of health workers were major barriers to utilization of health care facilities by them. In the latter study, 61% of Fulani partly or fully pay for their own medical costs, and 22.8% of respondents did not visit government hospitals due to attitude of the staff. It was also reported that when they see an opportunity, health care workers extort fees from Fulani, while counter-clerks mock the Fulani who do not speak English or the local language.[11] It is therefore not surprising that less than half (42.8%) of the respondents in this study sought care in a hospital when their children were ill, and these findings bring to the fore the need for governments at all level to improve the accessibility (physical, financial and intellectual) of residents of the rural populations across the country to healthcare services. Also, the management of healthcare facilities should promote good health worker-patient relationship in their respective facilities.

Long distance between the health facilities and their homes was the reason given for not seeking care in a hospital by close to a fifth (16.6%) of the respondents in this study. This is similar to the finding in a study on sedentism and malnutrition among nomadic Fulani children in South Western Nigeria, in which the settlements were said to be located very far from the health facilities that provide health and nutrition education services.[21] Also in contrast to the relatively high proportion (16.5%) of female respondents who did not seek care in a hospital because their husbands did not allow them to do so, only a few respondents (4.3%) reported non-utilization of health care facilities as being due to lack of approval by their husbands in a study in South Western Nigeria.[21] This could be due to the low level of educational attainments by the respondents in this study as compared to those in the latter study. According to the Nigeria Demographic and Health Survey 2013, North Western Nigeria had the highest proportion of females with no formal education in the country (62.8%), and within the North-Western zone, Sokoto State had the highest prevalence of women with no formal education (78.5%).[22] It is therefore not surprising that only about a fifth (21.5%) of the female respondents in this study had their last pregnancies

supervised and only a few of them (18.6%) delivered in a hospital; and the main reasons given by the majority whose pregnancies were not supervised were also inability to afford the charges (49.6%) and lack of approval from their husbands (18.5%). These findings underscore the need for government to pay special attention to education of the Fulani girl child.

The high proportion (72.3%) of respondents whose last children were never vaccinated in this study is alarming, and it is far higher than the 21.0, 20.8 and 24.1% prevalence of no vaccination in Nigeria, North-Western zone, and Sokoto State respectively; and it may not be unconnected with the poor educational attainment among women in Sokoto State.[22] Also, rumors of 'contaminated' polio vaccine ignited a controversy in Kano state, in Northern Nigeria in mid-2003 and led to official suspension of immunization activities. Such rumors, which ranged from contamination of polio vaccine with human immunodeficiency virus at the time of manufacture to deliberate addition of hormones to permanently sterilize young girls, have plagued the attitude towards immunization services in Northern Nigeria (the study area inclusive),[23] and this could have contributed to the abysmally low immunization coverage obtained in this study.

It had been observed over the years that basically, health programs often do not reach the Fulani. For example, among the Fulani living in South-western Nigeria, their children had lower immunization rates than the settled farmers and their settlements they were not included in the guinea worm surveillance and control program that was carried out in their area.[24] It is therefore not surprising that Fulani children had the worst health indices in Nigeria[11] and these findings provide additional evidence in support of the need for Government at all levels to make healthcare services more accessible (both physically and financially) to the Fulani and others vulnerable populations across Nigeria. In addition, utilization of maternal and child health services should be promoted among the Fulani through aggressive advocacy and education, improved and more accessible healthcare services, and regular outreach immunization programs, to be taken to the door steps of the nomadic Fulani in their respective settlements.

Specifically, to attain and maintain a level of health that will permit good economic and social development among this vulnerable group, basic education of the Fulani girl child should be made compulsory in Nigeria. Also, the national board for nomadic education should be strengthened and empowered to carry out its mandate

in ensuring that Fulani children in every part of the country have access to Western education.

CONCLUSION

Majority of the respondents in this study wrongly perceived illness to be naturally from God, and utilization of healthcare services was poor among them. Government should give education of the Fulani girl child top priority and make healthcare services more accessible to this vulnerable population.

Conflict of interest

None declared.

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Impact of antiretroviral therapy on immunity and malaria among febrile HIV-infected children seen in a tertiary hospital in Sokoto, Nigeria

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ABSTRACT

Background: Coexistence of malaria with HIV in Sub-Saharan African and its attendant high morbidity and mortality could be a threat that can reverse the gains of ART in HIV-infected children. **Aim:** This study aims to determine the impact of ART on immunity and malaria among febrile HIV-infected children seen in UDUTH, Sokoto, Nigeria. **Materials and Methods:** A cross-sectional study was conducted among HIV-infected children presenting with fever at the Paediatric ART and other Paediatric Outpatient Clinics in the hospital between May and October 2016. Blood film for malaria parasite, packed cell volume, random blood sugar, retroviral test and $CD4^+T$cell count were done for the participants. Data were analyzed using the IBM SPSS version 23.0 computer statistical software package. A p-value $\leq$ 0.05 was considered as significant. **Results**: A total of 100 febrile HIV-infected children on ART, and 40 febrile newly diagnosed HIV-infected children not on ART were recruited. The prevalence of malaria among the febrile HIV-infected children on ART was 60% (60/100) compared to 100% (40/40) among those not on ART (χ^2=25.6, p < 0.001). Among the 60 HIV-infected children on ART who had malaria, 12(20.0%) had severe malaria compared to 34 (85.0%) among the 40 that were not on ART (χ^2=25.6, p < 0.001). The mean $CD4^+T$ cells count was 403 $\pm$ 168cells/μl among the HIV infected children on ART compared with 194 $\pm$ 67cells/μl in the treatment naïve patients, and the difference was statistically significant (p < 0.001). Although, the $CD4^+T$-lymphocyte level correlates negatively with malaria parasite density among the HIV-infected children, it was not statistically significant (r = -0.082, p = 0.33). **Conclusion**: ART boosted immunity and reduced malaria prevalence and severity in febrile HIV-infected children. Efforts should be intensified towards early diagnosis and prompt commencement of ART in HIV-infected children.

Keywords: HIV infection, ART, impact, immunity, malaria, children

INTRODUCTION

Human Immunodeficiency Virus (HIV) is an infection of global health importance.[1]Before the introduction of antiretroviral therapy in the mid-1990s, HIV infection in human was considered a death penalty because people with HIV infection rapidly progressed to AIDS in just a few years. In 2017, more than half of the global population living with HIV were receiving antiretroviral treatment including 52% of HIV-infected children aged 0–14 years.[1] Hence, AIDS-related deaths reduced by more than 51% since the peak in 2004. Today ART has converted HIV, a once fatal infection, to a chronic stable infection. Therefore, HIV-infected persons can live nearly as long as someone who is non-HIV infected. The World Health Organization (WHO) had looked into ways of sustaining this great achievement of ART and

identified the need to focus on other preventable and treatable infections that may add to the morbidity and mortality of HIV-infected persons, hence the consideration of malaria in this study.

Malaria is also an infection of global health importance that affects about 200 million people worldwide annually and causes about 584,000 deaths each year.[2] More than 90% of malaria cases and death occur in sub-Saharan Africa and remain a major cause of childhood mortality. Nigeria which currently ranks top among the African nations plagued by HIV/AIDS has the highest burden of malaria in the WHO sub-Saharan Africa region.[3,4] It is feared that the coexistence of Malaria with HIV in the sub-Saharan African countries including Nigeria and its

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attendant high morbidity and mortality could be a threat that can reverse the gains of ART in HIV-infected children.

Studies in sub-Saharan Africa have reported increased risk of malaria parasitaemia and clinical malaria in HIV-infected populations compared to HIV-negative groups.[5-7] In Nigeria, high prevalence of malaria in HIV-infected population has been documented in a few studies.[8,9] However, most of these studies were carried out among adult populations who were not on antiretroviral treatment.[5-9] It is suspected that ART which is able to prevent destruction of CD4$^+$Tcell to boost immunity and prolong the life of HIV-infected patients may also offer some protection against malaria and the severe form of malaria in HIV-infected children who are on ART as compared to HIV-infected children who are not on ART. This study was conducted to assess the impact of ART on immunity, malaria prevalence and severity among febrile HIV- infected children with the hope that the findings would provide additional evidence on the need to intensify efforts towards timely ART uptake among HIV-infected children.

MATERIALS AND METHODS
Study Design, Population and Area
A cross-sectional study was conducted among febrile HIV-infected children, aged 3-months to 15-years from May to October 2016. The study population comprised known HIV-infected children presenting with fever at the Paediatric ART clinic and newly diagnosed HIV – infected children during visit to the Paediatric Out-Patient Department (POPD), Emergency Paediatric Unit (EPU) or Paediatric Medical Ward (PMW) of Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto, Nigeria. Children that were aged 3 months to 15 years, with confirmed HIV infection (i.e., HIV positive), and axillary temperature ≥ 37.5^{0}C or complaint of fever, whose parents or caregiver gave informed written consent (and assent in children aged 7 years and above[13]) were considered eligible for enrollment into the study; while those with prior anti-malaria treatment (< 2 weeks) before presentation, those known to have background chronic illnesses like sickle cell anaemia, malignancy, allergic disorders, severe malnutrition (not due to HIV infection), and those with obvious clinical features of alternative causes of fever other than malaria were excluded.

Sample Size Estimation and Sampling Technique
A sample size of 140 was estimated using the statistical formula for calculating the sample size for cross-sectional studies,[10] based on a 9.1% prevalence of malaria among HIV-infected children in a previous study in Nigeria[11], a precision level of 5%, and an anticipated 90% response rate. All known HIV-infected children presenting with fever at the Paediatric ART clinic and all febrile children attending the EPU, POPD or PMW that were found to be reactive to retroviral screening during the study period, and met the eligibility criteria were recruited consecutively until the sample size was met.

Data Collection and Analysis
A proforma was used to obtain information on the socio-demographic characteristics (age, sex, educational and employment status of parents), and their clinical parameters (HIV status, ART treatment, clinical features of severe malaria, recent treatment of malaria and other symptoms that may present with fever e.g. urinary symptoms, respiratory tract infection), and the results of the laboratory tests (including blood film for malaria parasite, packed cell volume, random blood sugar, HIV serology test, HIV DNA PCR for confirmation of HIV infection, CD4$^+$T cell count) which were also done according to standard procedures.[16-19] The socioeconomic class of the parents was determined using Oyedeji's classification.[15] Data analysis was done using the IBM SPSS version 23.0 computer statistical software package. Comparison of arithmetic means was done using Student t-test, while comparison of proportions was done using Chi-square test, and Fisher's exact test where applicable, and the results were presented using frequency distribution tables. A p-value ≤ 0.05 was considered as significant.

Operational definition of terms
Severe *P. falciparum* malaria was defined using the WHO criteria[12] as a person with P. falciparum asexual parasitemia and one of the following clinical features: impaired consciousness or coma (i.e., a Blantyre coma score < 3 in children), prostration, failure to feed, multiple convulsions, acidotic breathing, circulatory collapse, clinical jaundice with evidence of other vital organ dysfunction, hemoglobinuria, abnormal spontaneous bleeding, and/or pulmonary edema. The laboratory findings can include: hypoglycemia (blood glucose < 2.2mmol/l or < 40mg/dl), metabolic acidosis (plasma bicarbonate < 15 mmol/l), severe normocytic anemia (Hb < 5g/dl or Haematocrit of < 15% in children), hemoglobinuria, hyperparasitemia (> 5% / 250,000 per μl), and renal impairment (serum creatinine > 265μmol/l).

Ethical Consideration
Ethical approval was obtained from UDUTH's Health Research and Ethics Committee

(UDUTH/HREC/2015/No.341) while informed written consent was obtained from the parents or caregivers. In addition, assent was obtained from children aged 7 years and above.[13] Participants recruited were assigned identification numbers (ID) and the details were kept confidential by the investigator. The content of the consent form was read and interpreted in a language that the parent/caregiver understood. The consent form provided information on the importance of the study, the blood tests to be done, and need for anti-malarial treatment. Children with uncomplicated or severe malaria were treated according to the current WHO guidelines on treatment of malaria.[20,21]

RESULTS

Socio-demographic characteristics of participants

A total of 140 febrile HIV-infected children of which 71 (50.7%) were males and 69 (49.3%) were females. One hundred (71.4%) of the 140 participants were on ART, while 40 (28.6%) were newly diagnosed HIV- infected children who were not on ART (Figure I). The mean age of the HIV–infected children that were on ART was 6.00 ± 4.10 years while the mean age of the HIV-infected children that were not on ART was 4.20 ± 3.90 years, and there was no significant difference between the mean ages of the participants in the two treatment categories (t= 0.11, p= 0.315) [Table1]. Twelve (12.0%) of the 100 HIV-infected children that were on ART were in the upper socioeconomic class while none of the HIV-infected children that were not on ART was in the upper socioeconomic class and the difference in distribution of participants by socioeconomic class was statistical significant ($\chi^2 = 6.030$, p = 0.049) [Table1].
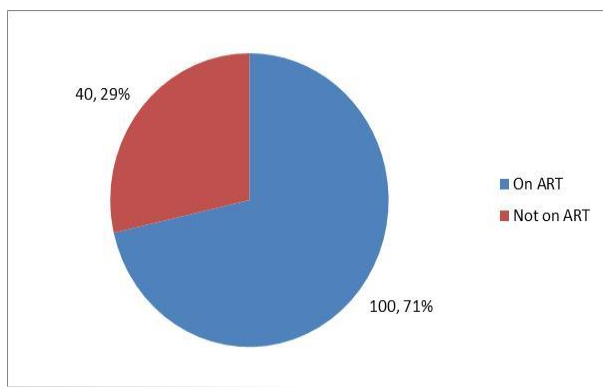

Figure 1: Distribution of participants by type of treatment

Prevalence of malaria among participants

Malaria parasite was demonstrated in 60 (60.0%) of the 100 febrile HIV-infected children that were on ART as

compared to all the 40 (100%) febrile HIV-infected children that were not on ART ($\chi^2 = 25.6$, p < 0.001) [Figure 2]. The prevalence of malaria among the HIV-infected children on ART was found to be significantly associated with age ($\chi^2 = 11.848$, p = 0.003) [Table 2].
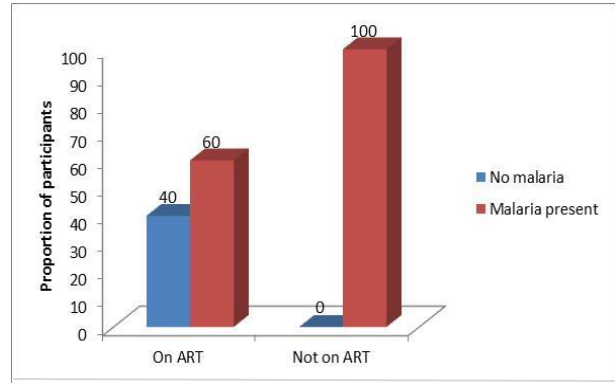
Figure 2: Prevalence of malaria by type of treatment

Severity of malaria among participants

Among the 60 HIV-infected children on ART who had malaria, 12(20.0%) had severe malaria compared to 34 (85.0%) of the 40 cases of malaria among the HIV-infected children that were not on ART ($\chi^2 = 25.6$, p < 0.001) [Figure3]. Among the HIV-infected children on ART who had malaria, the severe form of malaria was significantly (p < 0.05) associated with sex, age and socioeconomic class (Table 3). The mean parasite density was 70,636 ± 52,821 among the HIV-infected children that were not on ART as compared with 62,357 ± 45,520 among the HIV-infected children that were on ART, but the difference was not statistically significant (t = 0.841, p = 0.09). Also, the mean CD4+T cells count was 403 ± 168cells/ul among the HIV infected children on ART compared with 194 ± 67cells/µl in the treatment naïve patients, and the difference was statistically significant ($\chi^2 = 33.70$, p < 0.001).

