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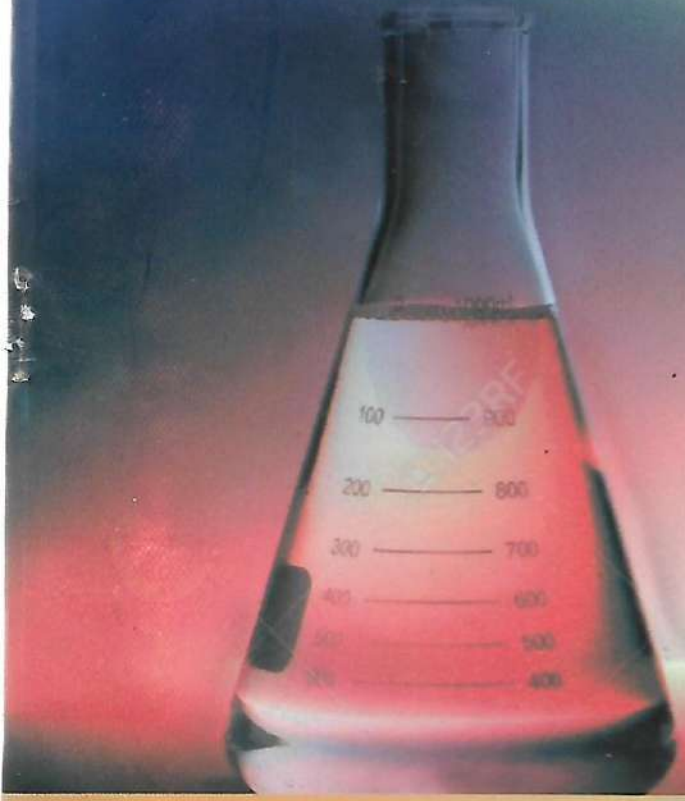

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CONTENTS

A COMPARATIVE STUDY OF THE MEAN HEIGHT AND WEIGHT OF SCHOOL CHILDREN AGED 3 – 5 IN URBAN AND RURAL COMMUNITIES IN ANAMBRA STATE, NIGERIA WITH THOSE OF WHO/NCHS STANDARDS

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ABSTRACT

This is a comparative study of the mean height and weight of pre-primary children aged 3 - 5 in rural and urban communities in Anambra State with the WHO/NCHS standard. Two objectives and one hypothesis were formulated in order to determine the mean measurements of weight and height of preschool children aged 3 – 5 in the urban and rural communities of Anambra State. A cross sectional survey research design was used for the study to collect sampled data of 1280 pre-primary children from three education zones in Anambra State. These data were organized and tested with inferential statistics of t-Test. The weights and heights were compared using graphs. The results showed that pre-primarychildren aged 3 - 5 in the urban areas indicated higher weights and heights than those in the rural areas. These pre-primary children aged 3 - 5 in both urban and rural locations had weights and heights that are higher than that of WHO/NCHS standards for their age. Based on the findings of the study, the researchers recommended that, it is important that the weight and height measurements of pre-primary children be routinely monitored as part of the school health programme.

INTRODUCTION

Background to the Study

Normal human growth is the progression of changes in weight and height that are compatible with established standard for a given population[1]. Normal human growth, as reflected in the growth curves of groups of individuals in various age groups has its determinant factors. Some of these factors include age, sex, place of residence, socio–economic class and the individual's prevailing status of health[2]. Normal growth, therefore, is a reflection of the overall health of an individual which is determined by the measurement of his/her body weight and height.

Optimal growth is often consistent with normal health if the individual is provided with the minimum physiologic nutrient requirement for his age and sex. The interaction of environmental, sociocultural and demographic factors directly influences the availability, consumption and utilization of food[3]. A population well adapted to its environment should present indicators of weight and height in accordance with the standards expected. In this study, normal growth means the evident state of nutrition of an individual which is assessed by the measurement of the individual's body weight and height for age.

Growth retardation is shown by retarded weights and heights, inadequate bone development and delayed menarche in girls[4]. It has been confirmed that stature is an index of nutritional status, depending on how well the genetic potentials have been achieved[5].

According to Burren, the short individual may have lacked the essential nutrients like proteins, vitamins, calcium and iron for optimum development, instead of being short

for reason of genetics. It has also been pointed out that under severe conditions, growth in the body weight is first affected by loss of body fat, followed later by loss of muscle tissue leading to growth retardation[5].

Environmental factors such as socio-economic class and place of residence have influence on the weight and height of children[6,2]. Accordingly, Pearce observed that children of parents of high socio-economic class are about 2 cm taller at three years and 5 cm taller at adolescence than those of low socio-economic class. Apparently, this reflects the difference in nutritional habits, rest and sleep, exercise pattern and home conditions[7]. Growth and development retardation are common in city slums and rural areas where there is poverty[5]. Also, it has been observed that American children in low income groups have been found to be shorter and leaner than their peers in affluent groups[8].

Anthropometric measurement in form of growth monitoring is an essential component of child health supervision. Graphically, plotting anthropometric values for an individual indicates where the individual ranks in relation to all other individuals of the same age and gender. The reference standards most commonly used to standardize measurements were developed by the US National Center for Health Statistics (NCHS) and are recommended for international use by the World Health Organization (WHO). Available evidence suggests that children from well-nourished and healthy families throughout the world grow at approximately the same rate and attain the same height and weight as children from industrialized countries[9,2]. The international reference standards can therefore be used for standardizing anthropometric data from around the world.

Studies on growth rate have been well documented in developed countries as opposed to developing countries where not much works have documented anthropometric evaluations[10]. This study is important in order to evaluate the weight and height and establish growth standards (compared with WHO/NCHS standards) for pre-primary children in Anambra State and to provide a baseline data for future research and make further contributions to knowledge in this area. Understanding the nutritional status of these children has far-reaching implications for promoting the health of future generations.

Purpose of the Study

The study was aimed at determining the weight and height of pre-primary children aged 3 - 5 in urban and rural communities of Anambra State with the objective of comparing them with the WHO/NCHS recommended standards for their age. Specifically, the study aimed at:

1. Determining the mean measurements of weight and height of pre-primary children aged 3 – 5 in the urban and rural communities of Anambra State.
2. Comparing the measurements of the mean weight and height of pre-primary children aged 3 – 5 in rural and urban communities in Anambra State with those of WHO/NCHS recommended standards for their age.

Research Questions

The following research questions guided the study:

1. What are the mean measurements of the weight and height of pre-primary children aged 3 – 5 in urban and rural communities of Anambra State?
2. How do the mean weight and height measurements of pre-primary children aged 3 – 5 in urban and rural communities in Anambra State compare with those of WHO/NCHS recommended standards for their age?

Research Hypothesis

There is no statistically significant difference

in the mean measurements of weight and height of pre-primary children aged 3 – 5 in urban and rural communities in Anambra State.

Method and Materials

The research design adopted for this study, which is concerned with determining the growth of preschool children was the cross–sectional comparative survey design. This study basically focused on the assessment of the growth of preschool children aged 3 – 5 in Anambra State with respect to their weights and heights. The variables were delimited to their age and location of schools. The study involved only public schools approved by the State Ministry of Education located in the six education zones in Anambra State. The age limits were found in the early childhood/pre-primary education classes (3 – 5 years)[11].

The target population of the study comprises all pre-primary school children in the public nursery schools in Anambra State. Multi-staged sampling technique was used to select the sample size of 1280 pre-primary children used for the study from three educational zones in the state. The anthropometric measurements of the height and weight of the pre-primary school children were taken.

Data were collected using standard instruments for anthropometric assessment. The validity of the measurement tools was confirmed by experts. There was no test of reliability for the instruments for the study based on the fact that the instruments are standardized and valid instruments that have been recommended for such data collection. Height and weight were measured according to International Society for Advancement of Kinanthropometry standards for anthropometric assessments[12]. The children were in their school sport shorts and vest, and barefooted. They stood erect on the weighing scale, looked straight ahead and relaxed. The researchers took the readings when the pointer stabilized. Height was measured using a height ruler calibrated in meter and centimeter. The participants were dressed as for weight measurement. The height meter was mounted on the wall and the participants stood erect, barefooted, and looked straight ahead. The measurement was taken on the ruler against the vertex of the head. Data were summarized using descriptive statistic of mean and standard deviation. Comparative analyses between variables were done using independent sample t-test. Statistical significance was set at $P<0.05$ level of significance. All statistics were done using Statistical Package for Social Sciences (SPSS) for Windows (version 16.0). The data were presented in tables, bar charts and also plotted in line graphs for ease of comparism with those of WHO/NCHS recommended standards for their age.

RESULTS AND OBSERVATIONS

Research Question 1

What are the mean measurements of the weight and height of pre-primary school children aged 3 – 5 in urban and rural communities of Anambra State?

Table 1: Mean Weight and Height of Pre-primary School Children Aged 3 - 5 plus According to Location

VARIABLES Measurement	URBAN(n= 582) x Measurement	RURAL (n = 698)	x Difference
Weight (Kg)	17.08	16.72	0.36
Height (Cm)	1.04	1.03	0.01

Table 1 shows that the urban pre-primary children of Anambra State aged 3-5 had better mean weight (17.08kg) and mean height (1.04m) than their rural counterparts who had 16.72kg and 1.03m as their mean weight and mean height respectively.

How does the mean weight and height measurements of pre-primary school children aged 3 – 5 years in urban and rural communities in Anambra State compare with those of WHO/NCHS recommended standards for their age?

Research Question 2

Table 2: Mean Weight of Pre-Primary School Children Aged 3-5 compared with those of WHO/NCHS Reference Values in both Urban and Rural Areas

AGE (YEARS)	MEAN WEIGHT OF CHILDREN IN URBAN LOCATIONS(Kg)	MEAN WEIGHT OF CHILDREN IN RURAL LOCATIONS(Kg)	WHO/NCHS REFERENCE MEAN WEIGHT(Kg)
3	15.3	15.4	14.3
4	17.4	16.8	16.3
5	18.1	17.7	17.9

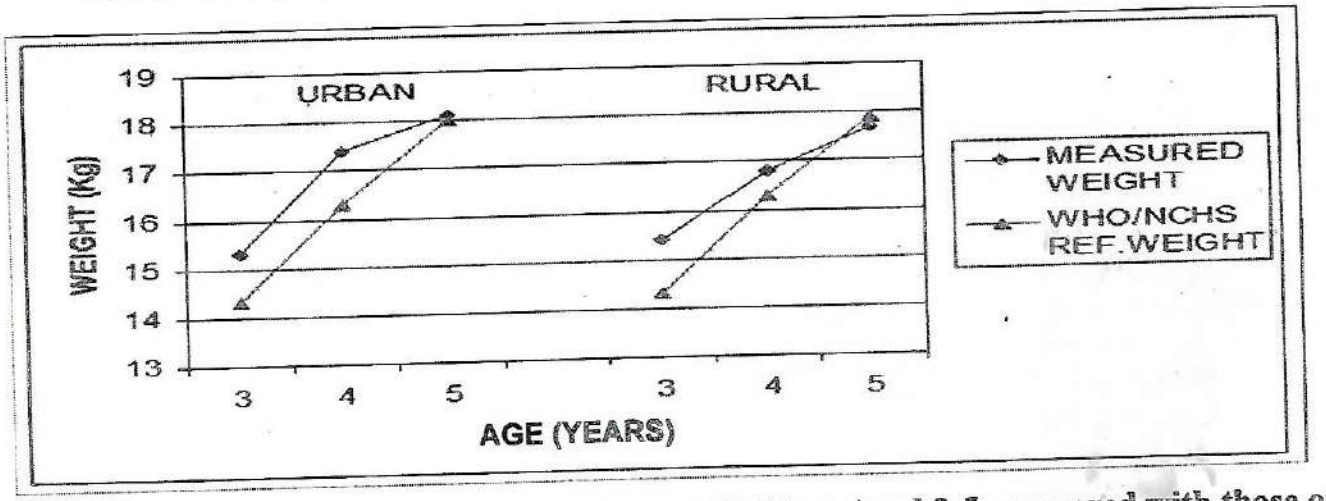

Fig. 1: The Mean Weight of Pre-primary School Children Aged 3-5 compared with those of WHO/NCHS Reference Values in both Urban and Rural Areas

Table 2 and Figure 1 show that the urban and rural pre-primary school children under the study weighed more than the WHO/NCHS reference weight for their age. The table also shows that the mean weight of children in urban locations aged 5 and that of WHO/NCHS reference standard were better than those in rural locations, but these children in urban locations weighed more than the WHO/NCHS reference standard.

Table 3: Mean Height of Pre-primary School Children Aged 3-5 compared with those of WHO/NCHS Reference Values in both Urban and Rural Areas

AGE(YEAR)	MEAN HEIGHT OF CHILDREN IN URBAN LOCATIONS (Cm)	MEAN HEIGHT OF CHILDREN IN RURAL LOCATIONS (Cm)	WHO/NCHS REFERENCE MEAN HEIGHT(Cm)
3	98.2	98.3	95.1
4	104.5	105.3	102.9
5	109.6	105.5	109.2

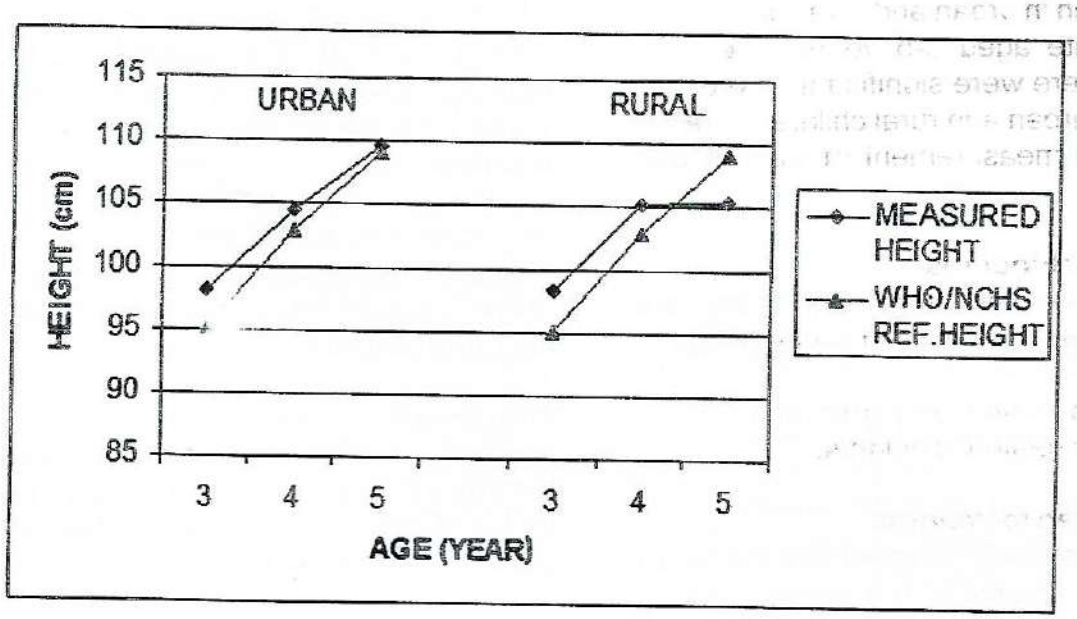

Fig. 2: The Mean Height of Pre-primary School Children Aged 3-5 compared with those of WHO/NCHS Reference Values in both Urban and Rural Areas

Table 3 and Figure 2 show that the mean height of the pre-primary school children in urban and rural locations aged 3 - 4 was greater than that of WHO/NCHS reference standard for their age. The table also shows that among the children aged 5, the mean height of those in urban locations and that of WHO/NCHS reference standard were better than that of those in rural locations, but these children in urban locations had better mean height (109.6cm) than the children of WHO/NCHS reference values who had a mean height of 109.2cm.

Research Hypothesis

There is no statistically significant difference in the mean measurements of weight and height of pre-primary school children aged 3 – 5 in urban and rural communities in Anambra State. The data verifying this hypothesis are contained in Table 4.

Table 4: Summary of the t-test comparison of the Mean Weight and Height of the Pre-primary School Children in Anambra State Aged 3-5 According to Location

VARIABLES	N	□	SD	Df	t- Cal	t – VALUE	P-VALUE	Remarks
Weight (Kg)		⊔						
Urban	582	17.08	2.81	79	2.24	1.99	<0.05	Reject
Rural	698	16.72	2.45					
Height (m)								
Urban	582	1.04	0.07	87	2.66	1.99	<0.05	Reject
Rural	698	1.03	0.07					

Table 4 presents the t-test summary of the mean weight and height of the pre-primary school children in urban and rural locations of Anambra State aged 3-5 years. The table shows that there were significant differences between the urban and rural children in terms of their mean measurement of weights and heights.

Discussion of Findings

The facts emerging from this study are discussed under the following subheadings:

- Results related to weights, and
- Results related to heights.

Results Related to Weights

Findings of this study revealed that the mean scores of the weight of pre-primary school children aged 3 – 5 in Anambra State were within normal range. However, when compared based on location, children in the urban areas indicated higher mean weight (17.8kg) than those of their rural counterparts. This might be due to differences in the socio-economic status of their parents because most of the children attending schools in rural areas are from relatively low socio-economic background. Therefore, the low socio-economic backgrounds of these children suggest that factors such as education, occupation and economic status of their parents may account for the differences. In addition, the usual higher prevalence rates of intestinal parasites in the rural communities compared with the urban areas could contribute to the disparity in the growth rate of these children.

The higher mean weight of children in urban communities in the present study is in agreement with those of other studies on pre-primary school children in Nigeria and other countries [13, 18]. In Nigeria, there are more children from high socio-economic classes in the urban areas than the rural communities. This probably accounted for the better growth rate of the children in the urban locations than the rural locations.

The weight of pre-primary school children aged 3 - 5 plus in both urban and rural locations was greater than that of WHO/NCHS reference weight (P<0.001). The graphs obtained from this study compared favourably with the WHO standards, showed that it did not fall below the recommended standards. This is in contrast to the study done elsewhere in Nigeria where it was found that the mean weight of the children at all ages was much lower compared to WHO/NCHS reference standard [19,20,21].

Results Related to Heights

The height of pre-primary school children aged 3 – 5 plus in both urban and rural locations were higher than that of WHO/NCHS recommended reference height for their ages. Findings have shown that factors such as socio-economic class and genetic factors have influence on the weight and height of children [6, 2]. In this connection, it has been reported that growth and

development retardation are common in city slums and rural areas where there is poverty[5].

Implications of the Study

The findings of the study indicated that location has significant influence on the anthropometric indicators of the children. What this implies is that children in the urban locations have adequate dietary intake than their rural counterparts. This, therefore, calls for health education of the parents and care-givers on the need for adequate nutrition and elimination of some of the factors that contribute to low dietary intake especially in the rural areas. Parents should monitor the type and quantity of food their children consume and make sure they are adequate in quantity and quality. This will guide them on the need to provide adequate nutrition for their children to enable them achieve normal growth and brain development for their age and sex. This is because of the need to maintain an optimum wellness and normal growth of the school age population in Anambra State. This need has become abundantly clear by virtue of the results of this study. It is, therefore, recommended that the weight and height measurements of pre-primary children be routinely monitored as part of the school health programme.

CONCLUSION

Growth monitoring has been identified as an opportunity for health care providers to increase awareness and provide anticipatory guidance on the importance of healthy feeding and eating practices. Growth monitoring is essential in order to identify the risk of inadequate nutrition and conditions manifested by growth disorders. There is, therefore, the need for regular measurements of the weight and height of Nigerian children through the school health services in order to monitor their growth. The need to educate mothers and caregivers to bring their children for growth monitoring and the importance of referring conditions manifested by growth disorders to health care providers for adequate management can never be over-emphasized.