Figure 3: Distribution of severe malaria by type of treatment

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Table 1: Socio-demographic characteristics of participants

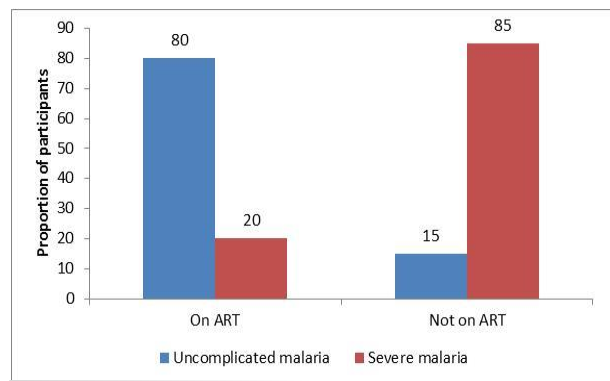| Variables	Type of treatment		Test of significance
	On ART (n = 100) Frequency (%)	Not on ART (n = 40) Frequency (%)	
Age (years)			
Minimum	0.25	0.25	t = 0.11,
Maximum	15	15	p = 0.315
Mean	6.01 ± 4.10	4.2 ± 3.91	
Age group (years)			
0.25-5.0	43 (43.0)	26 (65.0)	χ^2= 11.848, df = 2
6.0-10.0	37 (37.0)	14 (35.0)	p = 0.003*
11.0-15.0	20 (20.0)	0 (0)	
Sex			
Male	60 (60.0)	12 (30.0)	χ^2= 11.504, df = 1
Female	40 (40.0)	28 (70.0)	p = 0.001*
Socioeconomic status			
Upper class	12 (12.0)	0 (0)	χ^2= 11.848, df = 2
Middle class	18 (18.0)	6 (15.0)	p = 0.049*
Lower class	70 (70.0)	34 (85.0)	

*Statistically significant, t = unpaired t test; χ^2= Pearson's chi-square test

Table 2: Distribution of malaria by socio-demographic variables among the study participants

Variables	HIV infected on ART (n = 100)		HIV infected not on ART (n = 40)	
	Malaria present Frequency (%)	Malaria absent Frequency (%)	Malaria present Frequency (%)	Malaria absent Frequency (%)
Sex				
Male	33 (55.0)	27 (45.0)	12 (100)	0 (0)
Female	27 (67.5)	13 (32.5)	28 (100)	0 (0)
	χ^2= 1.439, df = 1, p = 0.230		#	
Age group (years)				
0.25-5.0	19 (44.2)	24 (55.8)	26 (100)	0 (0)
6.0-10.0	29 (78.4)	8 (21.6)	14 (100)	0 (0)
11.0-15.0	12 (60.0)	8 (40.0)	0 (0)	0 (0)
	χ^2= 9.918, df = 2, p = 0.007*		#	
Socioeconomic status				
Upper class	4 (33.3)	8 (66.7)	0 (0)	0 (0)
Middle class	14 (77.8)	4 (22.2)	6 (100)	0 (0)
Lower class	42 (60.0)	28 (40.0)	34 (100)	0 (0)
	χ^2= 4.921, df = 2, p = 0.085		#	

*Statistically significant, χ^2= Pearson's chi-square test; # = no statistics were computed because malaria parasite was a constant

DISCUSSION

The significantly lower prevalence of malaria among the subject on ART may be because ART boosted immunity and increased CD4+T cell count thereby making CD4+T cells available to protect against malaria infection; this may be achieved by the destruction of pre-erythrocyte stages of the parasite in the liver by cytotoxic T-cells, and also by the production of anti-malarial antibodies by CD4+T-cells to control parasitaemia.[22,23] The lower prevalence could also mean that ART has direct anti-malaria property. Most of the available studies on prevalence of malaria in HIV-infected patients were carried out among HIV-infected patients that were not on ART in the era before the wide availability and high uptake of ART; Omoti et al[24] in Benin reported a malaria prevalence of 74% in HIV infected adults that

similarly had fever (clinical malaria) but were not on ART. Okonko et al[11] in Ibadan, Nigeria reported a significantly lower malaria prevalence of 9.1% among HIV-infected children aged 3 days to 15 years that were not on ART, but only antibody testing for HIV was carried out, viral DNA PCR confirmation for children aged less than18 months was not done. As such, the HIV–infected population could have been under represented, thus resulting in the relatively low prevalence of malaria that was reported. Ahmed et al.[25] in Abuja, Nigeria, reported a malaria prevalence of 13.3% among HIV infected children aged 3-15 years that had no fever, it means the specificity of absence of fever in identifying correctly those that were free of malaria was 86.7%. This when compared with the overall prevalence of malaria of 71.4% among the HIV-infected

Table 3: Distribution of the clinical forms of malaria by socio-demographic variables among the study participants

Variables	HIV infected on ART		HIV infected not on ART	
	Uncomplicated (n = 48) Frequency (%)	Severe malaria (n = 12) Frequency (%)	Uncomplicated (n = 6) Frequency (%)	Severe malaria (n = 34) Frequency (%)
Sex				
Male	30 (90.9)	3 (9.1)	1 (8.3)	11 (91.7)
Female	18 (66.7)	9 (33.3)	5 (17.9)	23 (82.1)
	χ^2 = 5.695, df = 1, p = 0.017*		χ^2 = 0.5, df = 1, p = 0.452	
Age group (years)				
0.25-5.0	14 (73.7)	5 (26.3)	0 (0)	26 (100)
6.0-10.0	28 (96.6)	1 (3.4)	6 (42.9)	8 (57.1)
11.0-15.0	6 (50.0)	6 (50.0)	0 (0)	0 (0)
	χ^2 = 21.99, df = 2, p < 0.001*		χ^2 = 10.649, df = 1, p = 0.001*	
Socioeconomic status				
Upper class	4 (100)	0 (0)	0 (0)	0 (0)
Middle class	12 (85.7)	2 (14.3)	2 (33.3)	4 (66.7)
Lower class	32 (76.2)	10 (23.8)	4 (11.8)	30 (88.2)
	χ^2 = 6.109, df = 2, p = 0.047		χ^2 = 4.141, df = 1, p = 0.42	

*Statistically significant, χ^2 = Pearson's chi-square test

children that presented with fever, meaning that the sensitivity of fever in identifying correctly those that had malaria was 71.4%. This may mean that fever is a possible sensitive clinical case definition for malaria and that in its absence, malaria may be unlikely.

The significantly lower proportion of participants with the severe form of malaria in the HIV group on ART could be because ART improves CD4+Tcell count, controls malaria parasiteamia and also keeps malaria parasite density low; and according to the mechanical hypothesis of severe malaria, organ affectation is proportional to the number of sequestrated parasite within it.[26] The findings of this study highlight the benefits of ART in reducing the burden of malaria among HIV-infected children, and therefore provide additional evidence in support of the need to intensify efforts towards early diagnosis of HIV infection and prompt commencement of ART in HIV-infected children.

CONCLUSION

ART boosted immunity and reduced malaria prevalence and severity among febrile HIV-infected children. Efforts should be intensified towards early diagnosis of HIV infection and prompt commencement of ART in HIV-infected children.

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Depression status, behavioral lifestyle and coping strategies among persons living with HIV/AIDS in Sokoto, Nigeria

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ABSTRACT

Background: Depression is common and a problem of public health importance worldwide. In Nigeria, clinical depression has been reported to be the most common mental illness among people living with HIV/AIDS (PLWHA). Assessment of the burden of depression and the coping skills of PLWHA is believed to be crucial to the prevention and control of the problem among them. This study was conducted to determine the depression status, behavioral lifestyle and coping strategies among PLWHA in Sokoto, Nigeria. **Materials and Methods:** This was a cross-sectional study among 419 PLWHA (selected by systematic sampling technique) attending the ART clinic of Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria. A structured interviewer-administered questionnaire was used to collect data on the research variables. Data were analyzed using IBM SPSS version 20 statistical computer software package. **Results**: Majority, 227 (54.2%) of the 419 respondents had depression, and different forms of unhealthy dietary habits were prevalent among them (≥ 70.0%). Only 84 (20.0%) and 147 (30.3%) of the 419 respondents perform regular moderate exercise and moderate intensity work respectively. Males had higher depression levels, while females had better coping skills, but the differences were not significant (p > 0.05). **Conclusion**: This study showed high prevalence of depression and unhealthy behavioral lifestyle, with use of both adaptive and maladaptive coping skills among PLWHA in Sokoto, Nigeria. Care providers should design gender sensitive interventions for preventing depression and maladaptive coping strategies among PLWHA.

Keywords: Depression status, behavioral lifestyle, coping strategies, PLWHA

INTRODUCTION

Depression is common and a problem of public health importance worldwide with more than 300 million people affected.[1] It affects an estimated one in 15 adults (6.7%) in any given year, and it has been estimated that one in six people (16.6%) will experience depression at some time in their life.[2] It is the largest cause of disability worldwide with more than 80% of the disease burden being among people living in low and middle income countries, and it is also among the most frequently observed psychiatric disorder among HIV/AIDS patients.[3-5]

Although, the overall prevalence of depression is difficult to estimate across the globe due to the wide variations in prevalence, it has been estimated to range from 20 to above 70%.[3-5] In Nigeria, clinical depression has been reported to be the most common mental illness among people living with HIV/AIDS with the prevalence ranging from 0-47.8%.[6] A study conducted in south-eastern Nigeria reported high prevalence of depression (27.8%) and suicide risk (7.8%) among HIV positive persons,[7] while a similar study among people living with HIV/AIDS in North-central Nigeria reported 56.7% prevalence of depression.[8]

There is increasing evidence that major depression impacts negatively on the course of HIV infection.[9] The negative impact of depression on the course of HIV may manifest in maladaptive self-care behaviors such as sexual risk taking, substance abuse and poor adherence to highly active anti-retroviral therapy (HAART).[8] Poor adherence to antiretroviral treatment (ART) regimes results in increased risk of developing viral resistance. Depression keeps people out of the workplace, reduces

productivity at school and work, and has tremendous negative effects on the economy. People who suffer from depression are nearly 28 times more likely to miss work because of emotional disability.[10] Depression has also has been associated with increased risky behaviors, noncompliance to treatment, and higher risk for co-morbid survival.[3-5]

Coping refers to expending conscious effort to solve personal and interpersonal problems, and seeking to master, minimize or tolerate stress or conflict, and coping mechanisms are commonly termed coping strategies or coping skills.[11] Coping strategies are either adaptive or maladaptive in nature. Adaptive or constructive coping strategies improve functioning and these include: anticipation (i.e when one reduces the stress of some difficult challenge by anticipating what it will be like and preparing for how one is going to cope with it)[12]; and social coping (this involves focusing on the positive side of live, observing adequate sleep and regular physical exercise among other techniques).[13] Maladaptive coping strategies on the other hand reduce symptoms while maintaining and strengthening the disorder, and they include: anxious avoidance (i.e., when a person avoids anxiety provoking situations by all means; escape (in which people want to flee the situation at the first sign of anxiety)[14]; and substance abuse. It is believed that individuals diagnosed with HIV infection may be overwhelmed and socially isolated and therefore prone to use maladaptive coping strategies, which could result in depression or negative health behaviors that amplify disease progression.[15]

Lazarus and Folkman also classified the coping styles that people employ when attempting to resolve or remove a stressor into two groups, namely, problem-focused and emotional focused coping.[16] Problem-focused coping involves altering or managing the problem that is causing the stress and is highly action focused. Individuals engaging in problem-focused coping focus their attention on gathering the required resources (i.e. skills, tools and knowledge) necessary to deal with the stressor. This involves a number of strategies such as gathering information, resolving conflict, planning and making decisions.[16] In general problem-focused coping is best, as it removes the stressors and deals with the root cause of the problem, providing a long term solution. Problem-focused coping appears to be the most adaptive coping style as it is associated with reduced psychological distress. The three problem-focused coping strategies identified by Folkman and Lazarus[16] include taking control, information seeking, and evaluating the pros and cons.

Emotion-focused coping styles are quite varied, and they all seek to lessen the negative emotions associated with the stressors such as embarrassment, fear, anxiety, depression, excitement and frustration. Emotion-focused coping is well suited for stressors that seem uncontrollable (e.g., a terminal illness diagnosis, or the loss of a loved one), and it can take a range of forms such as seeking social support, acceptance and venting of emotions etc.[17] In addition, emotion-focused coping involves releasing pent-up emotions, distracting oneself, managing hostile feelings, meditating using systematic relaxation procedures, reappraising the stressors in a positive light, accepting responsibility, using avoidance, exercising self-control and distancing.[16,18]

The widespread use of highly active antiretroviral therapy (HAART) that became available in 1996 has transformed HIV infection from a terminal illness to a chronic disease, thus increasing survival time for HIV-seropositive people; but while they live longer, they inevitably have to cope with other social and mental health problems (particularly depression) which are often overlooked by their care providers. Determination of the burden of depression among persons living with HIV/AIDS and their coping strategies is therefore crucial to curbing the problem among them. This study was conducted to determine the depression status, behavioral lifestyle and coping strategies among persons living with HIV/AIDS in Sokoto, Nigeria.

MATERIALS AND METHODS
Study Design, Population and Area
A cross-sectional study was conducted among persons living with HIV/AIDS attending the anti-retroviral therapy (ART) clinic of Usmanu Danfodiyo University Teaching Hospital (UDUTH), Sokoto, Nigeria, in July and August 2017. The hospital is a tertiary healthcare facility and it is also one of the designated care centers for persons living with HIV/AIDS in Sokoto state, Nigeria. All those who consented to participate were considered eligible for enrollment into the study, while those who were too ill to respond to the questions in the questionnaire and those with a past history of mental illness were excluded.

Sample Size Estimation and Sampling Technique
The sample size was estimated at 419 using the statistical formula for calculating the sample size for descriptive studies,[19] a 57% prevalence of depression among HIV patients in a previous study,[8] a precision level of 5%, and an anticipated 90% response rate. The eligible participants were selected by systematic sampling

technique using the list of clients attending the clinic during the period of the study to constitute the sampling frame. The clinics are held from Mondays to Fridays, and about 500 clients are seen monthly (i.e., an average of 25 clients are seen on each clinic day). One of 2 patients presenting consecutively at the clinic and meets the eligibility criteria was recruited into the study over a period of two months until the required sample size of 419 was obtained.