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Longitudinal study of changes in body composition of young adult in Nigerians. *Nigerian Journal of Sociology* 2010.36, 47-57.

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BARR BODY STUDIES AND CLINICAL APPLICATIONS

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ABSTRACT

One hundred (100) subjects from among staff and students of Nnamdi Azikiwe University, Nnewi Campus and Nnamdi Azikiwe University Teaching Hospital, Nnewi, were screened for the presence of Barr bodies in buccal smear. 41 males and 59 females (1 a known Turner Syndrome Patient) were studied. Of these, 20 (7 males and 12 females with children, and 1 previously diagnosed Turner Syndrome) subjects, served as positive and negative controls. The buccal smears were stained with Haematoxylin and Eosin (H&E) stain. Results showed that 57 of the 58 female subjects had Barr bodies. No male subject was found to have Barr bodies. None of the positive subjects had more than one Barr body in a cell. A mean Barr body of 22±5.6% standard deviation was obtained for the female subjects. There were slight variations in the Barr body count. Barr body count of married and single female subjects did not show any significant variation at P<0.05. The only female subject without a Barr body had infertility problems though she had no external features of abnormality.

INTRODUCTION

Human somatic cells contain 46 chromosomes, 22 homologous pairs of autosomes and 2 sex chromosomes, XX in the female and XY in the male[1]. These are seen in the normal condition, but there are conditions where the somatic cells are less or more than 46. Such conditions are known as cytogenetic disorders (chromosome mutations). The aberrations underlying cytogenetic disorders may take the form of an abnormal number of chromosomes or alteration in the structure of one or more chromosomes. The normal chromosome count is expressed as 46XX for the female and 46XY for the male. An exact multiple of the haploid is called euploid. If an error occurs in meiosis and a cell acquires a chromosome complement that is not an exact multiple of 23, it is referred to as aneuploidy. The usual causes of aneuploidy are non-disjunction and anaphase lag [1-3].

Cytogenetic disorders can be divided into two: Those involving autosomes and those involving sex chrosomes.

The genetic diseases associated with Karyotypic changes involving the sex chromosomes are far more common than those related to autosomal aberration. Imbalances (excess or less) of sex chromosomes are better tolerated than similar imbalances of autosomes. Autosomal monosomies are usually lethal and rarely occur[3]. Sex chromosome disorders can induce subtle, chronic problems relating to sexual development and fertility, which are often difficult to diagnose at birth. Many are first recognized at the time of puberty. Some are never detected as they do not affect the development of secondary sexual characteristics and fertility in a noticeable manner[4]. It is generally known that only one of the chromosomes is genetically active. The other X chromosome, either of maternal or paternal origin undergoes heteropyknosis and is rendered inactive[5-7]. The inactive X can be seen in the interphase nucleus as a darkly small in contact with nuclear membrane

known as the Barr body or sex chromatin[1,3,5]. Barr bodies are present in all somatic cells of normal females, but they are most readily demonstrated in smear of buccal squamous epithelial cells[8-10]. In the male, Barr body is absent.

The use of buccal mucosa is non-invasive, and easy to obtain, and when combined with molecular techniques is reliable and accurate[9-10]. The use of Barr bodies which can be seen in buccal smear is useful not only in cases of ambiguous genitalia but also in so many other chromosome disorders[11]. Barr body detection or non-detection may be of more diagnostic use than is currently made use of routinely, as a recent study has shown in breast and ovarian cancers[12].

The human abnormalities called Klinefelter's Syndrome and Turner's syndrome both result from the unnatural presence or absence of a Barr body. In the former, a male possesses a Barr body that it should not have while in the latter a female has no Barr body. In Klinefelters Syndrome, which is seen as the most frequent form of male hypogonadism[13], there are two or more X chromosomes and one or more Y chromosomes. 80% are XXY. In Klinefelters Syndrome, Barr bodies are seen because of the extra X chromosome. Turner Syndrome (45 XO) is the most common sex chromosome abnormality in females characterized by hypogonadism[13-14], in addition to other features. It is the second most important cause of primary amenorrhoea after Mullerian duct anomalies[14]. These females are sex chromatin negative, half of them exhibit 45 XO, the other half mosiacism and varied abnormalities of the X chromosome[5]. In multiple X females, more than one Barr body may be seen in each cell. There is increasing tendency of mental retardation in proportion to number of X chromosomes[15]. Presence of Barr body was introduced by the International Olympic Committee in 1968 as a gender verification test but had to be replaced by polymerase chain reception test at the 1992 Barcelona Olympics which is more sensitive.

SUBJECTS AND METHODS

Buccal scrapings were collected from 100 apparently healthy subjects aged between 19 and 52. The subjects were selected from among the staff and students of Nnamdi Azikiwe University/Teaching Hospital, Nnewi, Anambra State, after obtaining their informed consent. Twenty of the subjects were used as controls as follows: seven males and twelve females who are married and have children, served as negative and positive controls respectively, and one known Turner Syndrome case also served as a negative control.

SAMPLE COLLECTION

Samples were collected from the buccal epithelial lining. The subjects were given water to rinse their mouths before collection to prevent contamination with bacteria and food particles. To further restrict bacteria contamination, a light scraping was first discarded and a second deeper scraping taken. The inside of the mouth (cheek) was scraped firmly with the rounded blunt end of a spatula. A new spatula was used for each subject. Subjects who had mouth ulcers or sores in the mouth were excluded. The slightly turbid fluid obtained was immediately smeared upon clean grease-free slides. These were then placed, while still wet, in 95% ethyl alcohol.

Staining was done with Haematoxylin and Eosin.

Sex chromatic lying intra-perinuclearly against the nuclear envelop stained violet. The Barr bodies were counted and expressed as percentage. Only cells which were large with no folding of the nuclear membranes, cells whose nuclear membranes and whose nuclei were not obstructed were counted. The ones with folded or obstructed nuclear membranes or ones in which the nuclear membranes were not intact were excluded.

RESULTS

The age distribution of the subjects is shown in Figure 1. Peak age range was 19 - 24 years (34%). A total number of 41 males and 59 females were studied. Of the forty-one (41) males studied, none was found to possess a Barr body. Of the 59 females studied, one was found to have the Turner Syndrome case. Of the remaining 58, 57 were found to have Barr bodies (98.28%) while 1 (1.72%) had no Barr bodies. A mean of 22% of the total nuclei in positive women possessed Barr bodies. The Barr body count in married and single women did not show a significant difference $P<0.55$. Figure 2 shows the Barr body count in different age groups; 35 - 36 age group showed the highest count of 27%.

DISCUSSION

One hundred subjects were assessed for Barr bodies in buccal smears. In the subject with known Turner syndrome, no Barr body was found in the smear. In this study, one female subject was found to lack the Barr body. Incidentally, she had been married for four years without an issue. Cytogenetic disorders may remain undetected and only detected when associated with infertility[4]. This may well be true with this case work in which the female subject lacking Barr bodies has no outward sign of an abnormality. The secondary sexual characteristics are well developed. The subject is of normal stature and menstruates regularly. The use of Barr bodies from buccal mucosa when combined with molecular technique is reliable and accurate in detecting or excluding cytogenetic disorders. Thus, the subject will require further tests, like karyotyping to confirm or exclude abnormality.

Barr body analysis revealed a specificity of 95% and a sensitivity of 82% for the diagnosis of Klinefelters syndrome, hence provides a quick and reliable screening test, which, however, must be confirmed by karyotyping[12].The subject's husband had been investigated and found to have normal values in semen analysis.

No male subject was found to possess Barr body and this agrees with numerous works which have proved that normal males do not possess Barr bodies. So, one can surmise from this study that only normal males were studied. No female subject had more than one Barr body. The Barr body count of the subjects ranged from 9% to 40% with a mean of 22%. This agrees with a study on Jordanian women[16], which showed that the number of X-chromatin was the highest (approximately 22%) in the <9 - 19 years age group and was the lowest (approximately 10%) in 50 and above years age group. Hagy et al. [17] who worked on variation of sex chromatin in human oral mucosa have their result as between 14% to 56% of squamous cells and an average of 26%. A similar work by Douglass and Beaver[18], gave the range as between 2% and 21%. This wok seems to agree more with the work by Hagy and his co-workers.

The study by Ndubuka et al[19] on the different staining techniques for the demonstration of Barr bodies from buccal smears reported different results using different staining methods. Using cresyl fast violet, an average Barr body count of 25% was reported. For the acetorcein method, an average of 33% was recorded while with Actoorcein 1 Acetocresyl fast violet method, an average of 40% was noticed. An average of 22% Barr body count was observed from this present work using Haematoxylin and Eosin. Choice of method depends on many factors but mostly the sensitivity and availability of such methods. The straining method used is the Harris' Haematoxylin with Eosin as counterstain. H&E is the most commonly used technique in animal histology and routine pathology as the standard histological method [20].

Buccal scrapping as a choice specimen for the Barr bodies has the advantage of being non-invasive and easy to obtain. Other specimens such as skin biopsy and blood films can also be used. Barr body count is a critical exercise in exfoliative cytology. Indeed, it is critical in the sense that upon its result, depends the verdict of male and female patients with doubtful sex

and sexual pathology[7] especially in our environment with limited confirmatory chromosome studies. Indeed, the incidence of cytogenetic disorder may be more prevalent in the general population than is presently realised.

Interest was recently reawakened on the presence of heterochromatic X chromosome in certain breast and ovarian cancers. It is now known that heterochromatic instability is a common but largely unexplored mechanism leading to widespread genomic mis-regulation and the evolution of some cancers[11]. Also, the Y-chromosome is known to play peculiar roles in genetics, sex determination, evolutionary history and, therefore, of significant use in medical, forensic and human evolution. The SRY sex determining region has been linked to gonadoblastoma in intersex patients, testicular germ cell tumours, prostate cancer and other somatic cancers[21]. With the recent happenings in the sports world where some females with extraordinary performances have been found to have male characteristics, Barr body studies (plus PCR) have become even more useful as a screening tool.

RECOMMENDATIONS

We recommend that Barr body studies be made part of investigations for infertile couples when no other abnormality is obvious, as more subjects may be found to lack or possess Barr bodies in the larger population. The studies should also be extended to cancer patients and members of their families for screening, documentation and counselling purposes, as well as to sports women.

CONCLUSION

The incidence of cytogenetic disorders is more prevalent in the general population than is presently known. Barr body studies by cost-saving buccal smears are an important screening tool in our environment where the more sophisticated and expensive polymerase chain reaction (PCR) tests may not be easily accessible.

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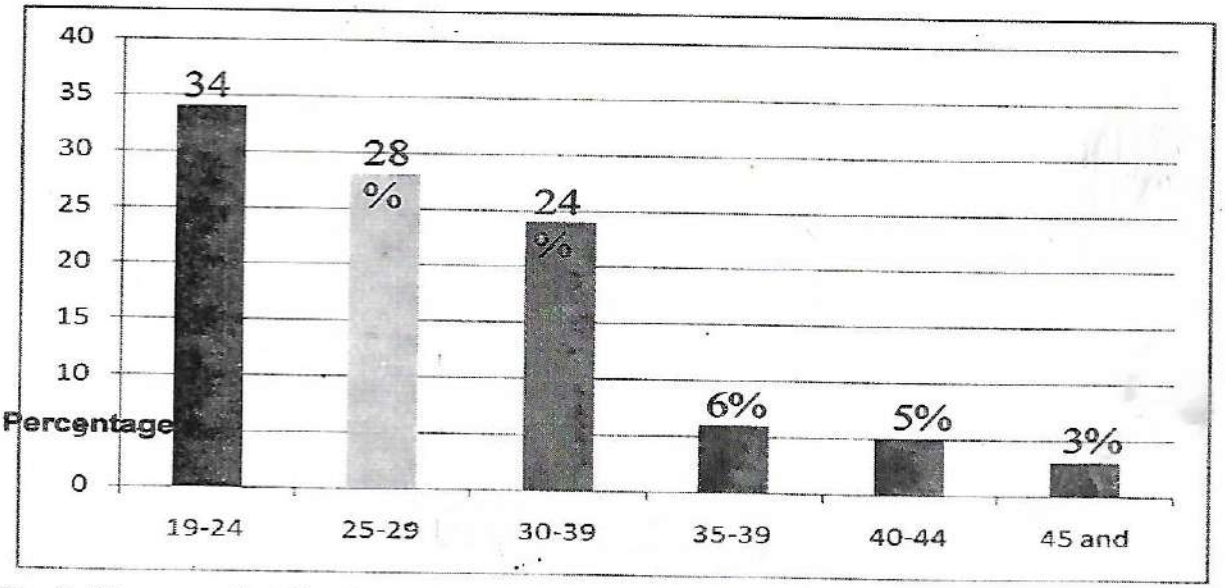

Fig.1: The age distribution of subjects studied
Age range 19-52 years. 19-24 is the highest number (34%).

Average Barr body count (22%)

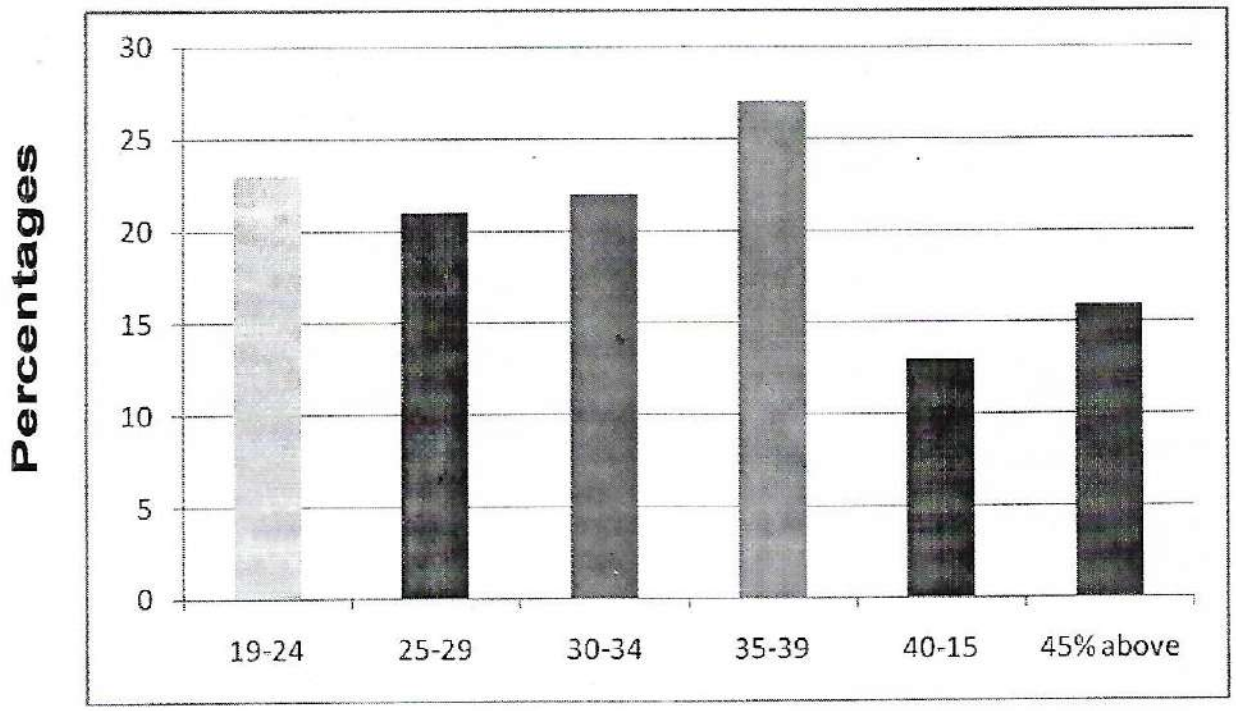

Fig. 2: Barr body count in different age groups
Age groups 35 - 39 showed the highest of 27%.

PREVALENCE OF LOW BACK PAIN AMONG OCCUPATIONAL MOTORCYCLE RIDERS IN NNEWI, ANAMBRA STATE

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ABSTRACT

Background: *Occupational motorcycling has become the mainstay of transportation in most parts of Nigeria.*
Objective: *This study investigated the prevalence of low back pain (LBP) among occupational motorcycle riders in Nnewi, south eastern Nigeria.*
Method: *Data was collected using a 27- item questionnaire adapted from the one used in a previous study. The consecutive non-probability sampling technique was employed in selecting the respondents.*
Results: *Two hundred and sixty nine copies of the questionnaire were completed and retuned out of the 270 administered, indicating a 99.6% response rate. The prevalence of back pain was found to be 40.9% and the body part most affected was the low back (79.5%) followed by the upper and mid back pain (10.2% each); 39% of those who reported LBP belonged to the 40 - 49 age group. Only 15% of the respondents who had worked for 1 - 2 years reported LBP. Sitting for long time was the posture identified by most of the respondents as worsening their back pain (33.3%) while standing for a long time was identified by most (66.3%) as relieving their pain. Upright sitting with 90° elbow flexion was reported by most of the occupational motorcycle riders (77.14%) as the most commonly adopted posture during riding. Although 12% of the motorcycle riders had stopped working on some days as a result of the pain; none of them had left the occupation.*
Conclusion: *LBP may be associated with longer duration of occupational riding and with age although at a certain age (50 and above); it was found to decrease.*

Keywords: *Low back pain, Occupational motorcycle riders*

INTRODUCTION

Low back pain (LBP) is a common symptom of musculoskeletal disorder or disorders involving the lumbar vertebra and has been found to have significant impact on functional ability, thereby restricting occupational activities with marked socio-economic repercussions[1]. LBP is one of the most treated disorders in outpatient physiotherapy clinics worldwide [2], as probably 80% of the population are affected by this symptom at sometime in life[3]. The number of visits to primary care providers as a result of LBP is second only the number of visits for upper respiratory tract illnesses.

Bad posture plays a significant role in the genesis of the disease [4] and a lot of conditions and factors like prolapsed lumbar inter-vertebral disc, facet joint arthritis, spinal stenosis, occupation, obesity, muscle strain and unaccustomed activities have been identified as the common causes of LBP. The typical patients report either acute low back pain (lasting less than three months) or chronic back pain (lasting more than three

months without improvement) and fatigue [5]. There may be pain radiating down the leg, suggesting nerve root involvement. The patient's gait, spinal mobility, reflexes, leg length, leg motor strength and sensory perception may be affected [5].

Motorcycles popularly known as 'okada' are a common sight in this part of the world as a means of transportation. The occupational motorcycle riders make their daily living by transporting people by their motorcycles (which are a two-wheeled motor vehicle without pedal propulsion). The small frames of these vehicles allow them pass between cars as commonly seen during traffic congestion on the roads. This in addition to their ability to take individuals to virtually any destination through even bad terrains probably makes commercial motorcycle riding the commonest and most easily affordable and available means of transportation especially for short distance trips.

There are basically three types of riding postures - cruiser, sports and standard [6]. Of the three, standard is the most neutral, in which the rider is not angled or slung back in any way. The body is upright, the head and eyes are up, looking through the path of travel, the hands rest comfortably on the grips without hyperextension of the arms. The researchers observed that due to variation in manufacturers and design of motorcycles, there are also varied postures adoptable by the riders leading to possible habituation.

Studies on the prevalence of LBP among orthopaedic and intensive care unit nurses [7]; among male physical education teachers [8] and among truck drivers [9] have been reported. This study investigated the prevalence of LBP among occupational motorcycle riders in Nnewi, a commercial city in South East Nigeria, using a 27-item questionnaire adapted from a previous study[1].

METHODOLOGY

Research Instrument

The instrument used was a self-administered questionnaire which is an adaptation of the one used in a related study[1], and which has been adapted for use by other workers in the area of occupational LBP[10].