Data Collection and Analysis
A structured interviewer-administered questionnaire was used to obtain information on the socio-demographic characteristics of the study participants and behavioral measurements. The questions on behavioral measurements (lifestyle) were adapted from the WHO STEPS Instrument (Core and Expanded).[20] The Patient Health Questionnaire-9 was used to screen the patients for depression, while the Ways of Coping Questionnaire was used to assess the respondents coping strategies. The Patients Health Questionnaire (PHQ-9) is a multipurpose instrument for screening, diagnosing, monitoring and measuring the severity of depression. It is a brief, 9-item, patients self-report depression assessment tool that was derived from the interview-based PRIME-MD.[21] Psychometric evaluation of the PHQ-9 revealed a sensitivity ranging from 62-92% and a specificity between 74-88%.[8] The responses to each of the 9 items that assessed depression in the respondents were scored as: not at all (0), several days (1), more than half the days (2), and nearly every day (3). The total depression score was obtained by adding up the scores of the 9 items; this gives a minimum total score of "0" and a maximum total score of "27", based on which depression level was graded as no depression (1-4), mild (5-9), moderate (10-14), moderately severe (15-19) and severe (20-27).[22]

The "Ways of Coping Questionnaire" has 8 scales namely: *Confrontative coping*- describes aggressive efforts to alter the situation. It also suggests a degree of hostility and risk taking; *Distancing*- describes efforts to detach oneself; *Self-controlling*- describes efforts to regulate one's own feelings; *Seeking social support*- describes efforts to seek informational and emotional support; *Accepting responsibility*- acknowledges one's own role in the problem and trying to put things right; *Escape-avoidance*- describes wishful thinking and behavioral efforts to escape or avoid; *Planful problem-solving*- describes deliberate problem-focused efforts to alter the situation; and *Positive reappraisal*- describes efforts to create positive meaning by focusing on personal growth. Each scale has sub scales to assess the respondents coping strategies.

The responses are scored as follows: Not used = 0, Used somewhat = 1, Used quite a bit = 2, and Used a great deal = 3. The raw score for each item on the scale were added to get a total score. The raw scores describe the coping effort for each of the eight types of coping. High raw scores indicate that the person often used the behaviors described by that scale in coping with the stressful event.

On the other hand, relative scores describe the proportion of effort represented for each type of coping and can be expressed as a percentage that ranges from 0 to 100. Relative scores are calculated as follows: First, calculate the average response per scale by dividing the total raw score by the number of items in the scale. For example, if the raw score for *Confrontative coping* = 15 then the average response = 2.5 (i.e., 15/6) because there are 6 items on this scale; and then sum-up the average responses per scale across all the scales. Finally, the average response for each scale is then divided by the sum of the average responses per scale across all the scales to obtain the relative score for the scale. The raw scores for each sub scale were converted to a relative score and interpreted based on ranking method (as per the test manual). Hence, the lesser the score indicates that the individual adapted that particular way of coping more than other coping styles. Data were analyzed using IBM Statistical Package for the Social Sciences (SPSS) version 20.0 software. Quantitative variables were summarized using mean and standard deviation, while categorical variables were summarized using frequencies and percentages. One Way analysis of variance (ANOVA) was used to compare differences between the coping strategies of males and females. All levels of significance were set at $p < 0.05$.

Ethical Consideration
Institutional ethical clearance was obtained from the Ethical Committee of Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria. Permission to conduct the study was obtained from the Management of the hospital; and informed written consent was also obtained from the participants before questionnaire administration.

RESULTS
Age and sex distribution of respondents
The mean age of the 419 respondents was 37.1 $\pm$ 10.0 years with a larger proportion (40.1%) in the 30 to 39 years age group, followed by those in the 40 to 49 years age group (23.9%); and majority of respondents (66.8%) were females (Table 1).

Table 1: Age and sex distribution of Respondents

Variables	Frequency (%) n = 419
Age groups (years)	
< 20	3 (0.7)
20-29	90 (21.5)
30-39	168 (40.1)
40-49	100 (23.9)
50-59	48 (11.5)
≥60	10 (2.4)
Sex	
Male	139 (33.2)
Female	280 (66.8)

Respondents' depression status

Majority, 227 (54.2%) of the 419 respondents had depression, with 179 (42.7%) having mild depression, 46 (11.0%) having moderate depression, and 1 (0.2%) each having moderately-severe and severe depression (Table 2).

Table 2: Respondents' depression status

Variables	Frequency (%) n = 419
Depression status	
Mild depression	179 (42.7)
Moderate depression	46 (11.0)
Moderately-severe depression	1 (0.2)
Severe depression	1 (0.2)
None	192 (45.8)

Respondents' behavioral lifestyle

Close to a tenth, 38 (9.1%) of the 419 respondents currently smoke cigarette, while few of them (2.1%) currently use a smokeless tobacco (2.1%), and consumed alcohol in the last 12 months (6.7%) and 30 days (4.5%). Majority of participants practiced unhealthy dietary habits such as consuming fatty food daily (70.2%), and eating less than 3 servings of fruits and vegetables daily (72.1%). Only about a third of respondents (30.3%) do moderate intensity work, while a fifth of them (20.0%) engage in regular moderate intensity sport and leisure activities (Table 3).

Respondents' coping strategies

Males had a higher level of depression and tended to use self-control and seeking support coping styles more than females; while females tended to use the other coping styles more than males (Table 4). However, there was no significant difference (p > 0.05) between males and females in their levels of depression and the coping strategies used by them (Table 5).

Table 3: Respondents' behavioral lifestyle

Variables	Frequency (%) n = 419
Tobacco use	
Currently smoke cigarette	38 (9.1)
Currently use a smokeless tobacco (snuff, chewing, etc)	9 (2.1)
Alcohol consumption	
Consumed alcohol in the last 12 months	28 (6.7)
Consumed alcohol in the last 30 days	19 (4.5)
Dietary pattern	
Consume fatty food daily	294 (70.2)
Eat less than 3 servings of fruits daily	302 (72.1)
Eat less than 3 servings of vegetables daily	302 (72.1)
Means of transport to work daily	
Trek to work	40 (9.5)
Bicycle	4 (1.0)
Motorcycle	148 (35.3)
Car	84 (20.0)
Other physical activities	
Engage in regular moderate intensity sport and activities	84 (20.0)
Do moderate intensity work	127 (30.3)

Table 4: Summary of respondents' mean scores on depression and coping styles

Variables	Male	Female
Depression	6.1223	5.5536
Coping styles		
Confrontative coping	0.1219	0.1118
Distancing	0.1394	0.1358
Self-control	0.1273	0.1422
Seeking social support	0.1421	0.1448
Accepting responsibility	0.1393	0.1314
Escape-avoidance	0.1466	0.1427
Planful problem solving	0.1472	0.1447
Positive re-appraisal	0.0391	0.0498

DISCUSSION

The high prevalence of depression among the respondents in this study (54.2%) contrasts with the finding in a study in South-eastern Nigeria[23] where a relatively lower proportion of participants (39.1%) were found to be depressed. This could be due to differences in the socio-economic status in the participants, as majority of the participants in this study were housewives, whereas most (91.9%) of the participants in the other study were gainfully employed. Lower rates of depression have been reported among PLWHA in developed countries as compared to developing countries.[24] Studies conducted in the United States of America majorly reported relatively lower depression prevalence rates ranging from 8.5% to 25.6%.[25-27]

Table 5: Summary of ANOVA on depression and coping styles among respondents

Variables	Source of variation	Df	Sum of Squares	Mean Square	F	p value
Depression (PHQ-9)	Between Groups	1	0.397	0.397	0.031	0.861
	Within Groups	417	5378.104	12.897		
Coping styles						
Confrontative coping (CC)	Between Groups	1	30.045	30.045	3.015	0.083
	Within Groups	417	4156.117	9.967		
Distancing (D)	Between Groups	1	3.642	3.642	0.279	0.597
	Within Groups	417	5436.911	13.038		
Self-control (SC)	Between Groups	1	12.045	12.045	0.805	0.370
	Within Groups	417	6242.160	14.969		
Seeking social support (SSS)	Between Groups	1	0.388	0.388	0.028	0.867
	Within Groups	417	5778.313	13.857		
Accepting responsibility (AR)	Between Groups	1	2.691	2.691	0.439	0.508
	Within Groups	417	2554.942	6.127		
		418				
Escape-avoidance (EA)	Between Groups	1	11.816	11.861	0.463	0.497
	Within Groups	417	10651.526	25.543		
Planful problem solving (PPS)	Between Groups	1	12.395	12.395	0.960	0.328
	Within Groups	417	5385.839	12.916		
Positive re-appraisal (PR)	Between Groups	1	13.823	13.823	0.588	0.443
	Within Groups	417	9796.864	24.494		

The higher prevalence of depression in developing as compared to developed countries is believed to be related to the higher levels of psychosocial problems and illness burden among PLWHA in the developing countries, such as being blamed for cause of illness, stigmatization, discrimination and social isolation.[28] In addition, the belief that a diagnosis of HIV is tantamount to a death sentence also contributes to the higher levels of depression in the developing countries.

The prevalent unhealthy dietary habit and poor physical activity among the respondents in this study could be due to the high prevalence of depression among them, as depression is known to affect how individuals feel, think and behave, and can also lead to a variety of emotional and physical problems.[2] The finding of better coping skills among females in this study as compared to males (with women having lower mean scores in all the scales) is in consonance with the finding in a study among HIV-positive people in Kolkata, India in which women also had lower mean scores as compared to males.[29] On the contrary, a study conducted at a referral hospital for the treatment of people living with HIV/AIDS in Northeast Brazil[30] reported better coping skills among males as compared to females. Whereas, the differences in the levels of depression and the respective coping skills between males and females in this study were not significant, a study that also found gender disparities in depression severity and coping attributed them to women's lower social status and limited access to resources.[31] It is therefore necessary for care providers to design gender sensitive interventions for preventing depression and maladaptive coping strategies among PLWHA.

CONCLUSION
This study showed high prevalence of depression and unhealthy behavioral lifestyle, with use of both adaptive and maladaptive coping skills among PLWHA in Sokoto, Nigeria. Care providers should design gender sensitive interventions for preventing depression and maladaptive coping strategies among PLWHA.

Conflict of interest
None declared.

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Knowledge of hepatitis B virus transmission, and seroprevalence of hepatitis B surface antigen among pregnant women attending Primary Healthcare Centers in Sokoto metropolis, Nigeria

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ABSTRACT

Background: Hepatitis B virus (HBV) infection is a major cause of morbidity and mortality across the world, and it is associated with high risk of maternal and fetal complications in pregnant women. **Aim**: This study aimed to determine the knowledge of HBV transmission, and seroprevalence of hepatitis B surface antigen (HBsAg) among pregnant women in Sokoto metropolis, Nigeria. **Materials and Methods:** A cross-sectional study was conducted among 209 pregnant women (selected by a two-stage sampling technique) attending the antenatal clinics of the Primary Healthcare Centers in Sokoto metropolis, Nigeria. Blood samples were collected and tested for hepatitis B surface antigen in addition to questionnaire administration. Data were analyzed using the IBM SPSS version 20 statistical computer software package. **Results**: Majority 182 (87.1%) of the 209 respondents were aged ≤ 34 years. Also, majority of participants had no formal education (58.9%), and were multigravida (76.1%). Only about a third and below knew the various modes of transmission of HBV infection. Whereas, only a few have had previous blood transfusions (6.7%) or surgeries (6.7%), more than a third of participants (39.2%) reported sharing needles and sharps. Sixteen (7.7%) of the 209 participants were reactive to hepatitis B surface antigen. **Conclusion**: This study showed low level of knowledge of HBV transmission and prevalent exposure to re-used needles and sharps among the participants, while a substantial proportion of them had HBsAg seropositivity. Mass education of the public on the risk factors of the disease, use of aseptic techniques, and proper screening of blood and blood products for HBV are crucial to its prevention and control.

Keywords: HBV transmission, HBsAg, knowledge, seroprevalence, pregnant women

INTRODUCTION

Hepatitis B virus (HBV) infection is a major cause of morbidity and mortality across the world, and it remains an important public health issue worldwide, especially in developing and under-developed countries.[1,2] It has been estimated that about one-third of the world population is infected with HBV, and with 600,000 HBV-related deaths annually, while about 350-400 million people develop lifelong chronic infection.[3,4]HBV infection is believed to be one of the most infectious diseases in the world, and accounts for about 7.3% of liver cancer deaths worldwide, with higher proportions in low and middle income countries; and HBV-related end-stage liver disease or hepatocellular carcinoma are responsible for over 1 million deaths per-year and currently represent 5-10% of cases of liver transplantation.[1-6]

Reports from previous studies showed wide variations in the prevalence of HBV infection in different regions of the world with the disease being endemic in sub-Saharan Africa, China, and some parts of Asia; and high rates of chronic infections were also found in the Amazon and southern parts of eastern and central Europe. [1,5,6] Evidence from literature showed wide variations in HBV seroprevalence across the sub-Saharan African countries including Sierra Leone (6.2%),[7] Mali (8.0%),[8] and Ghana (16.0%).[9] Nigeria is among the countries that are highly endemic for viral hepatitis in sub-Saharan Africa, with high HBV seroprevalence in studies conducted among pregnant women across the country including Makurdi (11.0%),[10] Maiduguri (11.6%),[11] and a rural community in North Central Nigeria (12.6%).[12]Of serious concern is

the fact that despite the availability of safe and effective vaccine in preventing the transmission of HBV infection, Nigeria has remained a hyper endemic area for HBV infection with an estimated 12% of the population being chronic carriers, and with 2-15.8% of pregnant women being infected.[13-15]

HBV infection is generally transmitted through either vertical or horizontal modes, but vertical transmission constitutes the major mode of transmission in endemic areas where it accounts for 90.0% of cases and poses high risk of neonatal infection.[16,17] Transmission from mother to baby can occur during delivery as well as transplacentally via the hematogenous route. This probably occurs when the maternal blood contaminates the mucosal membrane of the new born baby, and it carries high risk of persistent infection with about 90% of children infected in the first year of life becoming chronic carriers in contrast to 10% of those infected thereafter; and with the chronicity increasing the risk of cirrhosis and hepatocellular carcinoma.[17,18] On the contrary, horizontal transmission which occurs through transfusion of infected unscreened blood and blood products, injection drug use, tattoos or acupuncture needles, and sexual intercourse (homosexual and heterosexual) accounts for only 10.0% of cases in endemic areas; and it is transmissible among children, families, and close contacts of infected persons.[17,19]

HBV infection during pregnancy is associated with high risk of maternal and fetal complications.[20] Although, chronic infection with HBV is often asymptomatic in pregnant women, it causes serious complications including coagulation defects, postpartum hemorrhage, anorexia, acute and chronic liver cirrhosis, and hepatocellular carcinoma; and maternal mortality has been shown to increase in pregnant women with liver cirrhosis.[20] Also, there is a 10-20% risk of a pregnant woman infected with HBV transmitting it to her fetus, thus resulting to serious fetal complications such as stillbirth, neonatal jaundice and neonatal death. Without intervention, the risk of perinatal HBV transmission is greatest for infants born to women who are HBeAg positive with infectivity rate of 70 to 90% at 6 months of age, and about 90% of these children remain chronically infected.[21] On the other hand, the risk of perinatal infection among infants born to HBeAg negative mothers ranges from 10-40% with 40-70% of these infected infants remaining chronically infected. Also, children born to HBsAg positive mothers who do not become infected during perinatal period remain at a high risk of infection during early childhood.[1,5,6] Several conditions and practices have been found to increase the risk of transmission of HBV infection in pregnant women. These constitute the risk factors for HBV transmission, and they include history of HBV infection in family members, family history of liver disease, increasing parity, polygamy and history of previous STIs, tattooing/scarification or tribal marks, and other procedures that involve sharing needles or sharps; also, previous blood transfusions, and previous surgical procedures including dilatation and curettage for miscarriage are significant risk factors for hepatitis B infection.[22-24] Knowledge of transmission of HBV infection and the factors associated with it is important in halting the spread of the disease, as it enables those at risk to take appropriate measures against the factors associated with the transmission of the disease. Despite the high HBV seroprevalence among pregnant women across sub-Saharan Africa, reports from previous studies conducted among pregnant women in the continent generally showed low level of awareness of HBV infection and poor knowledge of its transmission.[25-27] Although, a previous study had reported an HBV seroprevalence of 6.5% among pregnant women in Sokoto, Nigeria, information on their knowledge of the transmission of HBV infection and their current HBV sero-status is limited. This study was conducted to determine the knowledge of hepatitis B virus transmission, and seroprevalence of hepatitis B surface antigen among pregnant women attending Primary Healthcare Centers in Sokoto metropolis, Nigeria.