Research Design, Sample size and Sampling Technique

The study employed a survey design. Two hundred and seventy copies of the questionnaire were administered to occupational motorcycle riders. The consecutive non-probability sampling technique was employed in selecting the respondents from their different zonal offices, terminals and parks (46 in all) in Nnewi, South East Nigeria. The participants in this study were active occupational motorcycle riders who had been involved in the occupation for at least one year. This was to eliminate or reduce the incidence of LBP which could have been as a result of previous occupations. Participation in the study was purely voluntary.

Procedure

Ethical approval was sought and obtained from the institutional review committee of Nnamdi Azikiwe University Teaching Hospital before commencement of the study. The informed consent of each respondent was obtained via the consent form attached to the research instrument before the questionnaire was administered to each participant.

DATA ANALYSIS

Descriptive statistics of mean, standard deviation, pie and bar charts was used to represent the data. The chi-square test was used to analyze the influence of age and duration of occupational riding on the occurrence of LBP.

Results

Two hundred and seventy copies of the questionnaire were distributed out but two hundred and sixty nine were returned, indicating a 99.6% response rate. From the returned copies, we observed that two

hundred and eight respondents were eligible for the study. The results of the study are presented in tables and charts.

The participants in the study were all males, as no female was found to be engaged in this occupation in Nnewi. Table 1 shows that the mean age of the participants was 37.39 ± 10.099 years and that the mean weight and height of the participants were 71.05 ± 11.511kg and 170.19 ± 6.518 m respectively. Out of the 88 respondents that reported back pain, 79.5% of them had low back pain with 10.2% having upper back pain and another 10.2% having mid back pain (Figure 1). The prevalence of LBP was found to increase with increasing age though there was a decline after a certain age (Figure 2) and with longer duration of occupational riding (Figure 3). Sitting for a long time was indicated as the most aggravating posture (Figure 4) while standing was indicted as the most relieving posture (Figure 5). Figure 6 shows upright sitting with 90° elbow flexion as the most commonly adopted posture for the respondents and Figure 7 shows the same posture as the most commonly adopted posture for respondents with LBP.

Table 1: Demographic characteristics of respondents

Variables	Minimum	Maximum	X + S.D
Age (years)	18.00	76.00	37.39 + 10.09895
Weight (kg)	40.00	117.00	71.05 + 11.51129
Height (cm)	152.00	192.00	170.19 + 6.51802

X – Mean
S.D – Standard deviation

Table 2: Prevalence of back pain (BP) among respondents

Back pain experience	Frequency	%
No, I have not	123	59.1
Yes, but never any treatment	33	15.9
Yes, but I treated myself	48	23.1
Yes but not serious enough to go to hospital	4	1.9

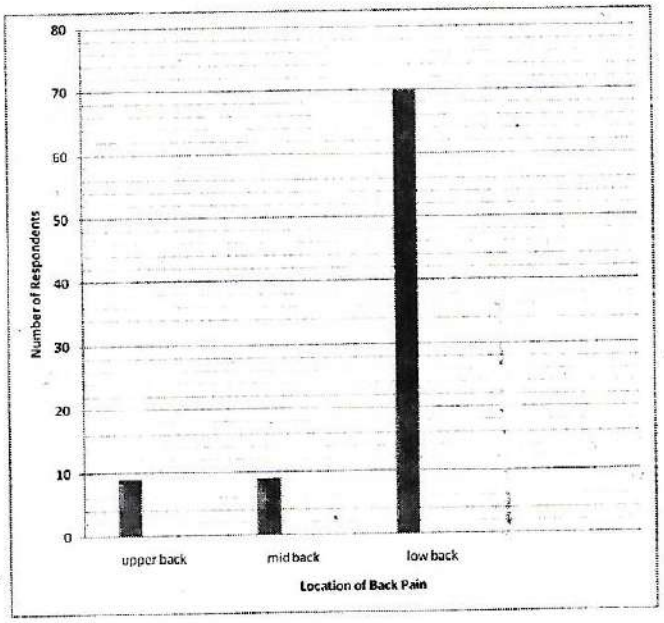

Figure 1: Bar chart of location of back pain in respondents

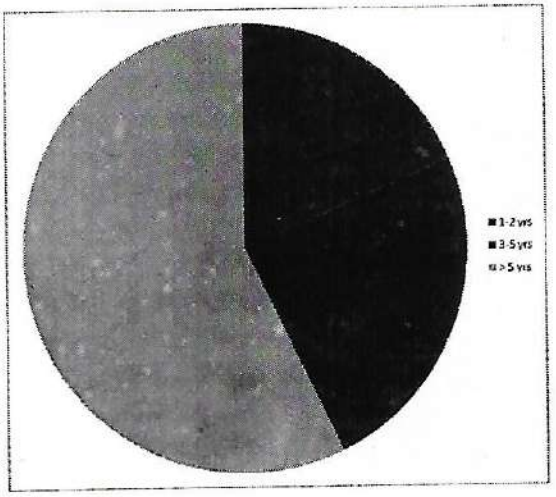

Figure 3: Pie chart of prevalence of LBP among respondents with different years of riding experience

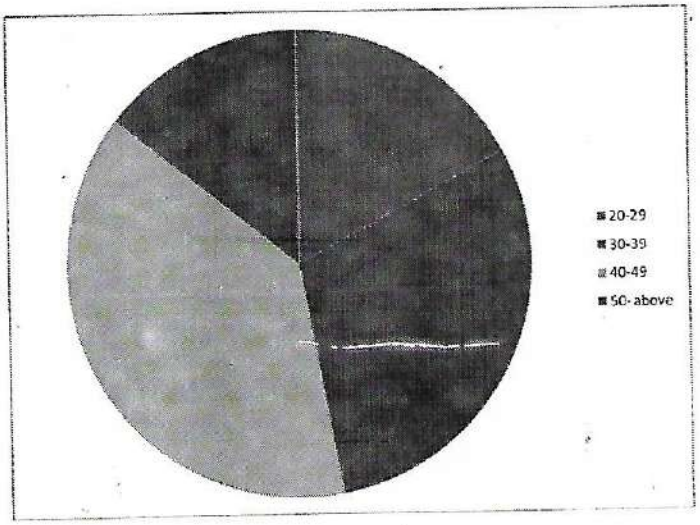

Figure 2: Pie chart of prevalence of LBP among different age groups of respondents

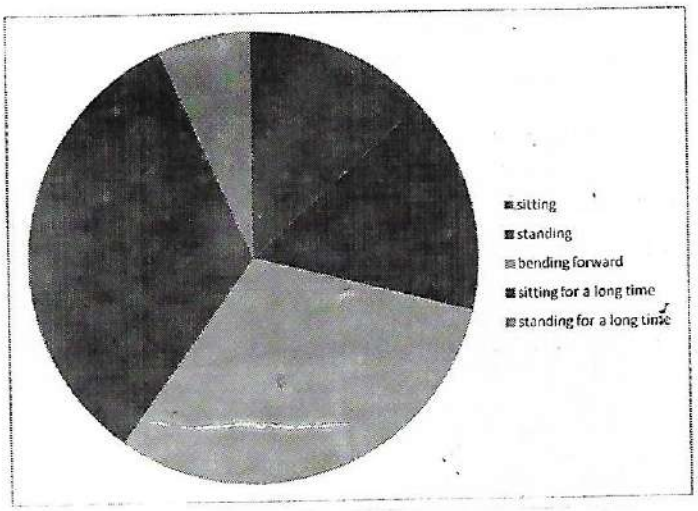

Figure 4: Pie chart of the postures that worsen back pain in the respondents

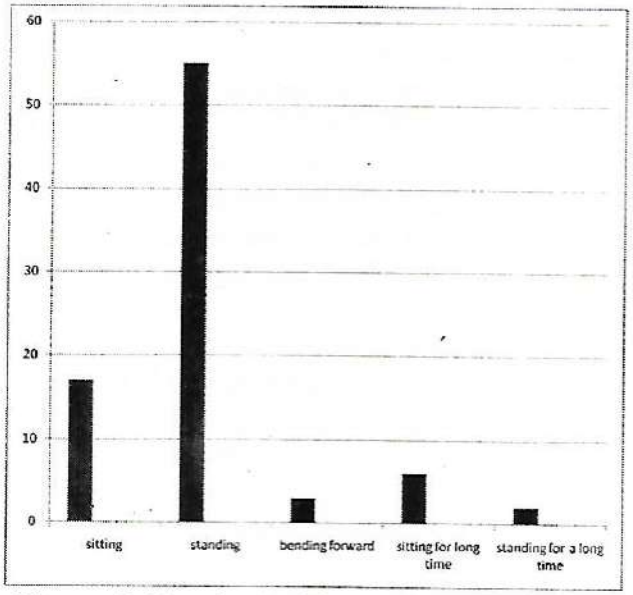

Figure 5: Bar chart of the postures that relieve back pain in the respondents

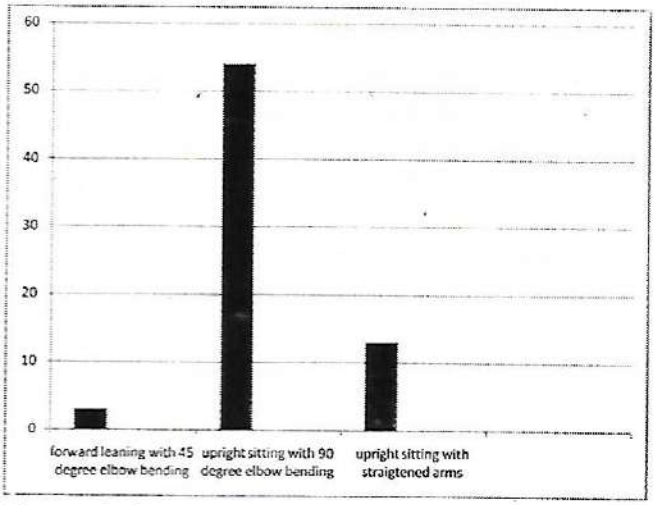

Figure 7: Bar chart of postures assumed by the respondents with LBP during riding

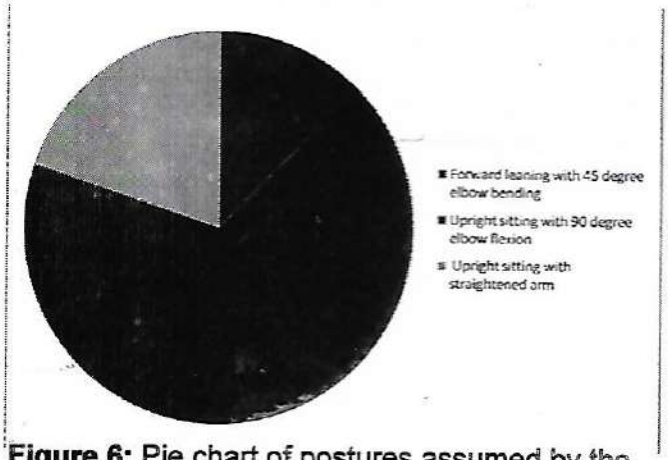

Figure 6: Pie chart of postures assumed by the respondents during riding

Table 3: Chi-square table showing the relationship of variables with the occurrence of LBP

Variable	Chi square	df	P- value
Age	215.7	42	0.000*
Years of riding experience	68.332	2	0.000*

Key:
df – degrees of freedom
* - P-value < 0.05 is significant

Discussion

The aim of this study was to investigate the prevalence of LBP among occupational motorcycle riders in Nnewi. Two hundred and sixty nine copies of the questionnaire were returned out of the two hundred and seventy that were administered to the respondents giving a response rate of 99.6%. This is similar to the 100% response rate recorded in a similar study [1] but higher than the 84% response rate recorded in a Greek study [11]; and the 74.9% response rate recorded in Lagos, Nigeria[10]. The high response rate was probably due to the fact that the questionnaire was administered and collected on the spot at the various motorcycle parks in Nnewi. Of the two hundred and sixty nine respondents, only two hundred and eight (77.04%) were eligible for the study. This was to eliminate confounding factors such as those who had not ridden for at least a year and those who suffered back pain before they started riding for occupational purposes.

The study involved only males and this is a reflection of the population from which the sample was drawn, as occupational motorcycling in this environment is a male-dominated occupation. It is also consistent with the population in similar studies [1, 10] in which the sampled populations were all males. Out of the 88 occupational motorcycle riders who had back pain, 70 (79.5%) had low back pain, followed by those with mid back pain (9) and upper back pain (9) who both had equal prevalence of 10.2%. The high prevalence of pain recorded in the low back could be because the lumbar spine has a natural resonating frequency of 4-5Hz; and when riding, vibration causes the body to resonate at that frequency[12]. Thus the low back becomes vulnerable to the strains and injuries due to the vibrations of the whole body[1].

The twelve month prevalence of LBP among occupational motorcycle riders in this study was found to be 54.7%, which is lower than the findings from a similar studies[1, 10] which reported 96% and 88% for commercial motor drivers and private automobile drivers respectively; and 64.5% and 60% for commercial motor drivers and commercial motorcyclists respectively. However, this high prevalence reported in the present study could be as a result of the bad state of the roads (pot-holes) common within Nnewi or the prolonged periods during which poor postures are assumed by the occupational motorcycle riders without backrest to support the back as occupational motorcycling is the commonest and most easily available mode of transportation in the area.

The present study found that there is a significant influence of age on the occurrence of LBP. This could be as a result of persistent micro-trauma occurring overtime at the posterior longitudinal ligaments with the normal activities of daily living in addition to the prolonged postures adopted by the occupational motorcycle riders. The highest number of respondents fell within the 30 - 39 age group (94 respondents) but the highest percentage of people with LBP fell within the 40 - 49 age group where 27 out of the 75 respondents (36%) in the group reported LBP, followed by the 50 and above age group where 10 out of 32 respondents (31.25%) reported LBP, the 30 - 39 age group where 21 out of 94 respondents (22.34%) reported LBP and the 20 - 29 age group where 12 out of 68 respondents (17.65%) reported LBP. The elastin content of the intervertebral disc which allows it return to its original size and shape after deformation decreases in later life and may be responsible for the high prevalence recorded in the 40 - 49 age group with the corresponding decreases in the other age groups. This could be associated with the fact that the nucleus pulposus of the inter-vertebral discs starts losing the water-binding capacity which enables it retain its shape with age, thereby reducing its resilience [3] after the first two decades and would have reached its peak at the fourth decade of life, so that from the fifth decade only the residual effects from the years of active damage may actually

responsible for the pain experienced by those in the 50 and above age group from accummulated microtrauma and chronic inflammatory changes.

Out of the population of the occupational motorcycle riders who had experienced LBP, the majority were within 40 - 49 age group representing about 38.57% of the population with LBP. They were followed by those within 30 - 39 age group who represented 30.00%, those within 20 - 29 age group representing 17.14% and then those within 50 and above age group representing 10.59% of the population.

Duration of years of occupational riding was also implicated as being significant in the possible occurrence of LBP and was highest in occupational motorcycle riders who have been riding occupationally for more than five years (57.14%) followed by those who have been riding occupationally for between three and five years (24.29%). The lowest prevalence was obtained in those who have been riding occupationally for between one and two years (18.57%). This suggests that the incidence of LBP may be associated with years of occupational riding so that with longer duration of occupational riding, there is increased risk of LBP. This could probably be because the respondents who had been riding for longer durations have had more exposure to stress on the back.

The five common postures commonly identified by the occupational motorcycle riders as worsening the occurrence of their back pain in decreasing order of importance are: sitting for a long time (33.3%), bending forward (31.1%), standing (15.6%), sitting (13.3%), and standing for a long time (6.7%). This could be related to the varying degrees of anterior spinal flexion associated with these postures (McGill et al, 1992). The five common postures identified by the respondents as being able to relieve their pain were: standing (66.3%), sitting (20.5%), sitting for a long time (7.2%), bending forward (3.6%), and standing for a long time (2.4%). The relative extension associated with these changes in postures could be responsible for the relief of back pain. Upright sitting with forty-five degree elbow bending was reported by 77.14% of the occupational motorcycle riders with LBP as being the posture they assumed while riding; 18.57% reported upright sitting with straightened arms and 4.29% reported forward leaning as the posture assumed during riding.

Despite the high prevalence of LBP in the occupational motorcycle riders, only about 12% of them had been stopped from working on some days as a result of the LBP. The reason for this may not be unconnected to the fact that the majority of the respondents are the breadwinners of their families and the poor socio-economic status of these respondents has left them no option but to continue to work despite of the pain they suffer since their lack of formal education and skills acquisition may make it quite difficult for them to seek alternative employment.

CONCLUSION

This study has shown a high prevalence of back pain among occupational motorcycle riders in Nnewi (79.5%) which may have been influenced by age, and years of occupational riding. It also shows that there is higher occurrence of LBP but lower occurrence of upper back pain among occupational motorcycle riders seen in Nnewi.

APPRECIATION

We would like to express our profound gratitude to all those who participated in this study. We thank the Chairman of the Motorcycle Riders Union in Nnewi and his executive committee for giving us all the support and assisting in mobilizing their members. Most importantly we thank all the commercial occupational motorcycle riders (okada riders) for their cooperation and willingness to participate in the study.

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APPENDIX

QUESTIONNAIRE

SECTION A: DEMOGRAPHIC DATA

(Please indicate your answer in the box or space provided as appropriate)

1. Age (as at last birthday) ☐
2. Sex: Male ☐ Female ☐
3. Weight (kg) ☐
4. Height (m) ☐
5. Marital status: single ☐ married ☐ separated ☐ divorced ☐

SECTION B: GENERAL QUESTIONS ON BACK PAIN

6. Have you felt pain in your back in the last 12 months?
   a. No, I have not ☐
   b. Yes, but never any treatment ☐
   c. Yes but I treated myself ☐
   d. Yes, and serious enough to require going to hospital ☐

7. Where is the location of your back pain?
   a. Low back ☐
   b. Mid back ☐
   c. High back ☐

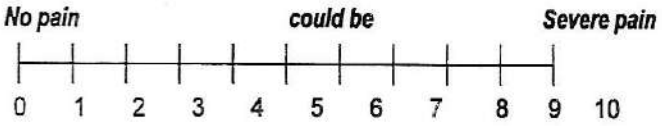
8. How long have you had the back pain?
   a. Before you started riding ☐
   b. After you started riding ☐
   c. Not applicable ☐

9. How many episodes of back pain have you had in the past 12 months?
   a. 1 ☐
   a. 2-5 ☐
   b. Greater than 5 ☐

10. How did the back pain start?
    a. gradually ☐
    b. suddenly ☐

11. Do you have pain in your back now?
    a. Yes ☐
    b. No ☐

12. How do you rate the level of your pain? (please indicate the severity of the pain experienced by using the numbers below.)



13. What is the nature of the pain you normally have?
    a. Sharp pain ☐
    b. Dull pain ☐
    c. Dull ache ☐

14. Have you ever been involved in a road traffic accident?
    a. No, I have never ☐
    b. Yes, but not serious enough to stop me from working ☐
    c. Yes and serious enough that I was hospitalised ☐

SECTION C: EFFECTS OF MOTORCYCLING ON THE BACK

15. Are you registered with any transport trade union?
    a. Yes ☐
    b. No ☐

16. How long have you been riding for commercial purpose?
    a. Less than 1 year ☐
    b. 1-2 years ☐
    c. Greater than 2-5 years ☐
    d. Greater than 5years ☐

17. How long do you work in a day?
    a. Greater than 2 hours ☐
    b. 2-5 hours ☐
    c. Greater than 5 hours ☐
    d. 6-9 hours (half a day) ☐
    e. More than 9 hours (full day) ☐

18. Has back pain ever stopped you from working?
    a. Yes ☐
    b. No ☐

19. Do you attribute your back pain to the nature of work you do?
    a. Yes ☐
    b. No ☐
    c. Can't tell ☐

20. What posture usually makes your back pain worse?
    a. Sitting ☐
    b. Standing ☐
    c. Bending forward ☐
    d. Sitting for a long time
    e. Standing for a long time ☐

21. What postures usually give relief to your pain?
    a. Sitting ☐
    b. Standing ☐
    c. Bending forward ☐
    d. Sitting for a long time ☐
    e. Standing for a long time ☐

22. What type of motorcycle do you ride?
    a. Wide hand ☐
    b. Narrow hand ☐

23. Would you consider the posture you assume when riding adequate?
    a. Yes ☐
    b. No ☐

24. What factors make your back pain worse?
    a. When putting the motorcycle to start ☐
    b. When helping to carry load while on the motorcycle ☐
    c. The vibrations of the motorcycle ☐
    d. Others please state _____

25. From the pictures below what picture corresponds to the position you assume while riding?




26. When do you normally have the back pain?
    a. It is there all the time ☐
    b. When I sit to ride ☐
    c. When I wake up in the morning ☐
    d. After the day's work in the evening ☐

27. Would you attribute your back pain to your sitting posture?
    a. Yes ☐
    b. No ☐

If no, what are the causes of your back pain?
.....
.....
.....
.....
.....
.....
.....

THANK YOU

QUALITY OF LIFE OF PEOPLE LIVING WITH HIV/AIDS IN NNEWI, NIGERIA

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ABSTRACT

BACKGROUND: *With the appreciable rise in longevity of people living with HIV/AIDS (PLWHA), the need to investigate their quality of life (QOL) has become increasingly important.*
OBJECTIVE: *This study aimed at assessing the QOL of PLWHA attending anti-retroviral (ARV) clinics in Nnewi North Local Government Area of Anambra State, Nigeria.*
METHODS: *The research design for this study was survey. A consecutive non-probability technique was used to recruit 388 PLWHA (113 males and 275 females) for the study. The WHOQOL-HIV Bref was used to obtain data. Subjects' socio-demographic information was obtained using a structured questionnaire.*
RESULTS: *A significant correlation was found between marital status, age and level of education, between level of independence and age, psychological health and level of education, and social relationship and spiritual/religion/ personal beliefs. The overall mean scores in the two domains of physical health (15.3±3.4) and spiritual/religion/personal beliefs (15.5±3.2) were found to be high. Lower QOL mean scores were observed in social relationships (13.9±3.3). No significant difference was found between males and females in all the domains of the WHOQOL-HIV Bref.*
CONCLUSIONS: *Discrimination as well as poor living conditions may have an effect on the QOL of PLWHA. Marital and educational status may influence social relationship, spiritual/religion/personal belief sand psychological health of PLWHA positively.*

Keywords: *HIV/AIDS, quality of life, discrimination*

INTRODUCTION

The human immunodeficiency virus (HIV) and its consequent acquired immune deficiency syndrome (AIDS) have been known for over three decades[1]; an epidemic worldwide which exerts its greatest effects on underdeveloped and developing societies. Even though it was first discovered in 1981, over16 million people have being estimated to have died of the disease[2]. Uncertainties about modes of transmission of HIV aside the well established routes of unprotected sexual intercourse and needle sharing, combined with the stigma attached to homosexuality and drug use have resulted in widespread discrimination against people living with HIV/AIDS (PLWHA) [3]. AIDS is characterized by profound immunosuppression leading to opportunistic infections, secondary neoplasm, neurologic manifestation and ultimately death.

The absence of an effective immune system makes the victims vulnerable to overwhelming infection by organisms which would normally have little pathogenic effect [4]. With alarming increase in the HIV/AIDS pandemic in developing countries, and the limited accessibility and availability of high active anti retroviral therapy (HAART), the majority of PLWHA continue to suffer from the disease, with a serious impact on their quality of life [5].

HIV/AIDS continues to contribute significantly to public health problems in Nigeria. Although HIV was initially limited to people with risky behaviors, such as commercial sex workers and multiple sexual partners, the currently available evidence suggests that this infection has permeated all strata of the Nigeria population [6]. The prevalence of the infection is estimated to have accounted for about 20% of the total disease burden globally [7]. AIDS has a

chronic debilitating cause and as such, determining the impact on the quality of life (QOL) in PLWHA is important for estimating the burden of the disease [8].

Quality of life (QOL) is a term that is popularly used to convey an overall sense of well-being and includes aspects such as, happiness and satisfaction with life as a whole. QOL relates both to the adequacy of material circumstance and the personal feelings about this circumstance with overall subjective feelings of well-being that is closely related to morale, happiness and satisfaction [9]. QOL has been considered synonymous with health status, functional status, psychological well-being, happiness with life, satisfaction of needs, and assessment of one's own life [10].

Several instruments for measuring QOL have being developed and described [11]. A number of investigations have been carried out on the QOL of PLWHA in other environments[10], and a few in Nigeria [12]. The validity of the WHOQOL-HIV Bref instrument used among HIV/AIDS patients has also been documented [13]. This study assessed the QOL of PLWHA and attending antiretroviral therapy clinics in hospitals in Anambra State, southeastern Nigeria using the WHO QOL-HIV Bref.

METHODOLOGY

Research design
The research design for this study was a survey design.

Population
The population comprised people living with HIV/AIDS and attending routine check-up at Nnamdi Azikiwe University Teaching Hospital (NAUTH), Nnewi, Anambra State.

Sample size and sampling technique
The participants in this study were drawn through a consecutive non-probability sampling technique from all PLWHA at the selected hospitals who were willing to participate.

Research instruments
The WHO QOL-HIV Bref questionnaire was used to estimate the quality of life of people living with HIV/AIDS. This contains 31 items, representing the 30 facets divided into six domains: physical, psychological, social, environmental, level of independence, spirituality/religion/personal beliefs domains. Each item is rated on a 5-point scale where 1 indicates low, negative perceptions and 5 indicated high, positive perceptions. The WHO-QOL-HIV Bref instrument has been reported as presenting good reliability, with cronbach alpha ranging from 0.61 to 0.81 across the domains. Exploratory factor analysis identified four major domains physical, psychological, social and environmental domains corresponding to the four WHO QOL-HIV Bref domains. The four domain scores correlated positively with general health satisfaction and overall quality of life questions. ($P < 0.01$ in all except general health and social domains with $P<0.05$) and correlated negatively with the frequency and severity of HIV symptom ($P<0.01$). The domain scores discriminated between patients with higher and lower frequency and severity of HIV symptoms ($P<0.01$)[13].

Procedure for data collection
Ethical approval was sought and obtained from the ethical committee of Nnamdi Azikiwe Teaching Hospital, Nnewi campus before commencing the study. The questionnaire was administered by the researchers to those who volunteered to participate in the study after obtaining their informed consent.

DATA ANALYSIS
Data entry and statistical analysis were performed using the statistical package for social science (SPSS) software, version 20.0. The descriptive statistic of mean and standard deviation was used to summarize the scores of the QOL. Domain scores were scaled in a positive direction (higher score denoting a higher QOL). The mean score of items within each domain was used to calculate the domain scores by multiplying them by 4, so that scores

ranged from 4 (minimum) to 20 (maximum), with higher score indicating a better QOL. Spearman's rank order correlation was used to ascertain relationships. The level of statistical significance was set at $p<0.05$.

Result

More than half of the entire sample size 46.4% were married, 19.6% single, 3.4% separated, 2.3% divorced and 10.1% widowed. A further 18.3% were living with their spouses even though they were not married. 19.6% were single, 3.4% were separated, 2.3% were divorced and 10.1% were widowed.

Respondents' educational status showed that 2.6% were not educated, 35.8% had at least primary school, 17.8% were educated up to tertiary level.

The mean scores in the domains of QOL were 15.3±3.4 in the physical health domain, psychological health 14.5±3.1, social relationship 13.9±3.3, level of independence 14.5±3.1, environmental 14.0±2.4, spiritual/religion/personal beliefs domain 15.5±3.2. The mean score in the domains of QOL was higher for spirituality/religion/personal beliefs and physical domains.

Table 1 shows a summary of the QOL domain scores. No significant difference was found between males and females in all the domains of the WHO QOL-HIV Bref. The results of the student t-test between gender and domain scores are summarized in Table 2.

The result for spearman's rank order correlating marital status, age and level of education and QOL of PLWHA, showed significant relationship between level of independence domain and age of PLWHA ($r = 0.144$; $p = 0.005$), between psychological health domain and educational status of PLWHA ($r = 0.147$; $p = 0.004$), between social relationship domain and marital status of PLWHA ($r = 0.112$; $p = 0.027$) and between spiritual/personal beliefs domain and marital status of PLWHA ($r = 0.202$; $p = 0.000$). Tables 3 - 6 show a summary of the spearman's rank order score.

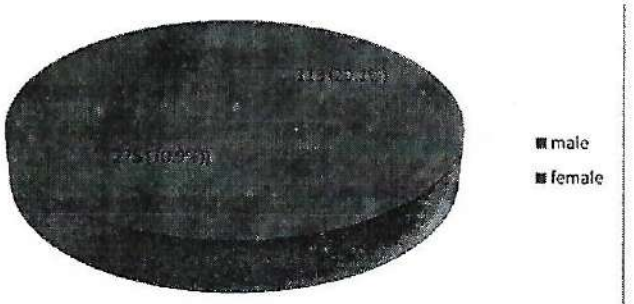

Figure 1: Pie chart showing gender of PLWHA

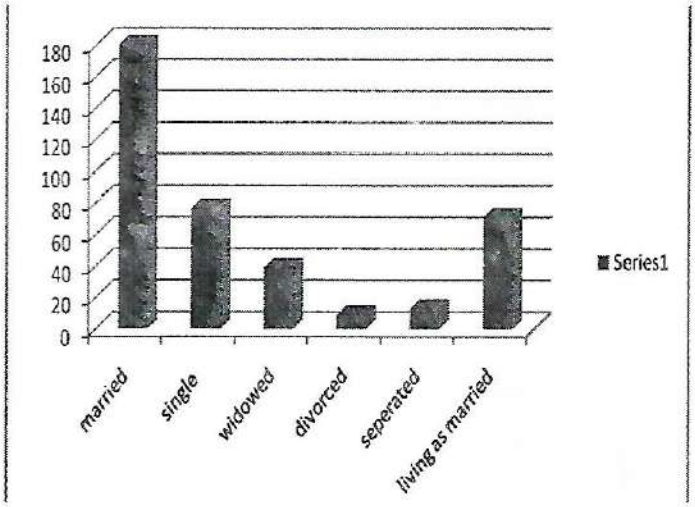

Figure 2: Bar chart showing marital status of the PLWHA

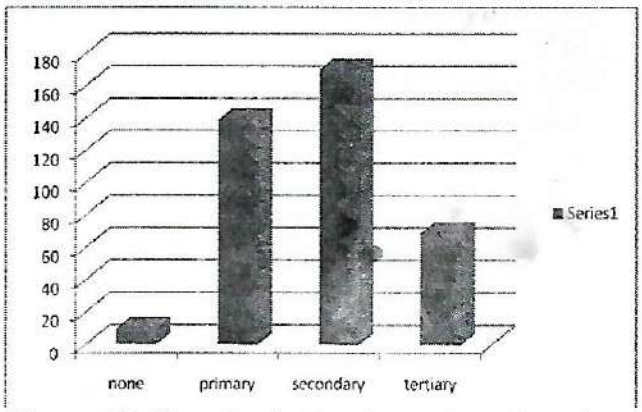

Figure 3: Bar chart showing educational status of the PLWHA

Table 1: Mean scores and standard deviations of the domains of the WHO QOL-HIV Bref

Domain	Mean +SD
Physical health	15.3±3.4
Psychological health	14.3±3.0
Level of independence	14.5±3.1
Social relationship	13.9±3.3
Environmental	14.0±2.4
Spiritual/religion/personal beliefs	15.5±3.2

Table 2: Comparison of domain scores between male and female participants

Domain	Sex	N	Mean(SD)	t-value	P-value
Physical health	Male	113	15.4±2.8	0.5	0.6
	female	275	15.2±3.6		
Psychological health	Male	113	14.2±2.7	0.1	0.8
	Female	275	14.2±3.1		
Level of independence	Male	113	14.2±2.8	-0.9	0.3
	Female	275	14.5±3.1		
Social relationship	Male	113	13.9±3.1	0.8	0.9
	Female	275	13.9±3.4		
Environmental	Male	113	13.7±2.4	-1.1	0.2
	Female	275	14.1±2.5		
Spiritual/religion/personal belief	Male	113	15.1±3.2	-1.1	0.2
	Female	275	15.5±3.2		

Table 3: Correlation of gender and domains of the WHO QOL-HIV Bref

Gender	Dom1	Dom2	Dom3	Dom4	Dom5	Dom6
r-value	-0.006	0.112	0.071	0.002	0.045	0.70
p- value	0.000*	0.014*	0.006*	0.968	0.375	0.170

*indicates significance at the 0.05 level

Key
Domain 1 - Physical health
Domain 2 - Psychological
Domain 3 - Level of independence
Domain 4 - Social relationship
Domain 5 - Environment
Domain 6 - Spiritual/ religion/personal beliefs

Table 4: Correlation of age and domains of the WHO QOL-HIV Bref

Age	Dom1	Dom2	Dom3	Dom4	Dom5	Dom6
r-value	-0.076	-0.046	-0.144	-0.024	-0.077	0.091
p-value	0.134	0.367	0.005*	0.641	0.129	0.074

*indicates significance at the 0.05 level

Key
Domain 1 - Physical health
Domain 2 - Psychological
Domain 3 - Level of independence
Domain 4 - Social relationship
Domain 5 - Environment
Domain 6 - Spiritual/ religion/personal beliefs

Table 5: Correlation of educational status and domains of the WHO QOL-HIV Bref

EDUCATION	Dom1	Dom2	Dom3	Dom4	Dom5	Dom6
r-value	0-044	0.147	0.049	0.087	0.091	0.089
p-value	0.387	0.004*	0.332	0.087	0.000*	0.079

*indicates significance at the 0.05 level

Key
Domain 1 - Physical health
Domain 2 - Psychological
Domain 3 - Level of independence
Domain 4 - Social relationship
Domain 5 - Environment
Domain 6 - Spiritual/ religion/personal beliefs

Table 6: Correlation of marital status and domains of the WHO QOL-HIV Bref

Marital status	Dom1	Dom2	Dom3	Dom4	Dom5	Dom6
r-value	0.064	0.019	-0.008	0.112	0.044	0.202
p-value	0.207	0.703	0.878	0.27	0.385	0.00*

*indicates significance at the 0.05 level

Key
Domain 1 - Physical health
Domain 2 - Psychological
Domain 3 - Level of independence
Domain 4 - Social relationship
Domain 5 - Environment
Domain 6 - Spiritual/religion/personal beliefs

Discussion

The aim of this study was to investigate the QOL of PLWHA who attend anti-retroviral clinics. It also evaluated the factors affecting the QOL of PLWHA in Nnewi Local Government Area of Anambra State.

In this study, the QOL of PLWHA was correlated with gender, age, level of education and marital status across the domains of the WHO QOL HIV-Bref. A significant correlation was found between level of independence and age of PLWHA. This might be because the younger adults usually have more zeal to try to live and as such work harder to take care of their families which is their primary responsibility, when compared to older adults that are weaker and depend on the younger ones for support and have lesser zeal to live. The finding of this study that there is a correlation between age and level of independence is in agreement with some other previous studies, which found out an association between age and level of independence in people living with HIV/AIDS[14].

There is also a significant association between Educational status and psychological health domain. This might be due to the high level of exposure of the respondents through media or counseling sections in the clinic about HIV/AIDS which would increase their knowledge about their health and how best to manage their condition thereby influencing their psychological health positively.

Social relationship correlated well with marital status of people living with HIV/AIDS. PLWHA often experience social isolation, derogation, stigmatization, discrimination and marginalization. Consequently, those that are unmarried may find it difficult to socialize in order not to be identified and stigmatized; so they may find it difficult finding a marriage partner. Occasionally, married people being HIV-positive while the other partner is not could bring about separation and even divorce, because the other partner would not want to be infected and might feel betrayed and cheated on. This study also shows a significant correlation between marital status and spirituality/religion/personal beliefs of PLWHA. This could be due to that fact that PLWHA get more spiritual after diagnosis and believe that their God will cure them someday of the disease. This finding agrees with the assertion that PLWHA become more spiritual or religious after diagnosis [15].

The PLWHA involved in this study appeared to have good physical health and spiritual/religious/personal beliefs. However, their social relationship was low indicating a possible poor quality of life in this domain. This finding is in line with a previous study which reported better scores in physical and spiritual/religion/personal beliefs, but poor scores in the social relationship domain[16], but disagrees with others [17], which reported low scores in all domains of QOL of PLWHA. However, these findings and that of the current study differ and this may be due to possible differences in the characteristics of the population of study. The resulting high scores in the physical health/spiritual/religion/personal beliefs could be due to the fact that in Nigeria, people tend to be spiritual and religious only when confronted with issues that are beyond them. A study reported that the life of PLWHA was better now than before they were diagnosed with HIV[15]. Several factors including spirituality were associated with believing that life has improved. The conceptual model of how spirituality/religion, post-HIV diagnosis and disease progression was examined and observed that nearly one-half of the patients reported an increase in spiritual/religious life following diagnosis[15].

The resulting low scores in the social relationship domain could reflect stigmatization and discrimination faced by the PLWHA. Also, issues like personal relationship, possibility of restricted sexual activities and lack of social support for

PLWHA may have had a negative effect in the social relationship domain.

In the current study, women and men showed high scores in virtually all domains indicating that gender possibly did not have any effect on the QOL of PLWHA. However, previous studies have reported lower scores in the psychological and environmental domains among women [10].

CONCLUSION

It was concluded that:

1. PLWHA in this environment appeared to have good spiritual/religion/personal beliefs and physical health.
2. Age may influence the level of independence of PLWHA.
3. Lower scores in the social relationship domain could be an indication of discrimination faced by PLWHA.
4. Educational status has an effect on the psychological health of PLWHA.
5. Marital status has effect on the social relationship and spiritual/religion/personal beliefs of PLWHA.

RECOMMENDATIONS

Based on the outcome of this study, the following recommendations are made:

1. Further studies should be carried out on a nationwide scale to ascertain the efficacy of intervention for PLWHA.
2. Studies should compare between different regions in Nigeria.
3. There is need for government and non-governmental organizations to strengthen social support for PLWHA.
4. More aggressive anti-stigma measures should be adopted.

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APPENDIX
WHOQOL-HIV BREF
ABOUT YOU

Before you begin we would like to ask you to answer a few general questions about yourself: by circling the correct answer or by filling in the space provided.

What is your **gender**?	Male/Female
How old are you?	(age in years)
What is the highest **education** you received?	Noneat all/ Primary/Secondary/Tertiary
What is your **marital status**?	Single/Married/Living as married/ separated Divorced/Widowed
How is your **health?**	Very poor/Poor/Neither poor nor Good/Good Very Good
Do you consider yourself currently ill?	Yes/No

If there is something wrong with you, what do you think it is?_____

Please respond to the following questions if they are applicable to you:
What is your **HIV serostatus?** Asymptomatic/Symtomatic/AIDS converted
In what year did first test positive for HIV? _____
In what year do you think you were infected? _____
How do you believe you were **infected with HIV?** (circle one only):
Sex with a man/Sex with a woman/Injection drugs/Blood products/Other (specify)_____

Instructions

This assessment asks how you feel about your quality of life, health, or other areas of your life. **Please answer all the questions.** If you are unsure about which response to give to a question, **please choose the one** that appears most appropriate. This can often be your first response. Please keep in mind your standard, hopes, pleasures and concerns. We ask that you think about your life **in the last two weeks.** For example, thinking about the last weeks, a question might ask:

		Not at all	A little	A moderate amount	Very Much	Extremely
11 (F5.3)	How well are you able to concentrate?	1	2	3	4	5

You should circle the number that best fits how well you are able to concentrate over the last weeks. So you would circle the number 4 if you were able to concentrate very much. You would circle number 1 if you were not able to concentrate at all in the last two weeks.