MATERIALS AND METHODS
Study Design, Population and Area
A cross-sectional study was conducted among pregnant women attending the antenatal care clinics of the Primary Healthcare Centers (PHCs) in Sokoto metropolis, Nigeria, from October to December 2017. All those who consented to participate were considered eligible for enrollment into the study, while those who work as health workers or were too ill to respond to the questions in the questionnaire were excluded.

Sample Size Estimation and Sampling Technique
The sample size was statistically estimated at 203 and the eligible participants were selected by a 2-stage sampling technique. At the first stage, 10 PHCs were selected from the PHCs in Sokoto metropolis, Nigeria, by simple random sampling using the ballot option. At the second stage, 21 eligible participants were selected from each of the selected PHCs by systematic sampling technique using the patients' attendance list in the respective facilities to constitute the sampling frame. A total of 209 pregnant women were enrolled into the study.

Data Collection and Analysis

A set of pretested semi-structured interviewer-administered questionnaire was used to obtain information on the participants' socio-demographic characteristics, knowledge of transmission of hepatitis B virus, and the risk factors for HBV infection. A data sheet was used to collect information on HBsAg sero-status; blood samples were obtained from the study participants by pricking them with lancets after obtaining informed consents and the samples were tested using validated Lab Acon rapid diagnostic kit for HBsAg (Hang Zhou Bios Test Biotech Co Ltd, Hang Zhou, China). The questionnaire was pretested on 15 pregnant women attending the antenatal care clinic of one of the PHCs that were not selected for the study; the questions were well understood and no modification was necessary. Data were analyzed using the IBM SPSS version 20 computer statistical software package. Quantitative variables were summarized using mean and standard deviation, while qualitative variables were summarized using frequencies and percentages.

Ethical Consideration

Ethical approval was obtained from the Health Research and Ethics Committee, Sokoto State Ministry of Health, Sokoto, Nigeria. Permission to conduct the study in the selected PHCs was obtained from the Sokoto State Ministry for Local Government Affairs, Sokoto, Nigeria and the administration of the respective Local Government Areas. Informed written consent was also obtained from the study participants before commencing data collection.

RESULTS

Socio-demographic characteristics of participants

All the 209 questionnaires administered were adequately completed and found suitable for analysis, giving a response rate of 100%. The ages of the participants ranged from 15 to 44 years, and majority 182 (87.1%) of the 209 respondents were aged $\leq$ 34 years. Most of the participants were married (95.2%), practiced Islam as religion (97.0%), and belong to Hausa ethnic group (90.4%). Majority of them had no formal education (58.9%), and were multigravida (76.1%) as shown in Table 1.

Participants' knowledge of transmission of HBV infection and its prevention with HBV vaccine

Whereas about half, 107 (51.2%) of the 209 participants were aware of HBV infection, only a few (8.1%) knew that it is caused by a virus, less than half (40.1%) knew that it is a communicable disease (40.7%), and less than a third (29.2%)

knew that it affects the liver. Also, whereas, about half of participants (54.1%) knew that HBV infection is not transmissible through contaminated foods, only about a third and below knew its modes of transmission with the most commonly known ways of transmitting the disease being transfusion with contaminated blood (39.2%) and sharing needles and sharps (37.3%). Only about a third (31.6%) of the participants knew that HBV infection can be prevented with HBV vaccine, and that the vaccine is available in the hospital (Table 2).

Table 1: Socio-demographic characteristics of participants

Variables	Frequency (%) n = 209
Age group (years)	
15-24	84 (40.2)
25-34	98 (46.9)
35-44	27 (12.9)
Religion	
Islam	203 (97.1)
Christianity	6 (2.9)
Marital status	
Single	8 (3.8)
Married	199 (95.2)
Widowed	2 (1.0)
Tribe	
Hausa	189 (90.4)
Others	20 (9.6)
Education level	
None	6 (2.9)
Quranic only	117 (56.0)
Primary	15 (7.2)
Secondary	57 (27.3)
Tertiary	14 (6.7)
Parity	
Primigravida	50 (23.9)
Multigravida	159 (76.1)

Participants' HBV risk profile and seroprevalence of hepatitis B surface antigen

Whereas, only a few of the participants reported risk factors for HBV infection such as family history of liver disease (4.3%), and previous blood transfusions and surgeries (6.7%), more than a third of them (39.2%) reported sharing needles and sharps. Sixteen (7.7%) of the 209 participants were reactive to hepatitis B surface antigen (Table 3).

DISCUSSION

This study assessed the knowledge of hepatitis B virus transmission, and seroprevalence of hepatitis B surface antigen among pregnant women attending Primary Health Centers in Sokoto metropolis, Nigeria. The participants in this study were relatively young with most of them being aged $\leq$ 34 years; this is similar to the finding in a study in Akure, Nigeria,[28] that also reported a young population of participants with majority of them being aged 25-35 years.

Table 2: Participants' knowledge of transmission of HBV infection and its prevention with HBV vaccine

Variables	Frequency (%) n = 209
Awareness of HBV infection and its cause	
Ever heard of HBV	107 (51.2)
Knew that HBV infection is caused by a virus	17 (8.1)
Knew that HBV infection is a communicable disease	85 (40.7)
Knew that HBV infection affects the liver	61 (29.2)
Knowledge of transmission of HBV infection	
Knew that it is not transmitted by eating contaminated food	113 (54.1)
Knew that it is transmissible through tattoo or body piercing	49 (23.4)
Knew that it is transmissible by sharing needles and sharps	78 (37.3)
Knew that it is transmissible through transfusion with infected blood	82 (39.2)
Knew that it is transmissible through sexual contact	73 (34.9)
Knew that it can be transmitted from an infected mother to her baby	72 (34.4)
Knew that it is not transmitted through breast feeding	25 (12.0)
Knowledge of prevention of HBV infection with HBV vaccine	
Knew that HBV infection can be prevented with HBV vaccine	66 (31.6)
Knew that that HBV vaccine is available in the hospital	66 (31.6)

Table 3: HBV risk profile and hepatitis B surface antigen status of participants

Variables	Frequency (%) n = 209
HBV risk profile	
Gave family history of liver disease	9 (4.3)
Had previous blood transfusions	14 (6.7)
Had previous surgeries	14 (6.7)
Shared needles and sharps	82 (39.2)
Hepatitis B surface antigen status	
Reactive	16 (7.7)
Non-reactive	193 (92.3)

The fact that majority (58.9%) of the participants in this study did not have formal education could have contributed to their early marriage with majority of them being multiparous at their relatively young age. In addition, they were predominantly Muslims (being the main religion in northern Nigeria), and Islam forbids child bearing outside wedlock. In contrast to the

finding in this study, majority of the participants in studies conducted in other places including Ghana,[9] and Rwanda[29] had at least primary education.

The low awareness of hepatitis B virus infection (51.2%) among the participants in this study and the generally low proportion of participants that knew the various ways of transmitting the infection, and it's prevention with HBV vaccine is disturbing considering the fact that Nigeria is highly endemic for the disease (with a prevalence of 10-20%)[30], and the high risk of transmitting the infection to their babies (i.e., vertical transmission) since they lack the knowledge of its transmission and prevention. Similarly low awareness of HBV infection and poor knowledge of its transmission were reported in studies conducted in several sub-Saharan African countries where the disease is also endemic including Ghana,[25] Cameroon,[26] and Kenya.[27] The rapid spread of hepatitis B virus infection in the developing countries is believed to be driven largely by the poor knowledge of the disease as a result of lack of community health education, illiteracy and poverty.[16]

Although, the prevalence of most of the risk factors for HBV infection was relatively low among the participants, it is worrisome that more than a third of them (39.2%) had shared needles and sharps, as this places them at risk of HBV infection and other blood borne viral infections particularly, HIV infection. The substantial proportion of participants that had shared needles and sharps in this study could be due to the fact that most of them did not know that it is one of the routes of transmission of HBV infection. This finding provides additional evidence in support of the belief that poor knowledge of the disease is one of the driving forces behind its spread in the developing countries,[16] and it suggests the need for mass public health education regarding the transmission and prevention of the disease in Sokoto, Nigeria, and in other places where the disease is endemic.[13] Also, the relatively high prevalence of sharing of needles and sharps among the participants in this study (39.2%) could have contributed to a substantial proportion of them (7.7%) having hepatitis B surface antigen seropositivity, as previous studies have established strong links between exposures involving sharing needles and sharps (including tribal and tattoo marks) and HBsAg seropositivity.[23,24] These findings underscore the need for collaboration between Sokoto State Ministry of Information, Home Affairs and Culture, and Sokoto State Ministry of Health in the prevention and control of the disease, through mass education of the public on its risk factors, use of aseptic techniques in the health facilities, and proper screening

of blood and blood products for HBV before administering them to pregnant women.

CONCLUSION

This study showed low level of knowledge of HBV transmission and prevalent exposure to re-used needles and sharps among the participants, while a substantial proportion of them had HBsAg seropositivity. Mass education of the public on the risk factors of the disease, use of aseptic techniques, and proper screening of blood and blood products for HBV are crucial to its prevention and control.

Conflict of interest

None declared.

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Knowledge and utilization of partograph among primary healthcare workers in Sokoto metropolis, Nigeria

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ABSTRACT

Background: Although, evidence from several studies has shown that the majority of maternal and perinatal deaths and complications could be prevented by use of partograph, its use remains poor in the sub-Saharan African countries and other developing countries. **Aim**: This study aimed to assess the knowledge and utilization of partograph among primary healthcare workers in Sokoto metropolis, Nigeria. **Materials and Methods:** A cross-sectional study was conducted among 239 health workers (selected by a 2-stage sampling technique) working at the maternity units of the Primary Healthcare Centers (PHCs) in Sokoto metropolis, Nigeria. A set of semi-structured self-administered questionnaire was used to obtain data on the research variables. Data were analyzed using the IBM SPSS version 20 statistical computer software package. **Results**: A larger proportion, 103 (43.1%) of the 239 respondents were community health extension workers (CHEWs). Most of them (80.3%) knew that partograph is a graphical representation of the events in labour, but only about half (55.2%) knew that it contains 3 components, and only about half to two-thirds of respondents knew the usefulness of the information contained in the various components of the partograph. Only about a fifth of respondents (22.2%) have ever used partograph to monitor women in labour, and the most commonly cited barrier to its use was unavailability (65.6%). **Conclusion**: This study showed sub-optimal knowledge and poor utilization of partograph among primary healthcare workers in Sokoto metropolis, Nigeria. The state government should recruit sufficient number of qualified personnel to run the maternity units of the PHCs in the state, while the management of the respective hospitals should periodically train their staff on the use of partograph and ensure its constant supply in their maternity units.

Keywords: Partograph, knowledge, utilization, primary healthcare workers

INTRODUCTION

Obstructed labour accounts for a substantial proportion and it is also believed to be the most disabling of all maternal conditions worldwide, causing both maternal and perinatal morbidity and mortality.[1] In 2015, the global estimates from the World Health Organization (WHO) showed that developing countries account for approximately 99% of global deaths with sub-Saharan Africa alone accounting for 66%; and with over one-third of all maternal deaths worldwide being from Nigeria (19%) and India (15%).[2] The cause for concern is the fact that although evidence from several studies has shown that the majority of maternal and perinatal deaths and complications could be prevented by use of

partograph (a simple pre-printed form which provides a pictorial overview of progression of labour with charts of fetal and maternal conditions which assists in identifying deviations from "normal" labour progression), its use remains poor in the sub-Saharan African countries and other developing countries. In addition, even in the few situations where it is used, it is often incompletely and incorrectly filled, and the results are often misinterpreted; and in several instances, it is filled retrospectively after delivery, thus making it just a midwifery recording sheet instead of a labour management tool.[3-7] It is disturbing that despite the fact that the simple design of the partograph makes it

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applicable and useful at all levels of healthcare delivery including primary and secondary healthcare facilities where the bulk of maternity services are provided, and are mostly manned by midwives and inexperience medical officers, it is utilized mainly in the tertiary healthcare facilities.[3,8-10]

In Sokoto State, Nigeria, most, 574 (92.7%) of the 619 functional health facilities are primary healthcare facilities, and they provide maternity care services for most of the populace. Assessment of the knowledge and utilization of partograph among PHC workers is important in view of its effectiveness in preventing and reducing maternal and perinatal morbidity and mortality. Previous studies conducted among healthcare workers across Nigeria reported wide variations in the knowledge and utilization of partograph with higher levels of knowledge of partograph among health workers in the tertiary healthcare facilities as compared to those in the secondary and primary healthcare facilities, while utilization of partograph was mainly in the tertiary healthcare facilities.[11-13] Currently, little is known about the knowledge and utilization of partograph among health workers in Sokoto State, Nigeria. This study was conducted to assess the knowledge and utilization of partograph among primary healthcare workers in Sokoto metropolis, Nigeria.

MATERIALS AND METHODS
Study Design, Population and Area
A cross-sectional study was conducted among healthcare workers working at the maternity units of the Primary Healthcare Centers (PHCs) in Sokoto metropolis, Nigeria, from September to November 2017. All those who consented to participate were considered eligible for enrollment into the study.