Please read each question, assess your feelings, and circle the number on the scale for each question that gives the best answer for you.

		Very poor	poor	Neither poor nor good	Good	Very Good
1(GI)	How would you rate your quality of life?	1	2	3	4	5

		Very dissatisfied	Dissatisfied	Neither Satisfied nor dissatisfied	satisfied	Very satisfied
2(G4)	How satisfied are you with your health	1	2	3	4	5

The following questions ask about **how much** you have experienced certain things in the last two weeks.

		Not at all	A little	A moderate amount	Very much	An extreme amount
3(F1.4)	To what extent do you feel that physical pain prevents you from doing what you need to do?	1	2	3	4	5
4(F50.1)	How much are you bothered by any physical problems related to your HIV infections?	1	2	3	4	5
5(F11.3)	How much do you need any medical treatment to function in your daily life?	1	2	3	4	5
6(F4.1)	How much do you enjoy life?	1	2	3	4	5
7(F24.2)	To what extent do you feel your life to be meaningful?	1	2	3	4	5
8(F52.2)	To what extent are you bothered by people blaming you for your HIV status?	1	2	3	4	5
9(F53.4)	How much do you fear the future?	1	2	3	4	5
10(F54.1)	How much do you worry about death?	1	2	3	4	5

		Not at all	A little	A moderate amount	Very much	Extremely
11(F5.3)	How well are you able to concentrate?	1	2	3	4	5
12(F16.1)	How safe do you feel in your daily life	1	2	3	4	5
13(F22.1)	How healthy is your physical environment?	1	2	3	4	5

The following questions ask about **how completely** you experience or able to do certain things in the last weeks.

		Not at all	A little	Moderate	Mostly	Completely
14(F2.1)	Do you have enough energy for everyday life?	1	2	3	4	5
15(F7.1)	Are you able to accept your bodily appearance?	1	2	3	4	5
16(F18.1)	Have you enough money to meet your needs?	1	2	3	4	5
17(F51.1)	To what extent do you feel accepted by the people you know?	1	2	3	4	5
18(F20.1)	How available to y ou is the information that you need in your day-to-day life?	1	2	3	4	5
19(21.1)	To what extent do you have the opportunity for leisure activities?	1	2	3	4	5

		Very poor	poor	Neither poor nor good	Good	Very Good
20(F9.1)	How well are you able to get around?	1	2	3	4	5

The following questions ask you how **good or satisfied** you have about various aspects of your life over the last two weeks.

		Very dissatisfied	Dissatisfied	Neither Satisfied nor dissatisfied	satisfied	Very satisfied
21(F3.3)	How satisfied are you with your sleep?	1	2	3	4	5
22(F10.3)	How satisfied are you with your ability to perform your daily living activities?	1	2	3	4	5
23(F12.4)	How satisfied are you with your capacity for work?	1	2	3	4	5
24(F6.3)	How satisfied a re you with yourself?	1	2	3	4	5
25(F13.3)	How satisfied are you with your personal relationships?	1	2	3	4	5
26(F15.3)	How satisfied are you with your sex life?	1	2	3	4	5
27(F14.4)	How satisfied are you with the support you get from your friends?	1	2	3	4	5
28(F17.3)	How satisfied are you with the conditions of your living place?	1	2	3	4	5
29(F19.3)	How satisfied are you with your access to health services?	1	2	3	4	5
30(F23.3)	How satisfied are you with your transport?	1	2	3	4	5

The following question refers to **how often** you have felt or experienced certain things in the last two weeks.

		Never	Seldom	Quite often	Very often	Always
31(F8.1)	How often do you have negative feelings such as blue mood, despair, anxiety, depression?	1	2	3	4	5

Did someone help you to fill out this form?

_____

How long did it take to fill this form?

_____

Do you have any comments about the assessment?

_____

_____

_____

THANK YOU FOR YOUR HELP.

APHRODISIAC EFFECT OF ETHANOLIC EXTRACT OF MUCUNA PRURIENS SEED IN MALE ALBINO MICE

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ABSTRACT

The seed of Mucuna Pruriens Linn, belonging to the leguminous family (Papilionacae) has been used in Ayurvedic medicine since ancient times for treatment of male sexual disorder. This study was aimed at evaluating the aphrodisiac effect of the ethanolic extract of Mucuna Pruriens seed in normal male albino mice by looking at the general mating behaviour, libido and potency using sildenafil citrate as the standard reference drug and also to investigate the possible mechanism by which the drug enhances sexual function. Animals were divided into five groups. The first group was used as control (received distilled water) and experimental groups 2 - 5 were divided on the basis of the dosage of extract to the animals as follows: 150mg/kg body weight (group 2), 200mg/kg body weight (group 3) and 250mg/kg body weight as standard. Animals were fed per oral (PO) with distilled water or extract or standard once a day for 7days. Female mice with oestrus phase were used for mating behaviour. The acute toxicity test done showed that Mucuna Pruriens seed has LD_{50} > 2000mg/kg. The extract administered significantly ($P<0.05$) increased the mounting frequency, intromission frequency and ejaculation latency and decreased the mounting latency, intromission latency and post-ejaculations intervals. The potency test significantly ($P<0.05$) increased erections, quick flips, long flips and total reflexes. The results indicated that the ethanolic extract of Mucuna Pruriens produced a significant and sustained increase in sexual activity of normal male mice without any conspicuous gastric ulceration and adverse effects.

INTRODUCTION

A medicinal plant can be described as any plant in which one of its organs contains substance that can be used for therapeutic purposes or materials for the synthesis of useful drugs[1]. Medicinal herb and plant extracts are now generally considered as effective medicines to be respected and appreciated and they play a major role in modern pharmacy[2].

The use of herbs is very common in developing countries particularly in rural setting.

However, during the last decade, an increase in the use of plants has been observed in metropolitan areas of developed countries[3]. Plants are extensively used to relive sexual dysfunction for example *Rauwolfia vomitoria, Garcina Kola* etc[4]. In many countries, different varieties of plants have been used as sexual stimulants in traditional medicine, one such plant, which claims various medical properties, is *Mucuna pruriens, Linn,* one of the popular and important medicinal plants of India. Sexual dysfunction is a common problem with increase in prevalence and etiological factors including degeneration disease, increase in injuries and stress associated with industrialized lifestyles. Sexual dysfunction can be treated by both medical and surgical treatment modalities, however, plants derived and herbal remedies continue to be a popular alternative for men and women seeking to improve their sexual life despite the availability of effective conventional medical treatment[5].

Mucuna pruriens has been recognized as an aphrodisiac agent. The plant and its efficacy in treating sexual disorder have been documented in Ayurveda, but lacks scientific validation.[6] It has been reported that the number of spermatozoa increased when the rats were treated with bark extract of *Mucuna*

pruriens. Further, it was also reported that the sexual and androgenic activities in adult male rats were sustained while improving the mass of the muscles [7] and[8]. The relevant parameters such as sexual behavior potency, libido, acute toxicity and possible mechanism by which this plant produces aphrodisiac effect has not been reported to the best of our knowledge. This present study aimed at finding scientifically the aphrodisiac effect of *Mucuna pruriens,* and determining the possible mechanism through which the plant produces aphrodisiac effect.

MATERIALS AND METHODS

Collecting and Preparation of Plant Materials

Dried velvet bean *(Mucuna pruriens)* fruits were collected locally from Amatutu village, Agulu in Anaocha Local Government Area, Anambra State, Nigeria and were identified by a botanist Mr. Ezioko at the Department of Botany, University of Nigeria, Nsukka. The seeds were removed from their hairy husks of the fruits and stored in a dried plastic container.

The dried seeds were oven dried at 40°c to allow the seed to be removed from their arilluses. The dried seeds were then pulverized into coarse powder using an electric blender (Blender/Miller III, Model MS-223, Taiwan, China) and sieved through No. 20 mesh size. The powder obtained was stocked in a plastic container and was weighed in a weighing balance. The overall weight was 44gm.

Solvent used for Extraction

Ethanol and distilled water were mixed in the ratio of 1:1 (i.e.) 100ml of ethanol and 100ml of distilled water to get 50% absolute ethanol which was used for sequential extraction of the powdered seeds of *Mucuna pruriens*.

Method of Extraction

The dried coarse *Mucuna pruriens* weighing 44gms were used for the extraction. The extraction was carried out by mixing the coarse powdered seeds in 50% ethanol using soxhlet apparatus. The extraction was carried out in cycles in which 15gm of the powdered seed was extracted per sample using 200ml of 50% absolute ethanol at a temperature of 70°c and each cycle lasted for 48hrs. The extract was filtered and the solvent from the filtrate was removed by open air evaporator under reduced pressure and low temperature. The weight of the extract was 5.05gm and the yield was 11.48% in terms of dried starting material. It was blackish and of pleasant smell. The extract was preserved in a refrigerator.

Stock Solution

1 gm of ethanolic extract of *Mucuna pruriens* was suspended in distilled water using Tween 80 (1%) in the ratio of 2:1; when calculated it gave a stock solution of 50mg/ml as the working stock. Distilled water was used as a vehicle.

Phytochemical Screening

Chemical test was carried out on the ethanolic using stardard procedure to identify the constituents as described by[9], [10] and [11].

Experimental Animals and Drug Preparation

Twelve week old female (body weight 26 - 30gm) and male (body weight 30 - 35gm) albino mice were used for the study. The mice were housed in standard cages and maintained under standard laboratory conditions (temperature 24 - 29°c, relative humidity 60 - 70% and 12h light/dark cycle) with free access to solid pellet diet (Vital Feed Nigeria) and water adlibitum throughout the study except during experiment. The Ethical Committee of the College for Animal Cares and Use, Nnamdi Azikiwe University, Nnewi Campus approved the study design. Animals were randomly divided into five groups with six animals per group.

Drug Preparation

Since *Mucuna pruriens* in Ayuredic medicine is orally administered, therefore, the extract of *Mucuna* seed was suspended in distilled water using Tween 80 (1%) for oral administration.

Sildenafil citrate and ethinyloestradiol were also suspended in distilled water using Tween 80 (1%) separately, for oral use. Progesterone was dissolved in castor oil for subcutaineous injection. All the drug solutions were prepared just before administration. Dosage of *Mucuna pruriens* was selected according to[12] with ± 50mg to confirm effective concentration.

Acute Toxicity Testing

The acute toxicity test of the extract was done by Up and Down Procedure (UDP) in accordance with the organization for Economic Co-operation and Development[13]. Doses were prepared shortly prior to administration. The extract was administered in a single dose. Healthy five male mice were used for the experience. They were fasted prior to dosing by withholding only food not water for 3 - 4 hours. The limit test was done first to know whether the main test should be done. Following the period of fasting, the animals were weighed and the suspension of the extract was administered PO at the dose of 200mg/kg. The animals were observed continuously for the initial 4h for behavioural changes and mortality and intermittently for the next 6h and then again at 24h and 48h after the administration of the dose. The behaviour parameter observed were convulsion, hyperactivity, sedation, grooming and loss of weighting reflex, increased respiration and death. The LD_{50} is greater than 2000mg/kg if three or more animals survive and the experiment is terminated[13].

Determination of the Aphrodisiac Effect of *Mucuna Pruriens* Extract Mating Behaviour Test

The test was carried out by the methods of [14] and[15], modified by [8].

Healthy and sexually experienced thirty male albino mice weighing 30 - 35gm were used. Animals that were showing brisk sexual activity were selected for the study. Female mice showing regular oestrus cycle were used for mating behaviour analysis. The receptivity of the female mice was confirmed before the test by exposing them to male mice. The receptive females were selected for the study. They were divided into 5 groups of 6 animals each and kept singly in separate cages during the experiment. Group 1 represented the control, which received 10mg/kg of distilled water only.

Group 2 - 4 received suspension of the extract of *Mucuna* orally at the doses of 150, 200 and 250(mg/kg) respectively, daily for 7days at 18:00h. Group 5 served as standard and was given suspension of sildenafil citrate orally at the dose of 5mg/kg, 1h prior to the commencement of the experience. Since the male animals should not be tested in unfamiliar circumstance, the animals were brought to the laboratory and exposed to dim light (in 1 watt fluorescent tube) at the stipulated time of testing daily for 6 days before the experiment. The female animals were artificially brought into oestrus (heat)[16] by the[15] method (as the female mice allow mating only during the oestrus phase). They were administered suspension of ethinyloestradiol orally at the dose of l00mg/animal 48h prior to the pairing plus progesterone injection subcutaneously, at the dose of 1mg/animal 6h before the experiment. The experiment was carried out on the 8th day after commencement of the treatment of the male animals. The experiment was conducted at 20:00h in the same laboratory and under the light of same intensity. The receptive female animals were introduced into the cages of male. Mating behaviours were recorded and used for further analysis by giving scores for first four mating series. The test was terminated if the male failed to evince sexual interest. If the female did not show receptivity she was replaced by another artificially warmed female. The occurrence and disappearance of events and phases of mating were recorded as soon as they appeared. Their disappearance was also called out recorded. Later, the frequencies and phase were determined by the recorded transcription: number of mounts before ejaculation or mounting frequency (MF),

number of intromission before ejaculation of intromission frequency (IF), time from the introduction of female into the cage of the male up to the first mount or mounting latency (ML), time from the introduction of the female up to the first intromission by the male or intromission latency (IL), time from the first intromission of a series up to the ejaculation up to the next intromission by male or Post Ejaculatory Interval *(PEI)*. The pre-coital sexual behaviours such as chasing, nosing, anogenital sniffing and mounting were observed for up to 2h of pairing. The values of the observed parameters for control and experimental groups were recorded. The values for the observed parameters of controls test and standard animals were statistically analyzed using one-way analysis of variance (ANOVA) method.

Test for Libido

Libido was assessed according to the method described by Davidson[17], later modified by[8]. Sexually experienced male albino mice were divided into 5 groups of 6 animals each and kept singly in separate cages during the experiment.

Group 1 represented the control group, which received l0mg/kg of distilled water orally, group 2 - 4 received suspension of the extract orally at the doses of 150, 200 and 250(mg/kg) respectively, once a day in the evening (18:00) for 7days. Group 5 served as standard and given suspension of sildenafil citrate at the dose of 5mg/kg, 1h prior to the commencement of the experiment. The female mice were made receptive by hormonal treatment and all the animals were accustomed to the testing condition as previously mentioned in mating behavior test.

The animals were observed for the mounting frequency (MF) on the evening of 8th day at 20:00h. The penis was exposed by retracting the sheath and *5%* lignocaine ointment was applied 30, 13 and 5 minutes before starting observations. Each animal was placed individually in a cage and the receptive female mouse was placed in the same cage. The number of mountings was noted. The animals were also observed for intromission and ejaculation. The MF in control, test and standard animals was statistically analyzed by employing one-way analysis of various (ANOVA) method.

Test for Potency

The effect of the *Mucuna pruriens* on potency was studied according to the method described by[18] and [19] modified by[8]. The male mice were divided into 5 groups of 6 animals each and kept singly in separate cages during the experiment. Group 1 represented the control group, which received l0ml/kg of distill water orally. Group 2-4 received suspension of the test drug orally at the doses of 150, 200 and 250 (mg/kg) respectively daily for 7 days. Group 5 received a suspension of sildenafil citrate orally at the dose of 5mg/kg. 1h before the commencement of the experiment. On the 8th day the test for penile reflexes was carried out by placing the animals on its back in a glass cylinder partial restraint.

The preputial sheath was pushed behind the glans by means of thumb and index finger and held in this manner for a period of 15mins. Such stimulation elicits a cluster of genital reflexes. The following components were recorded. Erections (E) Quick Flip (QF) and Long Flips (LF) and total penile reflexes (TPR). The frequency of these parameters observed in control, test and standard groups were statistically analyzed by using one-way analysis of variance (ANOWA) method.

Statistical Analysis

Data were presented as the mean ± SD (n = 6). The significant difference between the mean value of control and experimental groups was determined by one-way analysis of variance (ANOVA) with post hoc-test. P value < 0.05 was considered as statistically significant[16].

Results

Weight of ethanolic extraction fraction from *Mucuna pruriens* seeds. The weight of the extract was 5.05gm and that of the dried

powdered drug was 44gm, the percentage yield:

$$\% \text{ yield} = \frac{5.05}{44} \times \frac{100}{1} = 11.48\%$$

% yield was 11.48%

Phytochemical Analysis

Phytochemical screening of the ethanolic extract of *Mucuna pruriens* seeds showed the presence of alkaloids, saponins, glycosides and amino-acids. It is also contain tannins, flavonids, steroids carbohydrate and terpenoids.

Acute Toxicity Test

Acute toxicity studies showed no mortality and normal behaviour was observed in all the treated mice thus the LD_{50} >200mg/kg.

The Aphrodisiac effect of *Mucuna pruriens* seed. Mating behavior. Test for libido and test for potency. The data obtained with the mating behaviour test indicated that *mucuna pruriens* extract at the dose of 150mg/kg did not significantly affect the MF, IF, EL, and PEL; the ML and IL were decreased but not in a significant manner. The dose 200mg/kg increased the mounting frequency (MF) (P<0.01), intromission frequency (IF) (P<0.01); ejaculatory latency (EL) (P<0.01), intromission latency (IL) (P<0.01) in a significant manner. However, the standard drug increased the MF (P<0.01) IF (P<0.01); and IL (P<0.01) and PEL (P<0.01) in a highly significant manner when compared to control figures 1 to 5 and table 1.

Whereas, the dose of the test drug at 25omg/kg of the extract significant increase the IF (P<0.01) but did not significantly affect the post ejaculatory interval (PEL) MF, and IF the ML and IL were decreased but not to significantly manner.

The test for libido showed that the pre-coital sexual behaviours such as chasing, nosing and anogenital sniffing were well performed in the Group 3 (200mg/kg) whereas in control, Groups 2 and 4 the behaviours were not to the extent seen in Group 3 (table2).

However, effect of Group 3 showed less than Group 5 and also increased the MF in a significant manner (P<0.05). The extract at the doses of 150mg/kg and 250mg/kg did not significantly alter the MF. The standard drug striking increased the MF.

(P<0.01), intromission and ejaculation were absent in control, test and standard groups table 1.

The test for potency exhibited that the higher dose (250mg/kg) of the test drug significantly increased the frequency of erections (E) (P<0.05), quick flips (QF) (P<0.01) long flips (LF) (P<0.01) as well as the aggregate of these penile reflexes (APR) (P<0.01) the extract at the dose of 200mg/kg significantly increased the E (P<0.01) QF (P<0.001), LF (P<0.01) and TPR (P<.01) comparatively less than standard drug, whereas, the test drug at the dose of 150mg/kg did not alter the E, QF and TPR in a significant manner (figure 6).

Table 1: Effect of 50% ethanolic extract *of Mucuna pruriens on* mating behaviour in male mice

Parameters	Control (Group 1) (10ml/kg)	Group 2 (150mg/kg of extract)	Group 3 (200mg/kg of extract)	Group 4 (250mg/kg of extract)	Group 5(5mg/kg of Sildenafil citrate)
Post ejaculatory Interval (PEI, in sec.)	239.4±0,19	248 ± 0.17	212.5 ± 0.14**	241 ± 2.1:2	4.84 ± 1.03***
Number of intromission (M)	2.94±0.34	3 ± 0.37	3.08 ± 0.35	2.85 ± 0.3	3.73 ± 0.08***
Number of Mount (NM)	2.94 ± 0.3	2.72 ± 0.45	2.8 ± 0.25	2.63 ± 0.31	3.5 ± 0.11***

Mean ± SD; $n = 6$; *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

In table 1, the standard drug increased the NI ($P < 0.001$), NM ($P < 0.001$) as well as decreased PEI ($P < 0.001$) in a highly significant manner when compared to control. The dose of the test drug at 250mg/kg of the extract did not significantly affect the post ejaculatory interval (PEI).

Table 2: Effect of 50% ethanolic extract of *Mucuna pruriens* on tests for libido of male mice

Test for libido (sec)	Control (Group 1) (l0ml/kg)	Group 2 (150mg/kg of extract)	Group 3 (200mg/kg of extract)	Group 4 (250mg/kg of extract)	Group 5 (5mg/kg of Sildenafil citrate)
Mounting Frequency	16.17±1 .41	18.33±l.26	23.57±0.30*	11.42±1.24	35.50±0.53**
Intromission Frequency	Nil	Nil	Nil	Nil	Nil
Ejaculation	Absent	Absent	Absent	Absent	Absent

Mean ± SEM; n = 6; *P < 0.05, ** P < 0.01.

In table 2, Group 3 showed less effect than Group 5 and also increased the mounting frequency (MF) in a significant manner ($P < 0.05$). The extract at the doses of 150 mg/kg and 250 mg/kg did not significantly alter the MF. The standard drug strikingly increased the MF ($P < 0.01$). Intromission and ejaculation were found absent in control, test and standard groups.

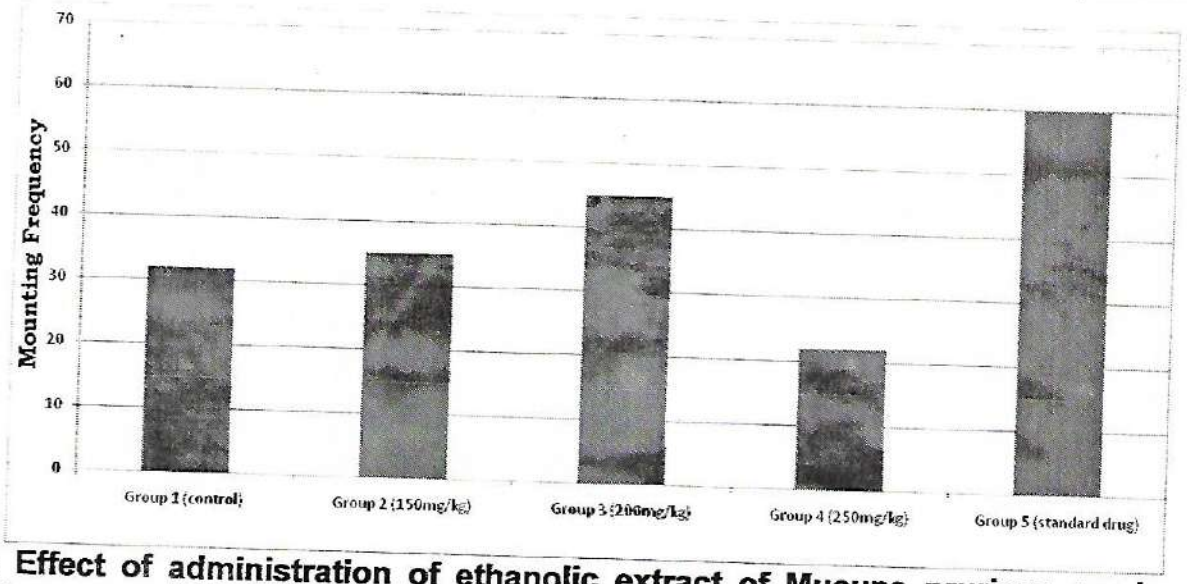

Fig 1: Effect of administration of ethanolic extract of Mucuna pruriens seed on the mounting frequency of male mice

This figure shows that the test drug at the dose of 200mg/kg significantly increased the MF as compared to control but less than that of the standard drug.
Mean ± SD; $n = 6$; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.
MF: Mounting frequency

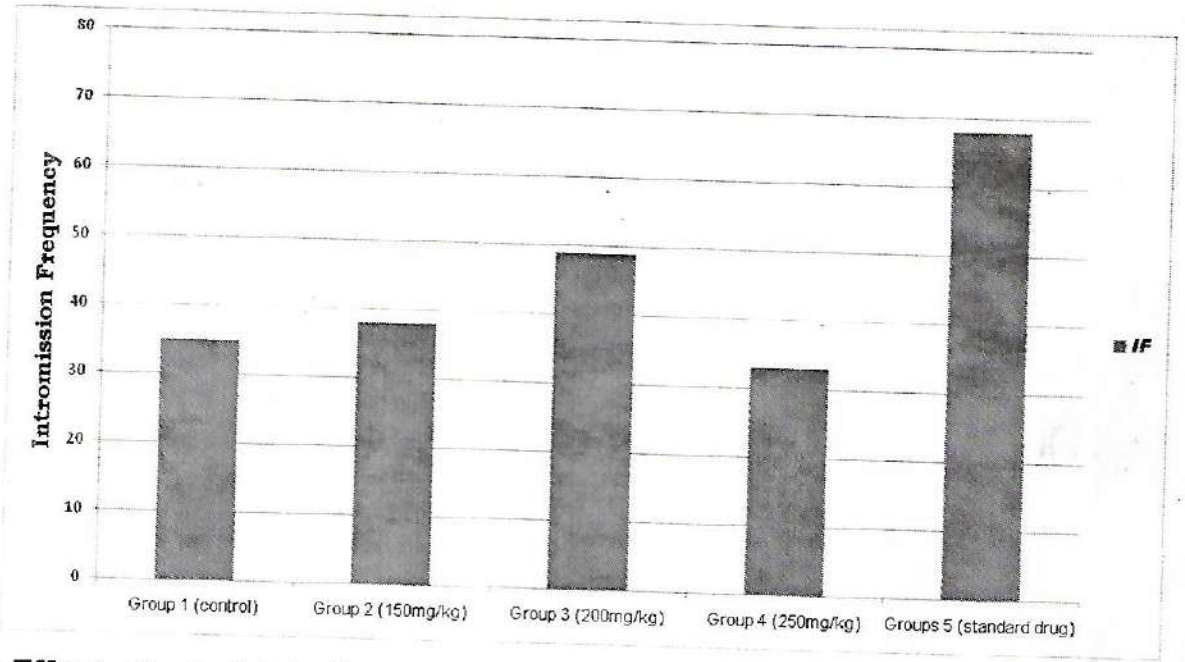

Fig 2: Effect of administration of ethanolic extract of Mucuna pruriens seed on the intromission frequency of male mice

This figure shows that the test drug at the dose of 200mg/kg significantly increased the IF as compared to control but less than that of the standard drug.
Mean ± SD; n = 6; *$p < 0.01$; ***$P < 0.001$.
IF: Intromission Frequency

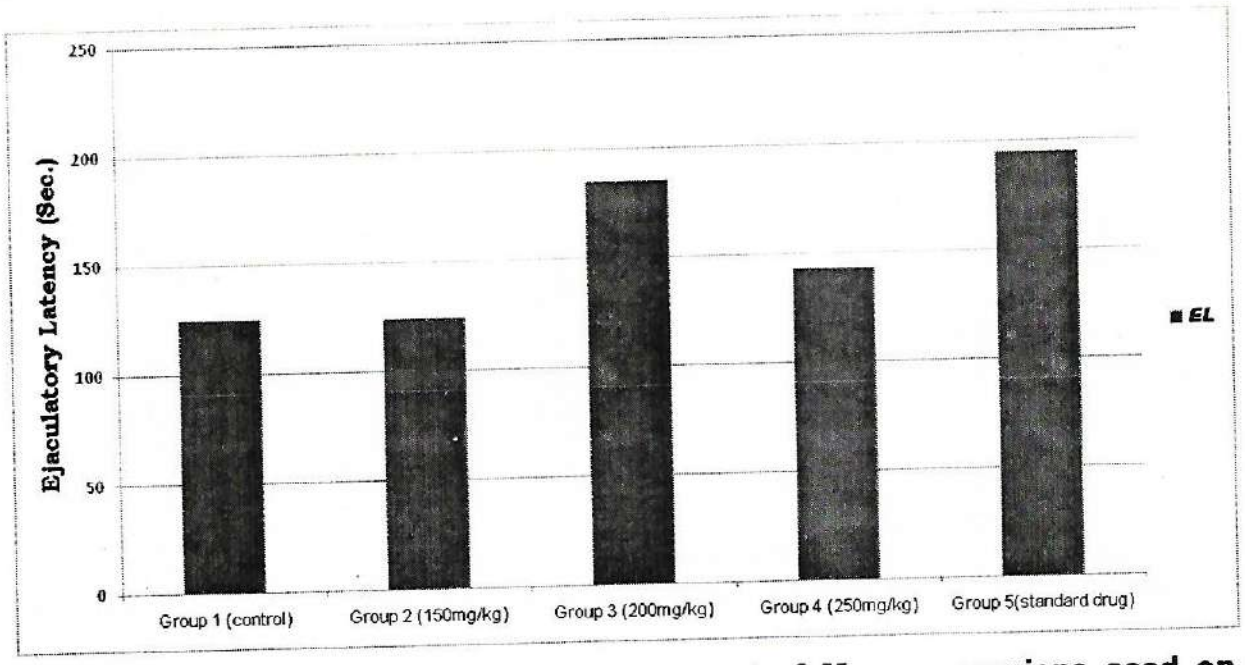

Fig 3: Effect of administration of ethanolic extract of Mucuna pruriens seed on the ejaculatory latency of male mice

This figure shows that the test drug at the doses of 200mg/kg and 250mg/kg significantly increased the EL as compared to control but 200mg/kg is higher in significance; it is also less than that of the standard drug.
Mean ± SD; n = 6; $*p < 0.05$; $**P < 0.01$; $***P < 0.001$.
EL: Ejaculatory latency

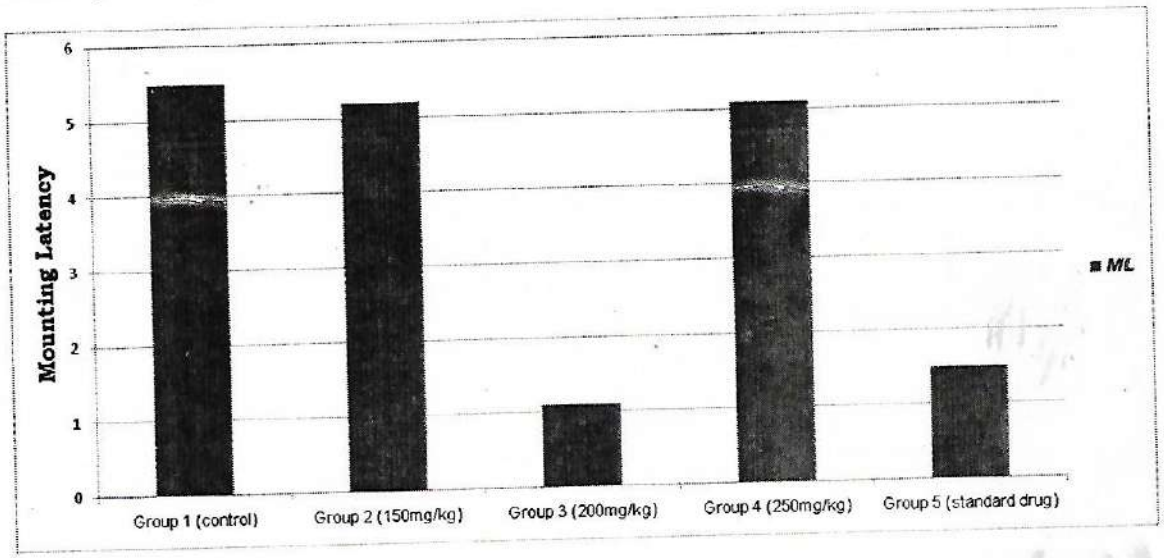

Fig 4: Effect of administration of ethanolic of Mucuna pruriens seed on the mounting latency of male mice

This figure shows that the test drug at the dose of 200mg/kg produced a significant reduction in the ML when compared to control, which indicates the aphrodisiac nature of *mucuna pruriens*.
Mean ± SD; n = 6; $*p < 0.05$; $**P < 0.01$; $***P < 0.001$.
ML: Mounting latency

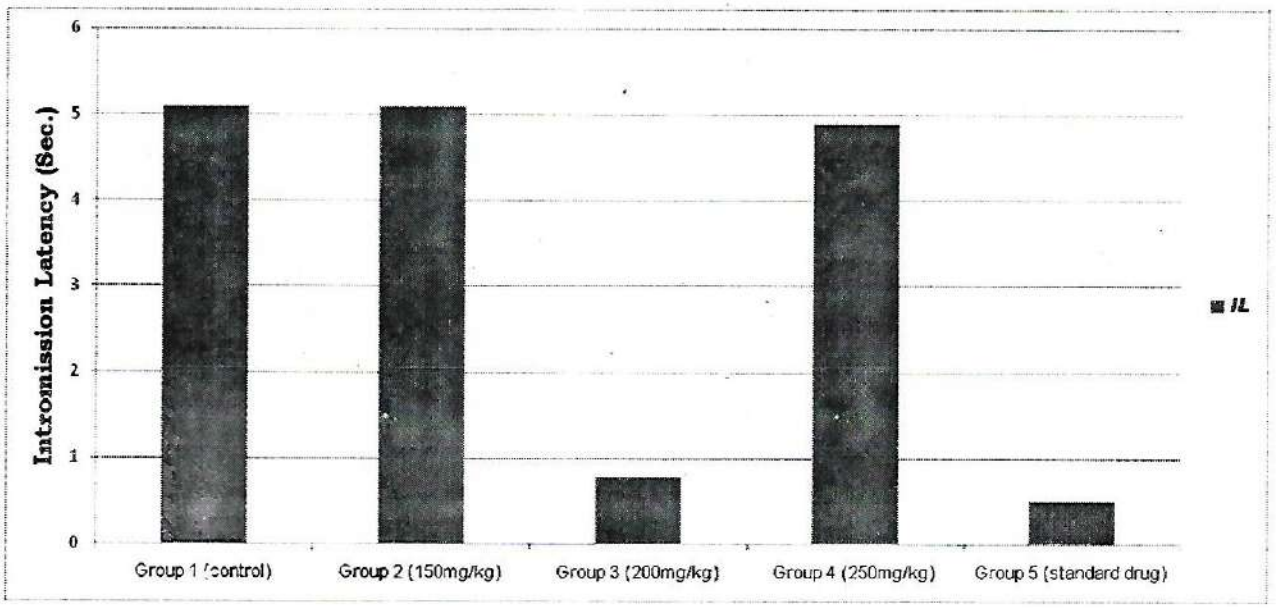

Fig: 5 Effect of administration of ethanolic extract of Mucuna pruriens seed on the intromission latency of male mice

This figure shows that the test drug at the dose of 200mg/kg produced a significant reduction in IL when compared to control, which indicates the aphrodisiac nature of *Mucuna pruriens*.
Mean ± SD; n = 6; *$p < 0.05$; **$P < 0.01$; ***$P < 0.001$.
IL: Intromission latency

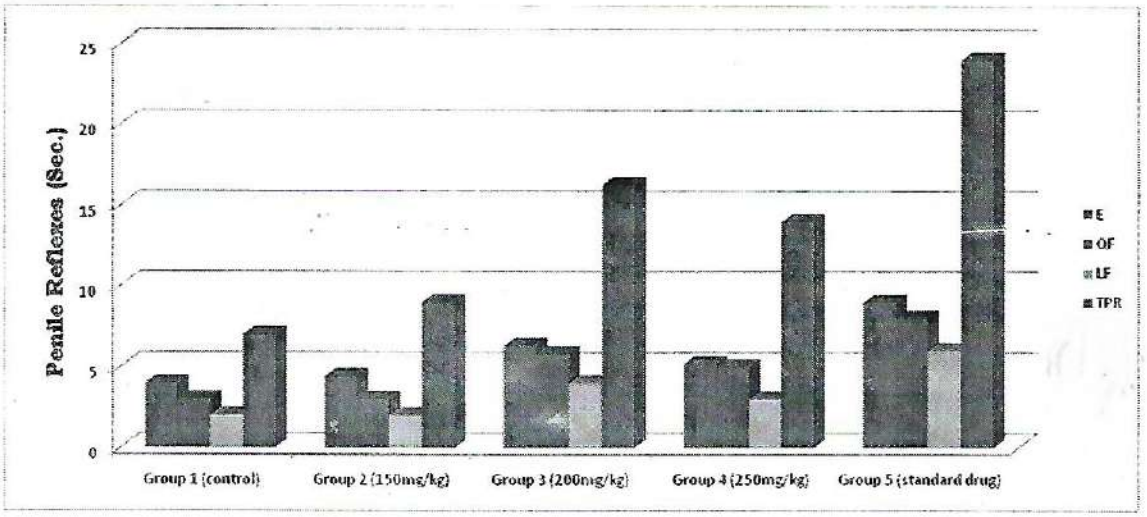

Fig 6: Effect of 50% ethanolic of Mucuna pruriens on penile reflexes (test for potency)

This figure shows that the test drug significantly increased the frequency of all components of penile reflexes (E, QF, & LF) in the test animals as compared to control group but comparatively lesser than the standard drug. Thus, this figure revealed that the test drug produced a marked increase in potency in all experimental groups with a profound increase seen in Group 3 (200mg/kg).

Mean ± SD; n = 6; *$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.
E: Erection, QF: Quick Flip, LF: Long Flip and TPR: Total Penile Reflex.

Discussion

Phytochemical screening can help to reveal the plant extract. It may also be used to search for bioactive agents for starting products used in the partial synthesis of some useful drugs[9]. Phytochemical screening of the powder, and ethanolic extract of *Mucuna pruriens* seed showed the presence of alkaloids and saponins. It also contains glycosides, ammo-acids, tannins, flavonoids, steroids carbohydrate and terpenoids. Saponins have been implicated as the possible bioactive agent responsible for the aphrodisiac effect in *Tribulus terrestris* extract[20].

The realization that the acute toxicity test showed no mortality, and normal behaviour was observed in all the treated and control groups is probably an indication that the extract is relatively safe.

In this study, seed (M. *pruriens)* was tested in animal experimentation for its effect on sexual behaviour, and sildenafil citrate was used as the standard reference. The study showed that the 50% ethanolic seed extract of *Mucuna pruriens* possesses significant sexual function, enhancing activity as observed in sexual behaviour tests. Mating behaviour test revealed that the test drug at the dose of 200mg/kg significantly increased MF, IF, and EL as compared to control but less than that of the standard drug. The mounting frequency (MF) and intromission frequency (IF) are considered as the indices of both libido and potency. So, this is an indication that test drug possesses a sexual function improving effect.

The test drug (200mg/kg) not only significantly increased the ejaculatory latency (EL) but also was found to produce a significant reduction in the mounting latency (ML) and intromission latency (IL) when compared to control, which indicates the aphrodisiac nature of *Mucuna prurients.*

The effect of the test drug on libido was evaluated by the mounting frequency (MF) after genital anaesthetization which does away with the reinforcing effect of genital sensation thus affording the study of pure libido or intrinsic sexual desire. The effect on potency was also evaluated by testing the effect of the drug on the frequency of penile reflexes namely erections (E), quick flips (QF), and long flips (LF). The test drug significantly increased the frequency of all the components of penile reflexes (E, QF and LF) in the test animals as compared to control group but comparatively lesser than the standard drug. For penile erection, a well coordinated system of vascular, endocrine and neural networks are required. Hence a drug that brings about changes in erection and sexual behaviour would induce changes in neutransmitter levels or at cellular levels [21]. Penile reflex experience revealed that the test drug produced a marked increased in potency in all experimental groups with a profound increase seen in Group 3 (200mg/kg). The vascular event governing penile erection relies on parasympathetic neural input derived from cholinergic preganglonic neurons residing within the sacral spinal cord.