Sample Size Estimation and Sampling Technique
The sample size was statistically estimated at 239 and the eligible participants were selected by a 2-stage sampling technique. At the first stage, 5 PHCs were selected from each of the 4 Local Government Areas (LGAs) in Sokoto metropolis, Nigeria, by simple random sampling using the ballot option. At the second stage, eligible participants were selected from each of the selected PHCs by systematic sampling technique using the staff list in the respective facilities to constitute the sampling frame. Proportionate allocation was done in the selection of participants from the respective health facilities based on their staff strength.

Data Collection and Analysis
A set of pretested semi-structured self-administered questionnaire was used to obtain information on the participants' socio-demographic characteristics, and their knowledge and utilization of partograph. The questionnaire was pretested on 20 primary healthcare workers working at one of the PHCs that were not selected for the study. The necessary modifications were effected based on the observations that were made during the pretesting. Data were analyzed using the IBM SPSS version 20 computer statistical software package. Quantitative variables were summarized using mean and standard deviation, while qualitative variables were summarized using frequencies and percentages.

Ethical Consideration
Ethical approval was obtained from the Research and Ethical Committee of Sokoto State Ministry of Health, Sokoto, Nigeria. Permission to conduct the study in the selected PHCs was obtained from the administration of the respective Local Government Areas, and informed written consent was obtained from the study participants before commencing questionnaire administration.

RESULTS
Socio-demographic characteristics of respondents
All the 239 questionnaires administered were adequately completed and found suitable for analysis, giving a response rate of 100%. The mean age of the respondents was 33.7 ± 8.1 years. Majority of respondents were aged 20-39 years (73.6%), belong to Hausa ethnic group (71.1%), and were males (58.6%). Most, 219 (91.6%) of the 239 respondents were Muslims, majority of them were married (66.5%), and a larger proportion of respondents (43.1%) were community health extension workers (CHEWs). Majority of respondents (71.5%) have spent ≤ 10 years in service (Table 1).

Respondents' knowledge of partograph
Most, 192 (80.3%) of the 239 respondents knew that partograph is a graphical representation of the events in labour, but only about half of them (55.2%) knew that it contains 3 components (i.e., fetal condition, progress of labour, and maternal condition). Also, only about half to two-thirds of respondents knew the usefulness of the information contained in the various components of the partograph in monitoring the progress in labour objectively, reducing or preventing morbidity and mortality in both mother and fetus, and in making referral decisions (Table 2).

Table 1: Socio-demographic characteristics of respondents	
Variables	Frequency (%), n = 239
Age group (years)	
20-29	88 (36.8)
30-39	88 (36.8)
40-49	54 (22.6)
≥ 50	9 (3.7)
`Sex	
Male	140 (58.6)
Female	99 (41.4)
Marital status	
Single	69 (28.9)
Married	159 (66.5)
Separated	5 (2.1)
Divorced	4 (1.7)
Widowed	2 (0.8)
Religion	
Islam	219 (91.6)
Christianity	20 (8.4)
Ethnicity	
Hausa	170 (71.1)
Yoruba	43 (18.0)
Igbo	17 (7.1)
Others	9 (3.8)
Cadre	
Doctor	15 (6.3)
Nurse	56 (23.6)
Midwife	65 (27.2)
CHEW	103 (43.1)
Length of practice	
1-10	171 (71.5)
11-20	53 (22.2)
≥ 21	15 (6.3)

CHEW: Community Health Extension Workers

Utilization of partograph by respondents

Whereas, most of the respondents (80.8%) have ever conducted labour, only about a fifth of them (22.2%) have ever used partograph to monitor labour. The most common abnormalities ever detected and referred through use of partograph by the respondents that had used it were prolonged labour (100%), obstructed labour (67.9%), and fetal distress (50.9%). The most common reasons given by those who have never used partograph were unavailability of partograph (65.6%) and lack of skills in monitoring labour with partograph (22.0%) [Table 3].

DISCUSSION

This study assessed the knowledge and utilization of partograph among primary healthcare workers in Sokoto metropolis, Nigeria. A larger proportion of the respondents in this study (43.1%) were community health extension workers (CHEWs), this is in contrast to the finding in a study conducted in southwest Nigeria[11] in which only 15.3% of respondents were CHEWs. This finding indicates inadequate staffing of the PHCs in the study area with skilled birth attendants, and it underscores the need for the state government to recruit

sufficient number of qualified personnel to run the maternity units of the PHCs in the state. Knowledge of partograph was sub-optimal among the respondents in this study. Whereas, most of them (80.3%) gave correct description of partograph, only about two-thirds (59.8%) knew that it is a chart containing maternal and fetal information during pregnancy, and only about two-thirds and below knew the components of a partograph and their functions. While this finding is similar to the finding in a study conducted among midwives in the Niger Delta Region of Nigeria[12] in which 84% of respondents knew what a partograph is, it differs from the finding in study conducted among obstetric care givers in southwest Nigeria[11] in which only 37.3% of respondents could mention at least one component of the partograph. While the findings in this study and the latter studies highlight the variations in the knowledge of partograph across the Nigeria, it also reflects the wide variations in the knowledge of partograph in studies conducted across sub-Saharan Africa.[14-16]

The low proportion of respondents (22.2%) that have ever used a partograph to monitor women in labour in this study could be due to both the sub-optimal knowledge of partograph among them, and the unavailability of partograph that was cited as the main reason for not utilizing it. This position is supported by the finding in a study among obstetric care givers in southwest Nigeria[11] in which only 37.3% of respondents could mention at least one component of partograph and only 32.3% of respondents used the partograph to monitor women in labour. Similarly, a study conducted among obstetric care providers in urban referral public health institutions in northwest and southwest Cameroon[14] reported that less than one-third (29.6%) of respondents had good knowledge of partograph, and only 32.4% of respondents routinely used it in monitoring women in labour. On the contrary, a study conducted among obstetric care givers in public health institutions of Addis Ababa, Ethiopia[15] reported that 96.6% of respondents correctly mentioned at least one component of the partograph, and 57.3% used it to monitor mothers in labour. A study conducted among doctors and midwives at a district hospital in Gauteng, South Africa[16] also reported that 83.8% of respondents have had some training on the partograph, while 79.4% routinely use it. The findings in this study and the latter studies bring to the fore the need for the management of the respective health institutions across sub-Saharan Africa to promote the use of partograph in their respective facilities by periodically training their personnel on the use of partograph and ensuring its constant supply in their maternity units.

Table 2: Respondents' knowledge of partograph

Variables	Frequency (%), n = 239
Description of partograph	
Knew that a partograph is a graphical representation of the events in labour	192 (80.3)
Knew that a partograph is a chart containing both maternal and fetal information during labour	143 (59.8)
Components of partograph and their functions	
Knew that a partograph has 3 components (fetal condition, progress of labour, and maternal condition)	132 (55.2)
Knew that the fetal component enables the birth attendant to know the state of wellbeing of the fetus	160 (66.9)
Knew that the fetal component helps to prevent perinatal morbidity and mortality	144 (60.3)
Knew that the progress of labour component enables the birth attendant to know if a woman can achieve spontaneous vaginal delivery	129 (54.0)
Knew that the progress of labour component helps to reduce and prevent maternal and fetal morbidity and mortality	147 (61.5)
Knew that the maternal component enables the birth attendant to know the state of wellbeing of the mother in relation to labour	136 (56.9)
Knew that the maternal component helps to prevent maternal morbidity and mortality	129 (54.0)
Knew that the partograph provides evidence for making referral decisions	143 (59.8)
Knew that the partograph can be used as a tool for teaching and handling over of a woman in labour between shifts instead of voluminous paper writing	135 (56.5)
Knew that the fetal component contains information on:	
Fetal heart rate	166 (69.5)
Fetal descent	126 (52.7)
Knew that the maternal component contains information on:	
Maternal temperature	163 (68.2)
Maternal blood pressure	187 (78.2)
Alert and action lines	
Knew that the parturient needs close supervision if the graph crosses the alert line	140 (58.6)
Knew that the alert line serves as a guide for transfer of the parturient to a hospital with facilities for caesarean section	165 (69.0)
Knew that the action line indicates danger in the parturient and serves as a guide for critical assessment of the delay in cervical dilatation	155 (64.9)

Table 3: Utilization of partograph by respondents

Variables	Frequency (%)
Ever conducted labour (n = 239)	
Yes	193 (80.8)
No	46 (19.2)
Ever used partograph to monitor women in labour (n = 239)	
Yes	53 (22.2)
No	186 (77.8)
Common abnormalities ever detected and referred through use of partograph (n = 53)	
Prolonged labour	53 (100)
Obstructed labour	36 (67.9)
Fetal distress	27 (50.9)
Reason for not using partograph (n =186)	
Unavailability of partograph	122 (65.6)
Did not know how to monitor labour with partograph	41 (22.0)
Too busy	3 (1.6)
Not aware of its benefits	20 (10.8)

state, while the management of the respective hospitals should periodically train their staff on the use of partograph and ensure its constant supply in their maternity units.

Conflict of interest
None declared.

CONCLUSION
This study showed sub-optimal knowledge and poor utilization of partograph among primary healthcare workers in Sokoto metropolis, Nigeria. The state government should recruit sufficient number of qualified personnel to run the maternity units of the PHCs in the

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Acute anxiolytic activity of aqueous *Ampelocissus africana* whole-plant, *Ficus sycomorus* stem bark and *Tapinanthus globiferus* leaf extracts in Swiss Albino mice

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ABSTRACT

Anxiety disorders are among the most prevalent mental disorders in all age groups world-wide. The attendant socio-economic burden is huge and on the increase. The currently used anxiolytic drugs are few and their usefulness are limited on account of toxicity, delay in, or lack of efficacy. This scenario calls for discovery of additional anti-anxiety therapeutic agents. This study investigated the acute anxiolytic effects of 50, 150 and 500 mg/kg aqueous *A. africana* whole-plant, *F. sycomorus* stem bark and *T. globiferus* leaf extracts, 10 ml/kg distilled water and 0.5 mg/kg diazepam in Swiss Albino mice in a battery of open-field and elevated zero-maze tests using key rodent anxiety parameters, one hour post extract/drug administration. Compared with distilled water treatment, aqueous *T. globiferus* leaf extract caused dose-dependent and significant ($p<0.05$) increase in mean % centre zone and open segment times and reduction in mean rears and stretch-attend postures. *A. africana* whole-plant and *F. sycomorus* stem bark extracts, when compared with water, caused dose-independent and insignificant ($p > 0.05$) anxiolytic activity on most of these anxiety parameters. The findings of this study indicate that aqueous *T. globiferus* leaf extract has an anxiolytic activity that is superior to that of *A. africana* whole-plant and *F. sycomorus* stem bark extracts and comparable to that of 0.5 mg/kg diazepam. There is a need for further investigation of different extracts and fractions of *T. globiferus* leaves for their potential anxiolytic activity.

Keywords: Anxiolytic activity, selected medicinal plants, test battery, mice

INTRODUCTION

Anxiety is a universal emotion dominated by the arousal of physical, psychological, and physiological functions in response to stressful or potentially stressful situations. Anxiety disorders are characterized by autonomic hyperactivity and dysregulated expression of anxiety.[1] Anxiety disorders are highly prevalent mental disorders globally, with an ever-increasing social and economic burden.[2-4] In Nigeria, anxiety disorders have also been reported as the commonest childhood mental disease and a highly prevalent class of mental disorders with a lifetime prevalence of 5.7% and a 12-month prevalence of 4.1% in the general population.[5] Pharmacotherapy is a key treatment modality for anxiety disorders but the anti-anxiety drugs presently in clinical use are few and have

individual class liabilities that are related to intolerable adverse effects (e.g. the benzodiazepines, the tricyclic antidepressants, and anticonvulsant anxiolytics), delayed onset of anxiolytic effects (e.g. the selective serotonin reuptake inhibitors, the serotonin-noradrenaline reuptake inhibitors) or weak and unpredictable anxiolytic efficacy (e.g. the azapirones).[6] The paucity and the inherent limitations of the currently available anxiolytic drugs in the face of the huge prevalence and socio-economic toll of anxiety disorders calls for concerted efforts at discovering additional novel anxiolytic agents. Hence, the present study was conducted to investigate the acute anxiolytic activity of extracts of *Ampelocissus africana* whole-plant, *Ficus sycomorus* stem bark, and

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Tapinanthus globiferus leaves (being the medicinal plants that were selected on ethnobotanical grounds) in Swiss Albino mice with a view to discover new potential anxiolytic agents.

Ethno-pharmacopeia and Ethno-medicine hold great promise for the discovery of diverse new therapeutic agents generally and anti-anxiety compounds cannot be an exception.[7] The plant kingdom has always proven to be an enormous reservoir for new pharmacological agents as demonstrated in the discovery of a novel plant-based antimalarial[8] in addition to earlier discoveries of chloroquine, quinine, artemisinin derivatives, digitalis, penicillin and aspirin.[9] Already, it has been estimated that between 60% and 80% of the global population still depend on ethno-medical resources for their primary health care on account of cultural acceptability.[9] Previously, leaf extracts from *Azadirachta indica* (Neem) tree -the host tree for the parasitic plant *Tapinanthus globiferus* have been credited with an anxiolytic activity.

Also, apart from the anecdotal reports of anti-anxiety usage of different parts of the three medicinal plants that were selected for this study, extracts from *Ficus sycomorus* have been reported to have aphrodisiac, anaesthetic, muscle-relaxing, sedative, anticonvulsant and anti-plasmodial effects,[10-13] those of *Ampelocissus africana* to have anti-trypanosomal, anti-bacterial and antineoplastic activities[14-16]; and those from *Tapinanthus globiferus* to have demonstrated efficacy in hypertension, cancer, epilepsy, and diabetes mellitus.[17] However, there has not been any scientific investigation of the anxiolytic property of extracts of *Ampelocissus africana* whole-plant, *Ficus sycomorus* stem bark, and *Tapinanthus globiferus* leaf extracts. This study therefore set to evaluate the preliminary anxiolytic activity of aqueous extracts of these plant parts in mice using standard rodent behavioural test battery comprising the open-field and elevated zero-maze tests.

MATERIALS AND METHODS
Tapinanthus globiferus leaves on a Neem tree sited at Shuni road, Mabera, Sokoto, Nigeria; whole plant of *Ampelocissus africana* and *Ficus sycomorus* stem bark from the forests of Rabah, Rabah Local Government Area, Sokoto State, Nigeria, were collected in the month of January 2018.

They were subsequently briskly washed, air-dried, pulverized and stored dry in opaque plastic containers till use. Plant parts were identified and specimen vouchers deposited at the Herbarium of the Department of Botany, Usmanu Danfodiyo University, Sokoto, Sokoto state, Nigeria. The plant extraction and drying took place in the laboratory of the Pharmacognosy Drug development Department, and the behavioural experiments took place in the behavioural room of the Department of Pharmacology and Therapeutics, Faculty of Pharmaceutical Sciences, Ahmadu Bello University, Zaria, Kaduna state, Nigeria. Two hundred and fifty grams (250g) of the fine powders of each plant part was cold-macerated for 24 hours in 1L of distilled water, filtered using Whatman's paper (150 mm) and evaporated in rotatory water bath at 45-50 degree Celsius to obtain dry crude aqueous extracts of *Tapinanthus globiferus* leaves (12.21%), *Ampelocissus africana* whole-plant (13.44%) and *Ficus sycomorus* stem bark (15.90%).