The cavernous nerves arise from the pelvic nerves that exit sacral cord which supplies autonomic input to the penis. These nerves release at least three neurotransmitters that are capable of relaxing the cavernous smooth muscle. These transmitters include nitric oxide, acetylcholine and vasoactive intestinal polypeptide of which nitric oxide is the most important. Acetylcholine activates endothelium via muscarinic receptors of the MS subtypes. Binding to receptors on endothelium leads to production of nitric oxide which is synthesized by endothdial nitric oxide synthetase.

Vasoactive intestinal peptide as well as forskolin and prostaglandian E acts through adenylate cyclase to trigger a rise in cyclic adensine monophasphate (CAMP). A rise in cAMP results in a fall in cytosolic Ca^{2+} in cavernous smooth muscles which eventually lead to relaxation of cavernous smooth

muscle in the penis. This relaxation of cavernous muscles will allow the blood to flow in the penis which results in erection of the penis.

With regard to the efficacy of the *Mucuna pruriens* and sildenafil citrate drugs, sildenafil citrate was predominatly used for erectile dysfunction, sexual dysfunction of psychologenic nature and reported to increase sperm count and functions[12]: However, extract actions are still not clear. In this study, *Mucuna pruriens* showed relatively good result in terms of sexual behaviour, libido potency and spermatogenic potential. With studies confirming the action *of Mucuna pruriens* on brain cells especially dopaminergic neurous [22], and dopaminergic pathway controlling sexual activities [23] these correlations strongly suggest aphrodisiac activity through dopaminergiic pathway with the presence of high level of L-DOPA in *Mucuna pruriens*. In addition, to discover the applied effective concentration or dosages of the extract, more studies are also required to fully elucidate the mechanism through which *Mucuna pruriens* produces aphrodisiac effect.

CONCLUSION

From the present investigation, we conclude that the ethanolic extract of *Mucuna pruriens* seed (200mg/kg) body weight possesses potent aphrodisiac activity in normal albino mice and may exert its activity through the activation of the cholinergic receptors. This result is the scientific evidence in favour of the claims in Indian system of medicine that the *Mucuna pruriens* is clinically useful as sexual invigorator in males.

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PROFILE OF MATERNAL MORTALITY AND MATERNAL HEALTH SERVICES IN NIGERIA

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ABSTRACT

Nigeria has a high maternal mortality that is disproportionate to its population relative to that of the world. This review examines maternal mortality in Nigeria with respect to the magnitude of the problem, its causes, together with the pattern of maternal health services and their influence on maternal mortality. Among direct medical causes of maternal mortality in Nigeria include haemorrhage (23 %), sepsis (17 %), malaria, anaemia, abortion, hypertensive disorders/eclampsia, obstructed labour (11 % each), and others (5 %). Non-medical factors which include sociocultural, economic, and legal factors, reproductive health factors, health services and health system factors, and delay in access to emergency obstetrics care; all impede availability and access to maternal health services, thereby promoting maternal mortality. The knowledge of these factors will redirect the thought and actions of stakeholders in maternal health towards a better focused planning and implementation of maternal mortality reduction efforts in Nigeria.

Keywords: *Profile, Maternal mortality and maternal health services, Nigeria*

INTRODUCTION

The death of a woman in relation to pregnancy and childbirth engenders grief, anguish and despair amongst the household and indeed the community at large, largely because pregnancy is not a disease but a physiologic and therefore natural process expected to perpetuate the continuity of the human race. Pregnancy and delivery should therefore be safe to the extent that no mother should be allowed to suffer disability or death from the events.

The World Health Organization defines maternal mortality as a death of a woman while pregnant or within 42 days of a termination of a pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental and incidental causes.[1]

Over the past 10 years, until recently, maternal deaths all over the world had been placed at approximately 523,000 annually; however following interventions in various countries pursuant unto the attainment of the major target of the fifth component of the United Nations' Millennium Development Goals (MDGs) i.e. reduction of maternal mortality by 75% by the year 2015, a 45% reduction of maternal mortality to 289,000 in 2013 has been reported by the United Nations[2]. Approximately 99 % of these maternal deaths occur in developing countries.[3] Presently, 60% of the current burden of global maternal deaths occur in 10 countries of the developing world, viz India (50000, Nigeria 40000, Democratic Republic of the Congo 21000, Ethiopia 13000, Indonesia 8800, Pakistan 7900, United Republic of Tanzania 7900, Kenya 6300, China 5900 and Uganda 5900[2].

Maternal mortality is believed to exhibit the

widest discrepancy amongst all public health statistics, between developed and developing nations, and further constitutes a manifestation of the disparity and inequity between men and women, and of women's place in the society.[4]

Issues related to maternal mortality and its reduction have occupied a prominent place as a contemporary global health challenge, and this has been aptly captured in one of the foremost world's developmental strategies – the United Nations Millennium Development Goals (MDGs) where it occupies a pivotal position, directly or indirectly affecting all the other goals.[5,6]

Nigeria is believed to have one of the highest maternal mortality ratios in the world, comparable only to that of war-torn countries. Given the position of Nigeria as the most populous nation in Africa, its abundant human, natural and economic resources, her high maternal mortality ratio, and indeed an overall poor reproductive health statistics only but constitute an embarrassment to the nation and the world at large.

This review examines maternal mortality in Nigeria with respect to the magnitude of the problem, its causes, together with the pattern of maternal health services and their influence on maternal mortality. The knowledge of this is expected to guide health policy-makers and health practitioners alike towards an evidence-directed maternal health care package that will facilitate a speedier maternal mortality reduction in Nigeria.

Magnitude of maternal mortality in Nigeria

Nigeria accounts for 10 % of the world's overall maternal mortality. This figure is quite high seen in the light of the fact that Nigeria constitutes only 1.2 % of the world's population. Nigeria's maternal mortality ratio as represented in the National Demographic and Health Survey (NDHS) of 1999 was given to be 704 per 100,000 live births.[7] The United Nations Population Fund's UNFPA 2002 version of the State of the World's Population Report showed a maternal mortality ratio figure of 1,100 deaths per 100,000 live births.[8] A 2003 report from the Federal Ministry of Health showed maternal mortality ratio of 948 per 100,000 live births with a range of 339 to 1,716 per 100,000 live births.[9] The 2008 Nigerian Demographic and Health Survey showed a reduction in Nigeria's maternal mortality ratio to 545 per 100,000 live births.[10] Variations in maternal mortality statistics are not unrelated to logistics and technical difficulties associated with the national maternal mortality surveys which cast doubt as to the reliability of those surveys. In spite of this, there is no doubt whatsoever as to the high maternal mortality ratio in Nigeria which in fact seems to have continued to be on the increase over the recent years. The 2013 National Demographic and Health Survey in fact reported maternal mortality ratio of 576 per 100,000 live births which is clearly higher than the 2008 report of 545 per 100,000 live births[11].

Nigeria's poor maternal mortality ratio is similar in pattern and trend over the past more than a decade to its other unsalutary related demographic and health indices as shown below in Table 1.

Table 1: Trend in some Nigeria's demographic and reproductive health statistics (1999-2013)

Characteristics	1990	2003	2008	2013
Total fertility rate	6.0	5.7	5.7	5.5
Maternal mortality	1000	704	545	576
(CPR) any method	6(%)	13(%)	15(%)	15(%)
(CPR)modern method	4(%)	8(%)	10(%)	10(%)
Child mortality	-	112	88	64
Neonatal mortality	-	48	40	37

Causes of maternal mortality in Nigeria

The pattern of the causes of maternal mortality in Nigeria is essentially similar to that of the world-over with subtle variations in incidence for the various components of causes. Broadly the causes of maternal mortality can be grouped into medical – direct and indirect, and non-medical, which are in fact associated factors and include socio-cultural factors, reproductive health factors, and health systems/health service factors.

Medical causes of maternal mortality

Direct medical causes of maternal mortality in Nigeria and the corresponding global profile[12,13,14] are shown in Table 2.

Table 2: Direct medical causes of maternal mortality in Nigeria/Global

Direct medical causes	Nigeria	Global
Hemorrhage	23 %	25 %
Sepsis	17 %	15 %
Malaria	11 %	-
Anaemia	11 %	-
Abortion	11 %	13 %
Hypertensive disorders/Eclampsia	11 %	12 %
Obstructed Labour	11 %	8 %
Others including Ectopic pregnancy, Embolism and Anesthesia related risks	5 %	8 %.

Indirect medical causes of maternal mortality refer to problems that may have been either pre-existing but have become aggravated by the pregnancy, or co-existing with the pregnancy. Examples are malnutrition, cardiac failure, tuberculosis, sexually transmitted infections, gender-based violence, etc. They constitute 20% of the medical causes of maternal mortality.

Non-medical causes of maternal mortality

Socio-cultural, economic, and legal factors impact tremendously on access, acceptability and utilization of maternal health services, and the ultimate outcome of maternal health in Nigeria. Socio-cultural constraints prohibit women's ability to make decisions even on issues concerning their health. Amongst socio-cultural factors recognized to play major roles in the causation of maternal deaths in Nigeria include: low status of women in the community in respect of education, income, occupation, social, and legal autonomy. Others include: young age at marriage, bearing children too early or too late, poor spacing of children, heavy work burden during pregnancy, harmful traditional practices, and obstacles to access to family planning services and apathy and stigmatization of women experiencing disabilities from childbirth such as vesico-vaginal fistulae.[15]

Poverty has profound influence on the health of the mother and child in Nigeria which impact tremendously on the overall quality of life. Poor mothers tend to have poor nutrition, increasing their susceptibility to anaemia and infection with overall poor pregnancy outcome. Furthermore they are seldom able to afford patronage to hospitals or orthodox maternal health services and oftentimes resort to substandard health care. Studies conducted in selected areas of Benue State of Nigeria show that in spite of the preference of most people to receiving treatment from orthodox health facilities, most of the poor, in fact resort to receiving treatment from patent medicine stores, native medicine men, and spiritual homes on account of their inability to afford the cost of health services from orthodox facilities.[16]

The Structural Adjustment Programme (SAP) introduced by the World Bank and International Monetary Fund (IMF) to Nigeria in 1988 seemed to have played a significant role towards the worsening of the socio-economic situation in Nigeria which it was intended to address. SAP's prescription of the devaluation of the national currency, embargo on employment, retrenchment of workers and removal of subsidies and subvention to hospitals and educational institutions in fact actually dealt a disastrous blow particularly on the nation's health and educational social sub-sectors.[17,18,19] School enrollment dropped, accompanied with a high level of dropout from schools of Nigerian children. Hospitals and health facilities became increasingly characterized by stock-out of drugs, break down of equipments which were not being replaced, dilapidation of physical infrastructure and poor patronage. These in conjunction with the introduction of user-fees into public health facilities, poor motivation and remuneration of the health workforce resulted in the exodus of quality staff in search of greener pastures – the brain drain, all led to increasingly worsening status of the health of Nigerians especially the mother and child. Worsening poverty increased the number of obstetric emergencies and the overall maternal mortality.

The poverty situation in Nigeria has undergone an upward trend over the past two decades, being largely fueled by corruption, bad governance, and adverse trade relation. Before 1980, only 27% of Nigeria's 66 million people were poor. This figure more than doubled by 1996 to as high as 65 %, with the core poor (i.e. those living on about 70 US per day) rising from 4 million to 30 million between 1980 and 1996.[20].This trend had not improved over the years, in a 2012 press briefing by the statistician general of the Federation on Nigerian poverty profile report, 2010 , it was

reported that 51.6% of Nigerians were living below US$1 per day which by 2010 had increased to 61.2%. If cognisance is taken of the current World Bank Standard of US$1.25, this figure would have been much higher[21]. Studies have shown that rising hospital cost and increasing poverty have resulted in drastic reduction in the utilization of hospital services[17 22], although the introduction of the National Health Insurance Scheme is going a long way towards alleviating the burden of the payment of out of pocket expenses for maternal health services especially for formal sector employees[23].

Religion has a significant impact on maternal health, whether in the northern or southern part of Nigeria. The Muslim Pudar system which is believed to have become integrated into the culture of the people discourages the patronage to orthodox health facilities, so as to prevent them from being attended to by male staff. They are encouraged therefore to be attended to by traditional birth attendant who apart from paying strict attention to cultural imperative also seize the available opportunity to perform religious rites.[24,25]

Literacy level and education in general, play important role in utilization of maternal health services by Nigeria women. The National Demographic and Health Survey (NDHS) of 2003 vividly captures this. Whereas 60 % of mothers with no education relied on unskilled attendants during delivery, only 9% of mothers with higher education did so.[7]

Unsafe abortion and its complications constitute major cause of maternal deaths in Nigeria. Unsafe abortion occurs mainly from clandestine operations, due to the restrictive abortion laws of the country which prevent women's access to legal abortion services.[26,27]

Reproductive health factors causing maternal mortality

Maternal outcome following pregnancy is to a large extent influenced by reproductive health seeking behaviours and practices both at personal and community levels. Although several factors interplay towards the ultimate behavior of an individual in respect of reproductive health – induced abortion for instance accounts for 11% of the overall maternal deaths in Nigeria. Altogether approximately 760,000 abortions are performed annually in Nigeria. More than 60 % of which are performed by non-medical personnel.[28,29] The implications of this to maternal mortality are obvious.

Antenatal care represents a well known approach to safe motherhood. Surprisingly however antenatal care of women by health professionals has shown a decline. For example the 1999 NDHS survey showed that 63.6 % of mothers received antenatal care from health professionals over the three years preceding the survey, compared to 58.8 % who did so over the three years preceding the 2003 NDHS survey, there was even a further decline to 58.0% from the report of 2008 NDHS survey, which increased to 61% in the 2013 report[11] . Among factors reported to be responsible for the declining antenatal care visits include: lack of awareness of the importance of antenatal care, lack of awareness of antenatal care services in the health facilities, and economic consideration.[30]. The extent to which these factors have continued to input into the declining patronage to skilled birth attendant for antenatal care services remains embarrassingly confounding, considering the plethora of activities and programmes put on over these years by several stakeholders which are governmental and non-governmental organizations towards maternal health services and maternal mortality reduction effort, especially under United Nations' Millennium Development Goals (MDGs)[33].

Delivery also adopts a near-similar pattern as antenatal care. While 37.3 % of deliveries recorded at the 1999 NDHS survey occurred in health facilities, a lower percentage – 30.4 % was reported for the health facility at the

2003 NDHS survey, which increased only slightly to 35% by the implications of the declining antenatal care and delivery at health facilities on maternal mortality are indeed grave.

Family planning plays an important role in preventing maternal mortality through either preventing the absolute number of women getting pregnant, or when targeted at the highly vulnerable groups – the too young, too old, or high parity. It is believed to prevent maternal mortality when combined with abortion services in 50% of cases.[34] The contraceptive prevalence rate for Nigeria currently stands at only 15% overall, much lower, than 25% reported for sub-Saharan Africa. Modern contraceptive method currently has a prevalence rate of just 10% from the 2013 NDHS[11] .The need to embrace modern methods of family planning has become absolutely necessary, considering the total fertility rate of Nigeria which has increased from 5.2% in 1999 to 5.7% in 2008, declining only slightly to 5.5 in 2013[12]. The Nigeria's revised Population Policy of 2002 stipulates specific provisions on family planning, which includes achieving reduction of the county's population growth rate to 2% lower by the year 2015; achieving reduction in total fertility rate (TFR) of at least 0.6 children every five years; increasing modern contraception prevalence rate by at least 2% point per year.[31] In Nigeria today, universal access to family planning is elusive while family planning commodities, logistics management is still quite poor.

Teenage adolescence contributes to increase maternal mortality rate (MMR) in several ways. The NDHS report of 1999 indicates that 22% of teenagers in Nigeria have begun childbearing. The NDHS report of 2003 further revealed that only 48% of teenage pregnant women received antenatal care from health professional in contradistinction to 60.7% amongst women above 35 years of age. Adolescents also have high rate of induced abortion with attendant complications. Studies have shown that up to 33% of women seeking abortion were adolescents, and up to 80% of hospital-based admissions for abortion complications occurred in the adolescent girls[34].

Health services and health system factors causing maternal mortality

Report has it that the total number of health facilities in Nigeria by the year 2000 was 23,676; of which 74% were primary health care facilities, 25.2% secondary health facilities while 0.2% constituted tertiary health facilities. 37% of the overall health facilities are privately owned. Only 14,474 of the 101,041 communities in Nigeria were reported to have access to any form of modern health facility by 1993. The proportion of Nigerians with access to health care services has been put at 56.5%[29, 32, 36]. This statistics of health delivery centres has shown only but a marginal increase over the years. Although zonal variations occur, it has been reported that there are a total of 13,211 primary health care facilities in the country. Only approximately half (49.8 %) of primary health care facilities in the country provide antenatal care while 42.9 % provide delivery services.[29]

Emergency obstetrics care is a recognized protocol for preventing morbidity and mortality during pregnancy, delivery, and postpartum period. Studies conducted by the Federal Ministry of Health and UNFPA in 2003 indicated only one state out of 12 studied met the minimum criteria of the four basic emergency obstetrics care facility per 500,000 population. Only 18.5% of facilities offering maternal health services, in general, met the minimum emergency obstetrics care criteria: 4.2% of public health care facilities, and 32.8% of private health care facilities respectively met the minimum criteria for EOC[36]. This finding is significant considering the fact that 15% of the complications of pregnancy and childbirth are life threatening, requiring emergency obstetrics care.

Human resources constitute an essential element of maternal health services. In particular the number of skilled birth attendant in a health facility is paramount to effective and safe obstetrics services delivery in the health facility. Skilled birth attendants – the doctor and the nurse/midwife are health personnel that have been trained over a set period of time and dully certificated to conduct midwifery services. The NDHS of 2003 reported that over 40% of the 6,219 births in five years preceding the survey had no trained assistance during delivery. As high as 58.2% of primary health care facilities offering both midwifery and delivery services have been shown in a recent study to have no midwife while 17% have neither midwife nor senior community health extension health worker (SCHEW).[29] This situation is more marked in the northern states of Nigeria compared to the southern states. It is generally believed that the general lack of skilled personnel is more related to the poor commitment of government towards their recruitment rather than an absolute shortage of the personnel – probably because of the perceived higher wages attached on the recruitment of skilled personnel. The presence of skilled personnel has been shown to impact on maternal mortality as shown in Table 3 below which compares antenatal care in relation to maternal mortality

Table 3: Skilled attendants at delivery and maternal mortality ratio in selected countries for 2003-2013

Country	% Skilled Attendants at Delivery		Maternal Death/100,000 Live Births	
Trinidad and Tobago	2003	2013	2003	2013
	98	97	90	84
Sir Lanka	94	99	140	29
Botswana	77	99	250	170
Bolivia	46	71	650	200
Nigeria	31	34	1000	560
Bangladesh	5	31	850	170

Training and re-training of skilled birth attendants on emergency obstetrics care – expanded life saving skills (ELSS) for doctors; lifesaving skills (LSS) for nurse/midwife; and modified life saving skills (MLSS) for community health extension workers, are also a fundamental requirement for effective prevention of maternal mortality. To date, the

number of doctors trained on ELSS is about 10-15%, while only approximately 20-25% of nurse/midwives are trained on life saving skills.