The behavioural anxiolytic efficacy screening of the selected plants' extracts was carried out in a fashion that is similar to the method previously used by Schmitt and Hiemke,[18] but with a modification of eliminating inter-test latency. One hour following administration of 50, 150 or 500 mg/kg of plant extracts, 0.5 mg/kg diazepam or 10 ml/kg distilled water, orally by gavage, to randomized groups (n=10; 5 per sex) of mice (21.00±0.15 g) under good laboratory practices, each mouse was exposed to a test battery consisting of an open-field an elevated zero-maze in an opaque cubicle with 100-lux illumination (Figure 1).

The behavioural assay was initiated by placing each mouse in the centre of the open field and allowing it to move freely and explore the field for 5 minutes. At the end of this period, each mouse was again transferred to the mid-point area of an open segment of the zero-maze with the mouse facing one of the closed segments. The animal was allowed to freely explore its new environment for 5 minutes. Animals that jumped off the open segment of the zero maze during the procedure were gently returned immediately to the test. Tests sessions were videotaped and visually monitored and subsequently interpreted. Data were analyzed using analysis of variance (ANOVA) followed by Turkey post hoc test; and p values ≤ 0.05 were considered as significant.

Figure 1: Behavioural test battery of an open field and an elevated zero-maze
(Source: Fabricated by the corresponding author)

RESULTS

Anxiolytic activity of crude aqueous *Ampelocissus africana* whole-plant, *Ficus sycomorus* stem bark and *Tapinanthus globiferus* leaf extracts in mice

In the open-field test (OFT), (Table 1), compared to distilled water treatment, while aqueous *Tapinanthus globiferus* leaf extract dose-dependently and significantly ($p < 0.05$) increased mean per cent centre zone time (% CZT) at all graded extracts' doses; aqueous *Ampelocissus africana* whole-plant extract only attained significant ($p < 0.05$) increase in mean % CZT at the 150 mg/kg dose and aqueous *Ficus sycomorus* stem bark only at the highest extracts' dose of 500 mg/kg. On the frequency of rearing events (Table 2), from the lowest mean rearing frequency of 24.60 ± 2.66 in the distilled water-treated mice, aqueous *Tapinanthus globiferus* leaf extract treatment exhibited dose-dependent and significant ($p < 0.05$) reductions in this parameter to 19.00 ± 2.10 and 18.67 ± 1.20 at the 150 and 500 mg/kg dose levels, respectively. Treatments with the other two extracts did not attain any significant ($p > 0.05$) reduction in this parameter at any dose level compared with the distilled water treatment.

On the mean % OST in the elevated zero-maze test (Table 3), compared to the highest mean of 15.10 ± 1.60 recorded in the distilled water-treated mice, aqueous *Tapinanthus globiferus* leaf extract significantly increased ($p < 0.05$) the mean % OST across all dose levels (with the highest mean anxiolytic activity of 34.29 ± 1.43 recorded at the 500 mg/kg). The other medicinal plants' extracts only attained significant ($p < 0.05$) in mean % OST at the 500 mg/g dose level. On the stretch-attend postures (Table 4), again, aqueous *Tapinanthus globiferus* leaf extract showed a significant ($p < 0.05$) and dose-dependent reduction in this parameter from the mean value of untreated mice at the 3 extracts' doses; aqueous *Ampelocissus africana* whole-plant extract only attained significant ($p < 0.05$) paradoxical reduction in mean stretch-attend postures (SAPs) only at the lowest dose level, and with aqueous *Ficus sycomorus* stem bark extract displaying no significant ($p > 0.05$) anxiolytic activity on this parameter at any dose level. The anxiolytic activity of aqueous *Tapinanthus globiferus* leaf extract on most of the anxiety parameters evaluated in the two in-vivo efficacy assays was comparable to that of 0.5 mg/kg diazepam (standard anxiolytic) treatment.

Table 1: Per cent centre zone time of mice on open-field test

Treatments groups	Extracts' doses		
	50mg/kg	150mg/kg	500mg/kg
D/water (10ml/kg)	2.57 ± 0.65	3.17 ± 0.81	3.03 ± 0.94
Aq. *T. globiferus*	7.73 ± 1.80*	9.43 ± 2.45*	9.85 ± 1.17*
Aq. *A. africana*	3.55 ± 0.54	6.33 ± 2.51*	5.17 ± 0.72
Aq. *F. sycomorus*	5.67 ± 1.09	4.30 ± 0.59	6.77 ± 1.76*
Diazepam (0.5mg/kg)	9.00 ± 4.00*	9.57 ± 5.16*	9.60 ± 2.06*

Data were entered as mean ± S.E.M. of mice; *Statistically significant ($p \leq 0.05$)

Table 2: Number of rears of mice on open-field test

Treatments groups	Extracts' doses		
	50mg/kg	150mg/kg	500mg/kg
D/water (10ml/kg)	2.60 ± 2.66	27.80 ± 3.93	27.30 ± 7.00
Aq. *T. globiferus*	19.80 ± 2.37	19.00 ± 2.10*	18.67 ± 1.20*
Aq. *A. africana*	21.56 ± 4.56	20.10 ± 4.00	30.40 ± 3.47
Aq. *F. sycomorus*	18.90 ± 4.16	24.56 ± 3.69	28.50 ± 5.17
Diazepam (0.5mg/kg)	16.00 ± 2.24*	14.40 ± 3.43*	15.90 ± 3.98*

Data were entered as mean ± S.E.M. of mice; *Statistically significant ($p \leq 0.05$)

Table 3: Per cent open segment time of mice on elevated zero-maze test

Treatments groups	Extracts' doses		
	50mg/kg	150mg/kg	500mg/kg
D/water (10ml/kg)	13.84 ± 2.57	15.77 ± 2.52	15.10 ± 1.60
Aq. *T. globiferus*	28.00 ± 3.44*	35.10 ± 7.79*	34.29 ± 1.43*
Aq. *A. africana*	20.23 ± 3.76	27.77 ± 2.66	26.63 ± 2.94*
Aq. *F. sycomorus*	22.83 ± 6.23	23.13 ± 2.77	26.63 ± 2.41*
Diazepam (0.5mg/kg)	33.37 ± 7.88*	38.63 ± 8.37*	36.67 ± 5.86*

Data were entered as mean ± S.E.M. of mice; *Statistically significant ($p \leq 0.05$)

Table 4: Mean stretch-attend postures of mice on elevated zero-maze test

Treatments groups	Extracts' doses		
	50mg/kg	150mg/kg	500mg/kg
D/water (10ml/kg)	16.80 ± 3.23	12.60 ± 1.67	16.30 ± 2.42
Aq. *T. globiferus*	7.50 ± 1.89*	5.80 ± 1.35*	5.22 ± 1.28*
Aq. *A. africana*	10.80 ± 1.60	11.70 ± 2.13	13.10 ± 2.05
Aq. *F. sycomorus*	8.30 ± 1.86*	11.10 ± 1.00	11.80 ± 2.54
Diazepam (0.5mg/kg)	4.90 ± 1.08*	4.60 ± 1.29*	7.78 ± 1.71*

Data were entered as mean ± S.E.M. of mice; *Statistically significant ($p \leq 0.05$)

DISCUSSION

This report represents findings at a preliminary stage in the investigation of the anxiolytic activity of *Tapinanthus globiferus* leaf, *Ficus sycomorus* stem bark and *Ampelocissus africana* whole-plant extracts in standard mouse anxiety tests as an attempt at discovering potential anxiolytic agents. The important role of rodent anxiety tests in anxiolytic drug discovery has been demonstrated by the deployment of these tests in several previous preclinical screenings of putative anxiolytic agents.[19,20] This relevance is thought to derive from the ethological advantage of rodent anxiety assays and the close mouse-human genomic homology,[21,22] which are, in turn, viewed to confer high predictive validity on these tests for modeling both human anxiety disorders and for pharmacological evaluation of anxiolytic activity of novel putative compounds.[18,23] The open-field and the elevated zero-maze tests are reputed to be among the most proficient and widely used in-vivo anxiety efficacy paradigms in preclinical drug discovery due to their inherent sensitivity to rodent anxiety-related behaviours.[24,25]

This study found out that aqueous *Tapinanthus globiferus* leaf extract exhibited an acute anxiolytic activity that was comparable to that of 0.5 mg/kg diazepam and superior to that of aqueous *Ampelocissus africana* whole-plant and *Ficus sycomorus* stem bark extracts on all the four anxiety in the two tests. The four parameters i.e. percentage centre zone time (% CZT), rearing events, percentage open segment time (% OST) and stretch-attend postures (SAPs) used in evaluating rodent anxiety-related behaviours in this study have been adjudged as key rodent anxiety indicators.[26,27] Per cent CZT represents the proportion of the test duration that is spent by the experimental animals in the portion of the test arena floor that is designated as the central area. A rear or a rearing event describes the posture of rodents whereby the test animals stand erect on their hind limbs with their forelimbs either completely hanging in the air or on the wall of the open field. Increased % CZT and reduced frequency of rearing events have been reported as indices of reduced anxiety levels.[28] Percentage OST, defined as the proportion of the total test duration spent on the open segments of the elevated zero-maze, has been shown to be a widely accepted index of anxiety behaviour in rodents,[26] and increases in % OST have been thought to indicate reduced anxiety state.[29] Stretch-attend postures (SAPs) are also viewed to be an important rodent anxiety parameter.[30] SAPs are a risk assessment behaviour of rodents which involves episodic alternating forward stretching and recoil of its entire length while lowering and keeping its trunk to the floor of the test device. Exhibition of reduced SAPs by rodents exposed to zero-maze has also been described to be indicative of reduced anxiety level.[31]

Aqueous *Tapinanthus globiferus* leaf extract anxiolytic activity in this study was not only superior to the other two plants' extracts but was also significant on all the four rodent anxiety parameters evaluated. These findings may represent the first report of anxiolytic activity of leaf extracts of *Tapinanthus globiferus* grown on *Azadirachta indica* (Neem) tree and may justify the traditional anti-anxiety use of this medicinal plant in Sokoto metropolis and environs. The anxiolytic effects seen in this study may be due to the presence of certain secondary metabolites in the leaf extract. This finding is in agreement with the finding of a previous study whereby crude aqueous stem bark extract of a related specie, *Tapinanthus dodoneifolius* (DC) Denser has been shown to exhibit anxiolytic and antidepressant effects in mice.[32] Other studies have shown crude methanol leaf extract of *Tapinanthus globiferus* to exert antidepressant effect in mice,[33] and aqueous residue fraction of *Tapinanthus*

globiferus has been shown to exert anti-convulsant effects in mice and chicks.[34] The anxiolytic activity of *Ampelocissus africana* extract in the study was either insignificant on most anxiety parameters evaluated at the lower extract's doses or significant on few parameters at high doses. This weak anti-anxiety effect exhibited by *Ampelocissus africana* extract may represent the first scientific anxiolytic evaluation on this plant. This plant extract has been under-researched in spite of the anecdotal report of its aphrodisiac property and efficacy in alleviating agitated states in Sokoto and Rabah environs of Sokoto State, Nigeria. The few available academic reports available on the extracts from *Ampelocissus africana* extract include those of anti-diarrhea effect in an ethnobotanical survey in Sokoto State of Nigeria,[35] of anti-trypanosomal,[14] anti-bacterial[36] and antineoplastic[15] activity.

Ficus sycomorus (FS) stem extract exhibited inconsistent anxiolytic activity in this preliminary anxiolytic activity screening; it significantly increased (p<0.05) the open field mean % CZT and the elevated zero-maze mean % OST only at the highest doses, but it significantly (p<0.05) attenuated the mean SAPs at the lowest extract dose on elevated zero-maze. This study is one of the few (if any) scientific reports on the anxiolytic activity of FS stem bark extracts. The inconsistent anxiolytic profile exhibited by FS in this study is incongruent with anecdotal reports of its usefulness in alleviation of excessive worrying and nervous and depressive afflictions in Sokoto and Rabah districts of Sokoto state, Nigeria. The observed inconsistent anxiolytic activity displayed by aqueous FS stem bark extract in this study might be due to the fact that only acute anxiolytic doses of the extract were used in the anxiolytic activity assays. Perhaps an extended duration dosing regimen may need to be employed in subsequent studies in order to re-assess its anxiolytic property.

CONCLUSION
This study has demonstrated a dose-dependent and significant acute anxiolytic effect of crude aqueous leaf extracts of *Tapinanthus globiferus* grown on Neem tree in mice. This finding may justify the traditional anti-anxiety use of this medicinal plant, and there is a need to carry out comparative anxiolytic activity screening of this aqueous extract, its methanol counterpart, and fractions in subsequent studies.

Conflict of interest

None declared.

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Knowledge of breast cancer and practice of breast self-examination among female National Youth Service Corps members in a Northern Nigeria State

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ABSTRACT

Background: Knowledge of breast cancer and uptake of its prevention practices (particularly, regular breast self-examination) are crucial to both the prevention of the disease, and the reduction of its high burden in the developing countries. **Aim**: This study aimed to assess the knowledge of breast cancer and practice of breast self-examination among female National Youth Service Corps (NYSC) members. **Materials and Methods:** A cross-sectional study was conducted among 225 female NYSC members (selected by systematic sampling technique) in Sokoto State, Nigeria. A semi-structured, self-administered questionnaire was used to obtain information on the research variables. Data were analyzed using IBM SPSS version 20 statistical computer software package. **Results**: Majority, 202 (89.8%) of the 225 respondents were aware of breast cancer, less than a quarter (23.6%) had good knowledge of its risk factors, less than half (48.0%) had good knowledge of its symptoms and signs, while about two-thirds (61.7%) had good knowledge of its prevention. Whereas, about two-thirds of respondents (67.6%) were aware of breast self-examination (BSE), less than half (44.4%) had attended a training on BSE, and only about half of respondents (53.8%) had practiced it. **Conclusion**: Although, awareness of breast cancer was high among the respondents in this study, they had poor knowledge of the disease, and uptake of breast self-examination was relatively low among them. Management of tertiary institutions in Nigeria and the National Youth Service Corps (NYSC) scheme should organize regular education programs on breast cancer and its prevention for their female students and NYSC members respectively.

Keywords: Breast cancer, breast self-examination, knowledge, practice, female NYSC members

INTRODUCTION

Globally, breast cancer is the second most common cancer and the fifth cause of cancer-related mortality.[1] It is second only to lung cancer as the main cause of cancer-related deaths among women and poses a global public health concern.[1-3] It is the commonest site-specific cancer affecting women and the most common cause of cancer mortality in women worldwide.[1,3,4] Over one million breast cancer cases are diagnosed annually resulting in 411,000 deaths which account for 14% of female cancer deaths worldwide, while about 4.4 million women live with the disease; and it has also been estimated to affect one in eight women during their lives.[3-6] There is an increased burden of breast cancer in both developed and developing countries including Nigeria.[3] It was estimated that about sixty percent of

breast cancer deaths worldwide occur in the developing countries.[6,7] In low- and middle-income countries (LMICs), it remains a significant public health challenge as incidence rates have been shown to increase yearly by as much as 5% with over 1 million projected new cases annually by 2020.[3,4,8]

The advent of breast illness and the consequent development of cancer seems to be more belligerent in young women compared to its development in older women.[9] The prevalence of breast cancer in women ≥15 years in sub-Saharan Africa was estimated at 23.5 per 100,000 women and approximately 35,427 women died from the disease (crude mortality rate of 12.8 per 100,000 women) in 2018.[10] In Nigeria, it was estimated

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that more than 250,000 new cases of cancers are diagnosed every year, and up to 10,000 Nigerians die each year from cancer-related causes. It is believed that the high morbidity and mortality due to breast cancer can be in-part reduced if the lesion is detected early enough.[4] In this respect, women need to be "breast aware" by being able to recognize the risk factors and symptoms of breast cancer, as well as risk reduction approaches.

Breast cancer has been linked with many risk factors such as being a woman, getting old (≥ 50 years), genetic changes (BRCA 1 and BRCA 2 genes), having dense breast, personal history of breast cancer or certain non-cancerous breast disease, history of breast cancer in a first degree relative (mother, sister or daughter), previous radiation therapy, and use of certain drugs (including diethylstilbestrol, hormone replacement therapy, and some oral contraceptives). The other risk factors of the disease include physical inactivity, consumption of fatty foods, overweight and obesity, never having a full-term pregnancy or having the first pregnancy after the age of 30 years, not breastfeeding, alcohol consumption and smoking.[11]Also, the common signs and symptoms that are seen in breast cancer include painless breast lump, change in size or shape of the breast, and discharge from the nipple among others; and these signs and symptoms are often ignored out of ignorance, whence majority of breast cancer cases in the developing countries present at advanced stages of the disease when only palliative care is feasible.[11] Knowledge of breast cancer and uptake of its prevention practices (including regular physical exercise and healthy eating, periodic screening mammography and regular breast self-examination among others), are crucial to both the prevention of the disease, and the reduction of its high burden in the developing countries.[11]

A breast self-exam (BSE) is a personal check-up carried out by a woman to look for changes or problems in the breast tissue, and premenopausal women are expected to perform it monthly. It is believed that the contributory factors to the high breast cancer mortality rates in the developing countries include genetic factors, poverty, lack of access to prompt quality treatment, and inadequate knowledge of breast cancer (which has been documented as an important factor in preventing women from visiting screening facilities, and engaging in BSE, thus resulting in delayed treatment, and poor prognosis).[5,12-14] Despite the fact that regular breast self-examination facilitates early detection of breast cancer, and it is also known to play an important role in reducing the morbidity and mortality from the disease in the developed countries, earlier reports indicate that although awareness of BSE is high among women in Nigeria, its uptake is low among them, and majority of those who practice it among them do not know how to do it correctly; and this has brought about the recommendation that more research should be conducted on the knowledge and practice of breast cancer and its prevention among different populations of women across Nigeria.[5,12] This study was conducted to assess the knowledge of breast cancer and the practice of breast self-examination among female National Youth Service Corps (NYSC) members in a northern Nigeria state.

MATERIALS AND METHODS
Study Design, Population and Area, Sample Size Estimation and Sampling Technique
A cross-sectional study was conducted among female National Youth Service Corps members in Sokoto State, Nigeria, in October and November 2018. All female members of NYSC Batch C Stream 1 who consented to participate were considered eligible for enrollment into the study. The sample size was statistically estimated at 224 (and adjusted to 236 in anticipation of a 95% response rate) and the eligible participants were selected by systematic sampling technique using the sorted list of the females in the batch to constitute the sampling frame.

Data Collection and Analysis
A semi-structured, self-administered questionnaire was used to obtain information on the respondents' socio-demographic characteristics, knowledge of risk factors, symptoms and signs, and prevention of breast cancer; and also awareness and practice of breast self-examination. It was reviewed by senior researchers in the Department of Community Health, Usmanu Danfodiyo University, Sokoto, Nigeria, to ascertain content validity. The questionnaire was pretested on 15 final year students of Usmanu Danfodio University, Sokoto, Nigeria. The necessary corrections were made based on the observations made during the pretesting. Three resident doctors assisted in questionnaire administration after being trained on the conduct of survey research, the objectives of the study, and the administration of survey instruments. Data were analyzed using the IBM SPSS version 20 computer statistical software package. Respondents' knowledge of the risk factors, the symptoms and signs, and prevention of breast cancer were scored and graded on a 21-point, 12-point, and 10-point scales respectively. One point was awarded for a correct response, while a wrong response or a non-

response received no points. Those that scored ≥ 50% of the maximum scores in the respective scales were graded as having good knowledge, while those that scored < 50% of the maximum scores in the respective scales were graded as having poor knowledge. Quantitative variables were summarized using mean and standard deviation, while categorical variables were summarized using frequencies and percentages.

Ethical Consideration

Ethical approval was obtained from the Health Research and Ethics Committee, Sokoto State Ministry of Health, Sokoto, Nigeria. Permission to conduct the study was obtained from the management of the Sokoto State NYSC camp, and informed written consent was also obtained from the participants before commencing questionnaire administration.

RESULTS

Socio-demographic characteristics of respondents

Two hundred and twenty-five out of the 236 questionnaires administered were adequately completed and found suitable for analysis, giving a response rate of 95.3%. The mean age of the respondents was 24.6 ± 2.6 years, majority of them (50.2%) were aged 20-24 years, and most of the respondents (93.3%) were single. A larger proportion of respondents (47.6%) were of Yoruba ethnic group, most of them (80.4%) were Christians, and majority of respondents (66.7%) graduated from the university (Table 1).

Awareness of breast cancer and knowledge of its risk factors among respondents

Most, 202 (89.8%) of the 225 respondents had heard of breast cancer, and the most common sources of information were radio/television (74.2%), health workers (70.2%), and newspaper/magazines (63.6%). Less than a quarter of respondents (23.6%) had good knowledge of its risk factors. Whereas, about two-thirds (62.2%) of respondents knew exposure to radiation as a risk factor of breast cancer, only about half of respondents and below knew the other risk factors of the disease with the most commonly known risk factors being family history of breast cancer in a first-degree relative (53.3%), smoking (52.9%), and personal history of breast cancer (52.0%). Only 36.4, 16.9 and 12.4% of respondents knew that breast cancer is not caused by blunt injury to the breast, witchcraft and close contact with a person with breast cancer respectively (Table 2).

Table 1: Socio-demographic characteristics of respondents

Variables	Frequency (%) n = 225
Age group (years)	
20-24	113 (50.2)
25-30	112 (49.8)
Religion	
Christianity	181 (80.4)
Islam	44 (19.6)
Marital status	
Single	210 (93.3)
Married	13 (5.8)
Separated	2 (0.9)
Ethnic group	
Hausa	10 (4.4)
Fulani	12 (5.3)
Yoruba	107 (47.6)
Igbo	51 (22.7)
Others	45 (20.0)
Education level	
University certificate	150 (66.7)
HND certificate	75 (33.3)

Respondents' knowledge of the symptoms and signs of breast cancer

Less than half 108 (48.0%) of the 225 respondents had good knowledge of the symptoms and signs of breast cancer with the most commonly known signs and symptoms being a lump in the breast (88.0%), pain or soreness in the breast (81.3%), and discharge from the breast (80.9%). About two-thirds of respondents knew swelling/enlargement of the breast (66.7%), discoloration or dimpling of the breast (63.6%), and change in the size of the breast (58.2%) as symptoms and signs of breast cancer, while about a third to half of respondents knew the other symptoms and signs of breast cancer (Table 3).

Respondents' knowledge of prevention of breast cancer

Majority, 139 (61.7%) of the 225 respondents had good knowledge of breast cancer prevention with the most commonly known methods being physical exercise and healthy eating habits (81.7%), periodic examination of the breast by a healthcare professional (76.9%), regular breast self-examination (73.7%), and periodic screening mammography (64.8%). Only about half of respondents and below knew the other methods of preventing breast cancer, while about half of respondents and below knew that use of loose bra, vaccination, avoiding breast feeding, and avoiding contact with a patient with breast cancer are not measures for preventing breast cancer (Table 4).

Awareness and practice of breast self-examination among respondents

Majority, 152 (67.6%) of the 225 respondents had heard of breast self-examination (BSE), less than half of them (44.4%) had attended a training on BSE, and only about half of respondents (53.8%) had performed BSE (Table 5).

Table 2: Awareness of breast cancer and knowledge of its risk factors among respondents

Variables	Frequency (%) n = 225
Ever heard of breast cancer	
Yes	202 (89.8)
No	23 (10.2)
*Source of information (n = 202)	
Radio/television	167 (74.2)
Newspaper/magazine	143 (63.6)
Health workers	158 (70.2)
Family members/friends	124 (55.1)
Internet	120 (53.3)
Mosque/church	63 (28.0)
Knew the following as risk factors of breast cancer:	
Being a woman	97 (43.1)
Getting old	84 (37.3)
Positive family history	120 (53.3)
High fat diet	84 (37.3)
Smoking	119 (52.9)
Race/ethnicity	47 (20.9)
Exposure to radiation	140 (62.2)
Alcohol consumption	107 (47.6)
Not having a full-term pregnancy	37 (16.4)
Having the first child at a late age	50 (22.2)
Early age at first menstruation	41 (20.9)
Late menopause	47 (20.9)
Physical inactivity	69 (30.7)
Overweight / obesity	75 (33.3)
Hormone replacement therapy	102 (45.3)
Personal history of breast cancer	117 (52.0)
Not breastfeeding	37 (16.4)
Knew that breast cancer is not caused by the following:	
Wearing tight brassiere	122 (54.2)
Close contact with a person with breast cancer	28 (12.4)
Blunt injury to the breast	82 (36.4)
Witchcraft	38 (16.9)
Knowledge grading	
Good	53 (23.6)
Poor	172 (76.4)

*Multiple responses allowed

Table 3: Respondents' knowledge of the symptoms and signs of breast cancer

Variables	Frequency (%) n = 225
Knew the following as symptoms and signs of breast cancer:	
Lump in the breast	198 (88.0)
Discharge from the breast	161 (80.9)
Pain or soreness in the breast	183 (81.3)
Change in the size of the breast	131 (58.2)
Discoloration or dimpling of the breast	143 (63.6)
Ulceration of the breast	107 (47.6)
Weight loss	71 (31.6)
Change in the shape of the breast	121 (53.8)
Inversion/pulling of the nipple	98 (43.6)
Swelling/enlargement of the breast	150 (66.7)
Lump under the armpit	101 (44.9)
Scaling/dry skin in the nipple region	97 (43.1)
Knowledge grading	
Good	108 (48.0)
Poor	117 (52.0)

Table 4: Respondents' knowledge of prevention of breast cancer

Variables	Frequency (%) n = 225
Knew the following as methods of preventing breast cancer:	
Physical exercise and healthy eating habits	184 (81.7)
Avoid or quit smoking	169 (56.0)
Regular breast self-examination	152 (67.6)
Periodic examination of the breast by a healthcare professional	174 (76.9)
Period x-ray examination of the breast (screening mammography)	146 (64.8)
Avoid use of oral contraceptives	118 (52.4)
Knew that the following are not methods of preventing breast cancer	
Use of loose bra or not at all	126 (55.6)
Avoid contact with a person with breast cancer	42 (18.6)
Avoid breastfeeding	46 (20.4)
Vaccination	98 (43.5)
Knowledge grading	
Good	139 (61.7)
Poor	86 (38.2)

Table 5: Awareness and practice of breast self-examination among respondents

Variables	Frequency (%) n = 225
Ever heard of breast self-examination (BSE)	
Yes	152 (67.6)
No	73 (32.4)
Ever attended a training on BSE	
Yes	100 (44.4)
No	125 (55.6)
Ever performed BSE	
Yes	121 (53.8)
No	104 (46.2)

DISCUSSION

This study assessed the knowledge of breast cancer and practice of breast self-examination among female National Youth Service Corps (NYSC) members in a northern Nigeria state. Although, awareness of breast cancer was high (89.8%) among the respondents in this study, and it is comparable to the findings done among female university students in other places including Cameroon (88.1%),[15] and Pakistan (82.9%),[16] it is substantially lower than the 97.3% awareness reported in a study among female medical students in the University of Lagos, Nigeria.[17] Also, higher levels of awareness of breast cancer were obtained in community based studies conducted in other places including a study conducted among women in Morogoro Rural District of Tanzania

that reported 100% awareness,[18] and another study among women seeking care at Districts Hospitals in Dar es Salam, Tanzania, that reported 98.2% awareness.[19] While the higher level of awareness obtained in the study conducted among female medical students could be due to their discipline which involves training on different diseases including breast cancer, the higher level of awareness obtained in the community based studies could be due to adequate sensitization of the populace about the disease, as most of the respondents in the latter studies cited radio / television as their main source of information about the disease. The finding in this study and the relatively low levels of awareness of breast cancer in studies conducted among students and female staff of tertiary institutions in Nigeria and other places including Southwest Nigeria (67.9%),[20] and Iraq (69.1%),[21] suggest inadequate sensitization of students and female staff in the tertiary institutions in Nigeria and other developing countries about breast cancer.

The poor knowledge of breast cancer among the respondents in this study in which less than a quarter of them (23.6%) had good knowledge of the risk factors of the disease, and less than half (48.0%) had good knowledge of its symptoms and signs is surprising in view of the high awareness of the disease by them. This finding is in consonance with the generally poor knowledge of breast cancer that was reported in studies conducted among students in tertiary institutions in Nigeria and other places including Cameroon,[15] Pakistan,[22] Egypt,[23] and India.[24] Considering the fact that female NYSC members represent the population of young women with tertiary education in Nigeria (being fresh graduates from the tertiary institutions across the country), adequate knowledge of breast cancer by them is not only important in preventing the disease among them, but also among the women in the communities where they live and work, as they are expected to pass the knowledge they have acquired regarding the disease to their relatives, friends and colleagues at work. The poor knowledge of breast cancer among the students and staff of the tertiary institutions in Nigeria and other developing countries could therefore be related to the poor knowledge of breast cancer obtained among women in community based studies conducted in Nigeria and other countries despite high levels of awareness of the disease through radio/television.[19,25,26] These findings underscore the need for the management of the tertiary institutions in Nigeria and other developing countries to organize periodic sensitization programs on breast cancer prevention for their female staff and students.

While it is reassuring that majority of the respondents in this study (61.7%) had good knowledge of the methods of preventing breast cancer, particularly breast self-examination (67.6%), it is disheartening to see that little has been done by the management of the respective institutions from which they graduated from to promote the practice among them, as less than half of respondents (44.4%) had attended a training on breast self-examination (BSE); and this could be responsible for the relatively low uptake (53.8%) of BSE by them. Similar to the progressive decrease and wide gaps in the proportion of respondents that were aware of breast cancer and BSE (89.8 and 67.6% respectively), and those that had practiced BSE (53.8%) among the respondents in this study, studies conducted among undergraduate female students and women in different cities in Nigeria and other developing countries also reported relatively high levels of awareness of breast cancer, but low levels of awareness of BSE and uptake of BSE.[15,17,19,20] In a study among female undergraduate students in a higher teachers training college in Cameroon,[15] whereas, 88.1% of respondents had heard about breast cancer, less than half of those who had heard of breast cancer were aware of BSE, and only 38.5% of those who were aware of BSE had practiced it. Similarly, a study among women seeking care at District Hospitals in Dar es Salam, Tanzania,[19] found that whereas, almost all the respondents (98.2%) were aware of breast cancer, less than two-thirds of them (56.0%) were aware of BSE, and only 40% of the respondents that were aware of BSE had practiced it. The findings in this study and the latter studies underscore the need for the management of the tertiary institutions in Nigeria and other developing countries to organize regular education programs on breast cancer and its prevention for their female students in order to facilitate uptake of BSE and other breast cancer prevention practices by them. In addition, the management of the National Youth Service Corps (NYSC) program should make education of female NYSC members on breast cancer and its prevention an essential component of their orientation camp program.

CONCLUSION
Although, awareness of breast cancer was high among the respondents in this study, they had poor knowledge of the disease, and uptake of breast self-examination was relatively low among them. Management of tertiary institutions in Nigeria and the National Youth Service Corps (NYSC) scheme should organize regular education programs on breast cancer and its prevention for their female students and NYSC members respectively.

Conflict of interest

None declared.

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Comparative in-*vivo* anxiolytic efficacy of aqueous and methanol *Tapinanthus globiferus* leaf extracts

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ABSTRACT

Anxiety disorders have been known to be highly prevalent and to exert heavy disease burden on the health delivery system. The increasing prevalence is not helped by the fewness and individual drawbacks of the currently prescribed anxiolytic drugs. This situation calls for discovery of new anxiolytic agents. This study investigated the in-vivo anxiolytic efficacy of intraperitoneal injection of 50, 150 and 500 mg/kg aqueous and methanol leaf extracts of *T. globiferus*, 0.5 mg/kg diazepam and 10 ml/kg distilled water in mice using standard test battery of open-field and elevated zero-maze tests. While treatment with the aqueous *Tapinanthus globiferus* leaf extract caused significant ($p<0.05$) alterations compared to the negative control in all the four rodent anxiety parameters evaluated which comprised percentage centre zone time (%CZT), rears, percentage open segment time (%OST) and unprotected head dips (UHDs); its methanol counterpart only caused significant alterations in only three parameters which comprised percentage centre zone time (%CZT), rears, percentage open segment time (%OST). Overall, these results indicate though both aqueous and methanol leaf extracts of *T. globiferus* grown on *Azadirachta indica* possess anxiolytic effects, the former however, exhibited superior anxiolytic potency over the latter and these extracts need be developed further for potential anxiety-alleviation use.

Keywords: In-*vivo*, anxiolytic efficacy, *Tapinanthus globiferus*, test battery, mice, optimization

INTRODUCTION

Anxiety disorders are pathological anxiety states characterized by sustained pervasive feelings of unpleasantness and unease. These disorders, in the various forms as selective mutism, social anxiety, generalized anxiety, separation anxiety, agoraphobia and panic disorder, have been reported to be a highly prevalent class of mental disorders that may be affecting up to a third of the general population.[1] Pharmacotherapy remains the cornerstone of management of these disorders. But drug treatment is still faced with delayed or sub-optimal efficacy, or intolerable toxicities in the long term.[2,3] The gap thus created by the foregoing indicates a need to search for new anxiety-alleviating agents. Research has shown that a number of medicinal plants (e.g. *Passifloraincarnata*, *Albiziajulibrissin*, *Passifloraincarnata*, *Sonchusoleraceus*, *Withaniasomniferum*, *Uncariarhynchophylla*,) have exhibited significant anxiolytic potential in previous human and animal studies.[4] *Tapinanthus globiferus* is one of the numerous *Tapinanthus* species commonly known as

African mistletoes (evergreen dioecious plants belonging to the Loranthaceae family).[5-7] It is a parasitic plant commonly seen on Neem and other trees and it is regarded traditionally as an all-cure plant with reported ethmo-medicinal efficacy in nervousness, raised blood pressure, seizures, neoplasms and hyperglycemia.[8] Reported pharmacological activities of *Tapinanthus globiferus* include antioxidant and anticonvulsant,[9] anti-inflammatory, hepatoprotective[10] and antimicrobial[11] effects. Despite its traditional use to alleviate anxiety in Sokoto and the surrounding towns and villages; and a reported anxiolytic effect in an animal study of a leaf extract of *Azardirachta indica* (neem)[12] (i.e., the host tree of the *Tapinanthus globiferus* under investigation), there has not been any scientific report on the anxiolytic activity of the extracts of this plant. Hence, this study aims to investigate the anxiolytic activity of the aqueous and methanol leaf extracts of the plant in Swiss Albino mice using standard rodent behavioural battery of open-field and elevated zero-maze tests.

MATERIALS AND METHODS

Fresh leaves of *Tapinanthus globiferus* grown on a Neem tree located along Shuni road, Mabera, Sokoto; Sokoto State, Nigeria, were collected in the month of March 2019. They were then briefly washed, dried under a shade, ground to a powder and kept dry in opaque plastic containers for later use. The leaves were identified by a Botanist. Specimens were vouchers kept at the Herbarium of the Department of Botany, Usmanu Danfodiyo University, Sokoto, Sokoto State, Nigeria. The plant part was extracted in the laboratory of the Pharmacognosy Drug Development Department, and the behavioural experiments took place in the behavioural room of the Department of Pharmacology and Therapeutics, Faculty of Pharmaceutical Sciences, Ahmadu Bello University, Zaria, Kaduna state.

Two hundred and fifty grams (250g) of fine powders of *Tapinanthus globiferus* leaves was soaked and allowed to macerate in 1 L of distilled water or 70% methanol for 24 hours. They were then filtered using Whatman's paper (150 mm) and separately evaporated in rotatory water bath at 45-50 degree Celsius. The drying process produced 30.53 g of brownish aqueous dry extract (12.21%) and 31.45 g of greenish methanol paste (12.58%) of *Tapinanthus globiferus* leaf powder.

The behavioural anxiolytic efficacy study on these extracts was carried out in a way similar to the procedure earlier adopted by Schmitt and Hiemke[13] (modified by reducing the inter-test delay to almost zero). Forty-five minutes after intraperitoneal injection of 50, 150 or 500 mg/kg of plant extracts, 0.5 mg/kg diazepam or 10 ml/kg distilled water, randomized groups (n = 10) of male mice under good laboratory practices, were each subjected to a test battery of open-field and elevated zero-maze in opaque cubicles having 100-lux illumination. Each run of behavioural assay was begun with by placing each mouse in the centre of the open field and allowed to freely move and explore the field for 5 minutes. At the end of this period, each mouse was again transferred to the mid-point of an open segment of the elevated zero-maze with the mouse facing one of the closed segments. The animal was allowed to freely explore its new environment for 5 minutes. Animals that jumped off the open segment of the zero-maze during the procedure were gently returned immediately to the test. Video recordings were made of the behavioural studies in addition to visual monitoring. Data were analyzed using analysis of variance (ANOVA) followed by Turkey post hoc test. *P*-values less than 0.05 were considered as significant.

Figure 1: *Tapinanthus globiferus* **(with leaves and fruit berries) grown on Neem tree**
(Source: Corresponding author)

RESULTS

Anxiolytic activity of aqueous and methanol *Tapinanthus globiferus* leaf extracts in mice

Administration of the aqueous *Tapinanthus globiferus* (ATG) leaf extract caused significant (p < 0.05) alterations compared to the negative control in all the four rodent anxiety parameters evaluated (Tables 1-4); its methanol counterpart (MTG) only caused significant alterations in only three parameters. On the percentage centre zone time (%CZT), ATG leaf extract at 150 mg/kg dose exhibited best mean value of 11.67±4.96 compared to the methanol *T. globiferus* (MTG) with an 8.06±4.91best mean value at the same dose level. On the number of rears, MTG exhibited superior dose-dependent and significant (p < 0.05) reductions in this parameter at all dose levels compared to ATG with significant (p < 0.05) anxiolytic activity only on the 150 and 500 mg/kg dose levels. On the number of rears, MTG exhibited superior dose-dependency and significant (p < 0.05) reductions in this parameter at all the three dose levels compared with ATG with

significant anxiolytic effect on this parameter at only 150 and 500 mg/kg dose levels.

On the percentage open segment time (%OST), while ATG treatment caused significant (p < 0.05) increases in this parameter on the 150 and 500 mg/kg dose levels, MTG only caused significant increase in mean %OST only at the 150 mg/kg dose level. Additionally, on this same parameter, ATG's best mean %OST of 44.27±6.24 was superior to MTG's best of 38.50±5.74. On the unprotected head dips (UHDs), ATG increased incidence of head dips that was significant (p < 0.05) at 150 mg/kg dose level, while MTG did not record any significant (p > 0.05) anxiolytic activity on this parameter at any dose level. ATG's mean UHDs of 10.33±2.33 at the 150 mg/kg dose was comparable to 9.25±1.61 mean UHDs of 0.5 mg/kg diazepam treatment. Overall, these results indicate that though both leaf extracts of *T. globiferus* grown on *Azadirachta indica* possess anxiolytic effects, the former however, exhibited superior anxiolytic potency over the latter.

Table 1: Per cent centre zone time of mice on open-field test

Treatments groups	Extracts' doses		
	50mg/kg	150mg/kg	500mg/kg
D/water (10ml/kg)	2.12 ± 0.73	2.50 ± 0.51	1.81 ± 0.35
Aqueous *T. globiferus*	7.03 ± 2.99*	11.67 ± 4.96	5.28 ± 0.84*
Methanol *T. globiferus*	4.45 ± 1.53	8.06 ± 4.91*	2.21 ± 0.29
Diazepam (0.5mg/kg)	6.79 ± 1.47*	13.64 ± 3.33*	6.21 ± 1.15*

Data were entered as mean ± S.E.M. of mice; *Statistically significant (p < 0.05)

Table 2: Number of rears of mice on open-field test

Treatments groups	Extracts' doses		
	50mg/kg	150mg/kg	500mg/kg
D/water (10ml/kg)	18.73 ± 4.06	22.33 ± 5.63	17.67 ± 3.49
Aqueous *T. globiferus*	9.00 ± 2.53	7.33 ± 3.09*	5.50 ± 1.52*
Methanol *T. globiferus*	6.18 ± 2.11*	5.42 ± 1.06*	5.36 ± 2.11*
Diazepam (0.5mg/kg)	4.64 ± 1.38*	6.92 ± 2.23*	7.15 ± 1.76*

Data were entered as mean ± S.E.M. of mice; *Statistically significant (p < 0.05)

Table 3: Per cent open segment time of mice on elevated zero-maze test

Treatments groups	Extracts' doses		
	50mg/kg	150mg/kg	500mg/kg
D/water (10ml/kg)	18.61 ± 2.76	21.45 ± 3.54	19.08 ± 3.87
Aqueous *T. globiferus*	24.67 ± 8.16	44.27 ± 6.24*	39.92 ± 7.56*
Methanol *T. globiferus*	24.82 ± 6.42	38.50 ± 5.74*	33.72 ± 10.09
Diazepam (0.5mg/kg)	36.75 ± 9.20*	43.25 ± 5.39*	42.39 ± 7.98*

Data were entered as mean ± S.E.M. of mice; *Statistically significant (p < 0.05)

Table 4: Number of unprotected head dips (UHDs) on elevated zero-maze test			
Treatments groups	Extracts' doses		
	50mg/kg	150mg/kg	500mg/kg
D/water (10ml/kg)	4.36 ± 0.94	3.58 ± 0.99	3.83 ± 1.07
Aqueous *T. globiferus*	7.36 ± 1.98	10.33 ± 2.33*	5.83 ± 1.33
Methanol *T. globiferus*	7.72 ± 2.15	5.83 ± 1.40	3.92 ± 0.87
Diazepam (0.5mg/kg)	9.00 ± 1.88*	9.25 ± 1.61*	13.33 ± 3.34*

Data were entered as mean ± S.E.M. of mice; *Statistically significant ($p < 0.05$)

DISCUSSION

The existing and increasing gap between the high prevalence and attendant huge health costs of anxiety disorders on one hand, and the fewness and individual drawbacks of the synthetic anxiolytic drugs in current use on the other, is a clarion call for renewed efforts targeted at discovering new anxiolytic agents. It is in this light that this study carried out an in-*vivo* anxiolytic efficacy screening of the aqueous and methanol of *Tapinanthus globiferus* leaf extracts in mouse anxiety tests of open-field and elevated zero-maze with the overall goal of finding potential anxiolytic factors. The effective and indispensable roles of the rodent anxiety tests especially the widely used open-field and elevated zero-maze paradigms in anxiolytic drug discovery have been severally reported.[14-17]

In this study both aqueous and methanol *Tapinanthus globiferus* leaf extracts exhibited significant anxiolytic activities compared to the negative control on all the rodent anxiety parameters evaluated. The four rodent parameters i.e. percentage centre zone (% CZT) and rears in the open-field test and the percentage open segment time (% OST) and number of unprotected head dips (UHDs) have been shown to be fundamental anxiety parameters in rodents (with decreased rears, increased % CZT, % OST and UHDs indicating reduced anxiety levels).[18,19] Although both extracts have demonstrated significant anxiolytic effect in mice in this study, the finding of superior anxiolytic activity of the aqueous over the methanol extract suggests that the former has greater quantity of the active chemical entities than the latter.

This finding may justify the traditional use of water decocts from this plant for anxiety relief. The outcome of this research may constitute the first report of anxiolytic activity on the leaf extracts of *Tapinanthus globiferus* grown on *Azadirachta indica*. Antidepressant effects have earlier been associated with a methanol extract of the same plant in mice.[20] The finding is also similar to the outcome of a previous study in which a crude aqueous stem bark extract of another specie (*Tapinanthus dodoneifolius*) was found to exhibit anxiolytic and antidepressant activity.[21]

CONCLUSION

This study has shown that aqueous and methanol leaf extracts of *Tapinanthus globiferus* grown on *Azadirachta indica* possess anxiolytic property and need to be further investigated for potential use as anti-anxiety agents.

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Nil.

Conflict of interest
None declared.

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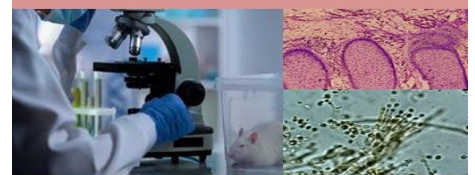**International Archives of Pharmacy and Pharmacology**
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