Good infrastructure, functional medical equipments, availability of adequate drugs and other supplies are prerequisite to offering quality services that will determine the ultimate outcome of any pregnancy at delivery. Many health facilities in the country exhibit infrastructural decay with lack of equipments, even as basic as sphygmomanometer where available, many of the equipments are in non-functional state, a situation more prevalent in state government owned facilities.[12,41]

Drug shortage and stock-out which characterized many of the public health facilities constitute an added factor that renders such facilities unattractive to patronage by community members. There is ample evidence to show that basic emergency obstetrics care drugs such as parenteral oxytocic, anti-convulsant, and antibiotics are lacking in many health facilities offering maternal health services.[41]

Quality of health care from health providers has been reported to be on a decline, and constitutes a major hindrance to access to health services in both private and public health facilities. Two key components of quality of services have been identified for the key role they play in maternal mortality viz: interpersonal relationship and technical competence of health workers. Interpersonal communication skills are lacking amongst many health workers. The unfriendly behaviour of hospital staff has been identified as a major reason for poor utilization of health facilities in some studies conducted.[29,41]

Studies and observations have shown incontrovertibly that the technical performance of virtually all cadres of health professionals in Nigeria had been below standard and requisite expertise.[42] Lack of exposure to modern medical equipment and training and re-training programmes have acted in concert to retard the technical proficiency of the Nigerian health professionals. Even following the acquisition of the skills through trainings, the unavailability of the necessary equipments may prohibit the health worker from practicing the acquired skills. For example a recently acquired expertise on the use of anti-shock garment for managing obstetrics haemorrhage by a doctor following an ELSS training, may be lost on account of the absence of the garment in the health facility.

The Nigerian health system essentially adopts a three tier structure vide the National Health Policy of 1988 with primary health care to operate at the local government level, secondary health care to operate at the state government level, and tertiary health care to be controlled at Federal Government level. Health was also placed at concurrent legislative list[43, 44]. Over the years however with the development of government parastatals of ministries of health with implementation status, the establishment of tertiary health facilities by state government, and construction of primary health centers by Federal Government, considerable over lap on the original three tier structural arrangement has become evident thereby seemingly disorganizing the entire health system arrangements, making it even more complex[44]. This situation has apparently affected the activities of government in the health sector – policy formulation programme and implementation filtering down from the Federal to the state and local government levels.

Inadequate funding of the health sector perhaps remains a foremost contributor to poor maternal health services. Even when funds are budgeted for health, release for implementation of programme is usually poor, being influenced tremendously by corruption, self-interest, and poor management. From 1996 - 2000 Federal Government budget on

health ranged from N4,835 million - N17,581.9 million; this amount represented only 2.7% - 5.0% of the total Federal Government budget. Nigerian's total health expenditure (THE) as a percentage of gross domestic products (GDP) is low ranging between 4.3% - 5.5% from 1996 - 2005. From 1996 - 2005 private sector expenditure on health as a percentage of This was high ranging from 66.5% - 78.2% with private household out of pocket accounting for 90.4% - 95.0% over the period[46,48]. This represents an enormous financial burden for health care on the poor Nigerian mass. Nigeria health expenditure as a percentage of the gross domestic product has been given to be 0.2% over the period between 1990 - 1998. This figure is considered low when compared with the World Bank's reported average of 2.6 % for sub-Saharan Africa from 1990-1996.[49] The inadequate funding of the health sector that characterized the Federal Government also replicated at both the state and local governments. Non release of approved budget for health care is even more pronounced in the state government which many a time depends on donor funds. In the local government, it has been reported that considerable percentage of the funds meant for health is spent on the personnel cost, leaving only very little to provide for health care delivery.

The overall performance of the Nigeria's health system has been adjudged to be deplorable. The 2014 WHO Global Rating of health system performance ranked Nigeria 187th out of 190 countries accessed.[48]

The Nigerian public health system has been reported to be characterized by low sector funding, poor staff motivation, and inadequate access to health care. Poor governance, institutionalized corruption, and low commitment to meeting the health care needs of the people have contributed immensely towards the poor performance of the Nigerian health system, and this has been profoundly expressed in Nigeria's poor maternal health profile.

Delay in access to emergency obstetrics care

Maine and Wray identified factors that affect the interval between onset of obstetrics complication and its outcome, which constitutes delays to access to emergency obstetrics care.[48] These have been effectively used as safe motherhood advocacy tools in communities. There are basically three delays involving **4R's**. These are:

Phase I – delays in recognizing the signs of life threatening complications which are attributed to a poor knowledge-base of obstetrics and its complications arising from the patient, household, and community on one hand, preventing them from seeking early appropriate care, and the health provider such as the traditional birth attendant lacking the necessary information to facilitate prompt referral on the other hand. It also includes delays in reacting to the presence of life threatening obstetrics complications which may be attributable to social, domestic, economic, and cultural constraints affecting the parturient woman which compels her to postpone seeking appropriate care.

Phase II – delay in reaching appropriate obstetrics emergency care centre. This is usually attributable to geographical, economic, and social inadequacies as may occur with bad roads, poor transportation system and social practices within a community.

Phase III – delay in receiving treatment for obstetrics emergency at health facility level. This may be related to personnel incompetency, poor interpersonal relationship and irresponsibility, lack of necessary drugs, equipment and other life saving necessities e.g. blood transfusion, and lack of enabling environment to render emergency obstetrics care services.

Phase I or first level delay
Phase II or second level delay
Phase III or third level delay

CONCLUSION

The foregoing exposé of the causes of maternal mortality in Nigeria as well as the various factors influencing them indicates unequivocally that most of these identified factors are largely preventable and remediable. This review has undoubtedly highlighted basic medical, social and logistic factors, most of which are human inflicted, and constitute profound food for thought by all stakeholders in Nigeria health system. It is expected that the facts presented in this review will go a long way towards providing the necessary information that will redirect the thoughts and actions of all the stakeholders of maternal health in Nigeria – especially including policy-makers at executive and legislative levels of government, non-governmental organizations, health care providers, community leaders, and of course the health care beneficiaries. This will constitute the veritable prerequisite to an effective maternal mortality reduction effort in Nigeria.

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COMPARATIVE STUDIES ON THE EFFICIENCY AND TOLERABILITY OF FOUR ANTIMALARIALS IN MALARIAL PATIENTS OF DIFFERENT HAEMOGLOBIN GENOTYPES (AA, AS, AND SS)

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ABSTRACT

Comparative studies on the efficiency and tolerability of four antimalarials, quinine dihydrochloride, sulfadoxine/pyrimethamine, halofantrine and artesunate were carried out in 480 volunteer malaria patients of different HB - genotypes (AA, AS, and SS). Patients with HB - genotype AA were 350 (73%). Those with HB - genotype AS were 102 (21.2%) and those with HB - genotype SS were 28 (5.8%), those with HB genotype AA were randomly divided into four groups of 84, 86, 90 and 90 patients each. Those with HB genotype AS were randomly divided into four groups of 25, 25, 26, 26 patients each and those with HB genotype SS were divided into four groups of 6, 7, 7 and 8-patients each. First group received sulfadoxine/pyrimethamine, 3 tablets of 500mg/25mg orally at once. Second group received quinine dihydrochloride 200mg or 8mg/kg 3 times daily for 6 days. Third group received halofantrine 160mg tablets (start) and 80mg 6 hourly for 3 days orally. Fourth group received artasunate 100mg tablets (start) and 50mg 12 hourly for 5 days orally. On day 7 efficacy of these antimalarials was evaluated and compared according to different heamoglobin genotypes AA, AS, and SS. Artesunate had the highest efficacy of 98% in AA, 93.3% in AS and 100% in SS. The efficacy of artesunate is not significantly different (P>0.05) in AA, AS and SS. Halofantrine ranked second in efficacy with 97.8% in AA, 92.0 % in AS and 85.7% in SS. Efficacy of halofantrine is not significantly different in these HB - genotypes (P>0.05), AA, AS and SS. Sulfadoxine/pyrimethamine ranked third in efficacy with 95.3% in AA, 84.0% in AS and 100% in SS. The efficacy is not significantly different (P>0.05). While quinine dihydrochloride ranked fourth in efficacy in AA with 93.0%, 87.7% in AS and 100% in SS. Efficacy is not significantly different (P>0.05) in these HB - genotypes. The adverse effects of these drugs were found to be mild to moderate as well as reversible immediately after drug withdrawal. Also these antimalarials under investigation were well tolerated when administered to these groups of patients.

Keywords: *Antimalarials, genotypes, malaria*

INTRODUCTION

There are few studies on efficacy and tolerability of antimalarials in malarial patients of different haemoglobin genotypes: AA, AS and SS. Malaria is a serious global health challenge. It continues to be one of the most important and devastating infective diseases in developing areas of the world[1]. Malaria is a disease of global importance and remains an overwhelming global problem and accounts for up to 500 million febrile illnesses and millions of deaths annually[2]. Malaria is a serious blood dependent disease caused by *plasmodium falciparum*. During the acute phase of *P. falciparum* malaria, destruction of parasitized and healthy erythrocytes, release of parasites and erythrocyte materials into the circulation and secondary host reaction

occur[3]. In the malaria endemic areas, the susceptibility of HB-S gene carriers to malaria parasites appears to be less than in Hb-A gene carriers[3]. *P. Falciparum* malaria attack was explored and data showed that paradoxically sickle cell trait is less hospitable to *P. falciparum* than AA gene which has more malaria parasites. It has also been reported that in all areas that have a past or present history of malaria endemicity, the HB SS gene frequency is high while the non-malaria regions have a much lower frequency[4]. There are many antimalaria drugs used in treating patients with malaria. These antimalaria drugs include chloroquine, quinine dihydrochloride, sulfadoxine/pyrimethamine combination, mefloquine, primaquine, amodiaquine, proguanil, halofantrine, lumen fantrine, chlorproguanil, dapsone, artesunate, artemeter etc[5]. These antimalarials, their tolerability and efficacy have not been documented with respect to different haemoglobin genotypes: AA, AS and SS and because there are differences in genetic constitution of different individuals with respect to their genotypes, malaria parasites may have different sensitivity to these antimalarials in different genotypes. The aim of this present study is to compare the efficacy and tolerability profile of four antimalarials, sulfadoxine/pyrimethamine combination, quinine dihydrochloride, halofantrine and artesunate in malarial patients of different genotypes.

MATERIALS AND METHODS

Patients: The studies were carried out at Nnamdi Azikiwe University Teaching Hospital, Nnewi, Anambra State, Nigeria. Malaria Patients attending General Out Patient Department (GOPD) of the hospital were used. A total of 480 Nigerian febrile patients were evaluated between March, 2008 and October, 2009. Males 260 (54%) and females 220 (46%). Patients with microscopically diagnosed *P Falciparum* malaria were considered for entry if they had parasitologic evidence for uncomplicated malaria[6]. Patients who fulfilled the inclusion criteria were randomly selected during their presentation and sequentially entered into groups.

Ethical committee approval of Nnamdi Azikiwe University Teaching Hospital was obtained for the study with human subjects. Also, written and oral consent was obtained from patients or their relatives.

Inclusion Criteria

Nigerians alone: Only those who have been in Nigeria for more than 6 months were included.

Sex:	Males and Females
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Genotypes:	HBAA, HBAS, HBSS
Malarial patients:	Uncomplicated malaria
High fever temperature:	38°-40° Headache

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Clinical Procedures

A full clinical examination was undertaken by a general practitioner on the day of presentation. Body temperature, body weight, pulse rate, respiration rate and blood pressure were measured. The patients were evaluated for the evalution of the signs and symptoms and any new events elicited during treatment daily for 7 days were recorded. Patients who were outpatients were monitored for compliance by

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visiting them at homes.

Laboratory Procedures

Blood samples were collected from each patient for malaria parasite detection. The left thumb of each patient was pierced with sterile lancet after cleaning the area with cotton wool soaked in methylated spirit. The cleaned part was allowed to stay for few seconds for spirit to dry so that the red blood cells would not be distorted by toxic methylated spirit. The subsequent drop in each patient was collected on a grease free clean slide and smears were made. The species differentiation was obtained from thin smears. A parasite count was obtained using thick blood films counted as the number of parasites per cell that is percentage parasitaemia, parasite clearances was determined using thick blood film on the day of presentation, then followed up, 12 hourly to day 4 and for 7 days. The thick films were considered negative if no parasites were seen in 100 oil immersion fields on thick smears. Giemsa staining method was used. The patients were also screened any of genotypes AA, AS, and SS as they came for several days and then grouped. 350 (73%) patients were in genotype group AA, 102 (21%) patients were in genotype AS and 28 (5.8%) patients were in genotype group SS. They had uncomplicated P. falciparum malaria.

Protocol

350 patients - males (180) and females (170) of HB AA group were randomly divided into four groups as:

1.	Group A	84 patients
2.	Group B	86 patients
3.	Group C	90 patients
4.	Group D	90 patients

Again, 102 patients (50) males and (52) females of HB AS group were randomly divided into four groups as:

1.	Group A	25 patients
2.	Group B	25 patients
3.	Group C	26 patients
4.	Group D	26 patients

Lastly, 28 patients (13) males and (15) females and HBSS group were randomly divided into four groups as:

1.	Group A	6 patients
2.	Group B	7 patients
3.	Group C	7 patients
4.	Group D	8 patients

Drug Administration

Patients of HBAA group that were randomly divided into four groups received the following therapeutic regimes:

1. Group A, 84 patients - each was given 3 tablets of sulfadoxine/pyrimethamine 500mg/25mg orally with a full glass of water on the first day (Hans-Elembeke, Germany source of the drug).
2. Group B, 86 patients - each was given orally with water 600mg tablets of quinine dihydrochloride or 8 mg/kg body weight daily for 6 days (Roch Nig. Ltd, source of the drug).
3. Group C, 90 patients - each was given orally with water 160mg tablets of halofantrine on the first day (start) and 50mg every 6 hourly for 3 days (Han-Elembeke, Germany, source of the drug).
4. Group D, 90 patients - each was given orally with water 100mg tablets of artesunate on the first day (start) and 50mg twice daily for 5days (Kumming, China, source of the drug).

All drugs were obtained from reputable retail pharmaceutical outfits in Nigeria.

The same regimens were applied to the genotypes HB AS groups and HB SS groups. All drugs were administrated by a trained nurse with clean water.

Blood samples were collected from each patient in each group on the day of

presentation and then every 12 hours on follow-up to day 4 and daily for 7 days for determination of parasitaemia reduction levels using Giemsa staining method as mentioned above.

Evaluation Criteria for Treatment Efficacy
Efficacy Assessment
The following laboratory and clinical end points were used to measure response to treatment objectively: fever clearance (the initial body temperature before the commencement of therapy until *body* temperature decreased to 37^{oc} and remained so at least 2 days), percentage cure rate (the percentage of patients who had recovery with complete initial disappearance of parasitaemia within 7 days), laboratory *measures* include parasite clearance (the initial parasite load before the initiation of therapy until the first negative blood film that remained negative for 2 days), and percentage failure rate (the percentage of patients who had initial treatment with antimalaria but their parasitaemia remained after 7 days period).

STATISTICAL ANALYSIS OF DATA
The comparison of data within the groups was carried out by using chi-square test and one-way analysis of variance for the comparison between the groups.

Result
The efficacy and tolerability of antimalarial drugs, quinine dihydrochloride, sulfadoxine/pyrimethamine, halofantrine and artesunate were investigated and compared in 480 malaria patients of different genotypes (AA, AS, and SS). The fever clearance/temperature reduction was recorded among the antimalarials used and the percentage clearances of parasitaemia after treatment are also shown on the tables 1-3.

Artesunate has the greatest efficacy of 98.9% and the lowest failure rate of 1.1% and followed by halofantrine with 97.8% and the 2.2% failure rate. Sulfadoxine/phrimethamine has efficacies of 95.2% with 4.8% failure rate and quinine dihydrochloride has 93.0% and failure rate of 7.0% in AA patients. Their efficacy in patients with HB-genotype AA are not significantly different (P>0.05). in patients with HB-genotype AS; artesunate has the highest efficacy of 93,3^% with failure rate of 6.7% followed by halofantrine with efficacy of 92.0% and failure rate of 8,09; sulfadoxine/pyrimethamine showed cure rate of 84.0% with failure rate of 16.0% and quinine dihydrochloride has cure rate of 87.7% and failure rate of 12.3%. The cure rates of these drugs are not significantly different when applied to patients with HB-genotype AS (P>0.05). In patients with HB-genotype SS, artesunate, sulfadoxine/pyrimethamine and quinine dihydrochloride have equal cure rate of 100% while halofantrine has cure rate of 85.7% with 14.3% failure rate. These drugs are not

Table 1: Age, *weight*, percentage parasitaemis, drugs and percentage cure and failure rates in patients with genotype AA (350)

Drugs	Sulfadoxine /Pyrimethamine	Quinine	Halofantrine	Artesunate
No. of patients	84	86	90	90
No. of males	46 (54.8%)	46 (53.5%)	52(57.8%)	46(51.1%)
No. of females	38 (45.5%)	40 (46.5%)	38(42.2%)	44(48.9%)
Ave. age	- -	20 ± 3.2 yrs	18 ±4.8 yrs	21 ±4.6 yrs
Ave. weight	44 ±1.8 kg	46 ±1.2 kg	39 ± 1.4kg	43 ± 1.5 kg
Initial temp. (fever	40.2^{oc}	39.8^{oc}	40.0^{oc}	40. 0^{oc}
Pre-treatment Parasitaemia	27.8 ± 7%	2.7.5 ± 6%	27 ± 8%	27.7 ± 6%
Reduction in fever	37. 1^{oc}	37.6^{oc}	36.8^{oc}	36.7^{oc}
No. of cure rate	80 (95.2%)	80 (93%)	88 (97.8%)	89 (98.9%)
No. of failure rate	44 (4.8%)	6 (7%)	2 (2.2%)	1. (1.1%)
Parasitaemia on day 7 (failure rate)	14.8%	21.5%	7.2%	4.0%

- (+ SEM)

Table 1 shows the efficacy of different antimalarials used in 350 malaria patients of genotype AA. Artesunate has the greatest efficacy of 98.9% followed by halofantrine with 97.2% and sulfadoxine/pyrimethamine with 95.2% and quinine dihydrochloride with 93.0% as the least drug. The cure rates of these drugs are not significantly different when applied to patients with HB-genotype AA ($P>0.05$).

Table 2: Efficacy of different antimalarials used in 102 malaria patients with HB-genotype AS

Drugs	Sulfadoxine /Pyrimethamine	Quinine	Halofantrine	Artesunate
No. of patients	25	26	25	26
No. of males	15(61.5%)	16(61.5%)	13(52%)	12(46%)
No. of females	10(38.5%)	12(52%)	14(53.9%)	14 (53.9%)
Ave. age	19.2 ± 1.2 yrs	19.4 ±3 yrs	19.8 ±6 yrs	20.2 + 4yrs
Ave. weight	10 ±1.2 kg	12 ± 3 kg	12 ± 3 kg	12 ± 5yrs
Initial temp. (fever	40.2^{oc}	39.8^{oc}	40.0^{oc}	40.0^{oc}
Pre-treatment (Parasitaemia)	22 ± 6%	22 ± 5%	21 ± 6%	22 ± 7%
Temp. reduction (fever)	37.2^{oc}	36.8^{oc}	36.4^{oc}	36.2^{oc}
No. of cure rate	21 (84%)	23 (87.7%)	23 (93%)	24 (93.3%)
No. of failure rate	4(16%)	3(12.3%)	2 (8%)	2 (6.7%)
Parasitaemia on day 7 (failure rate group)	11.4%	8%	5%	3.6%

- (± SEM)

Table 2 shows the efficacy of different antimalarials used in 102 malaria patients with HB-genotype AS. Artesunate has the highest efficacy of 93.3% followed by halofantrine 92% and quinine dihydrochloride 87.7% and quinine dihydrochloride with 84.0%. The cure rate or efficacy of these drugs is not significantly different from each other which applied to patients with HB- genotype AS ($p>0.05$).

Table 3: Efficacy of sulfadoxine/pyrimethamine, quinine and artesunate used in 28 malaria patients of HB-genotypes SS (sickle-cell disease)

Drugs	Sulfadoxine /pyrimethamine	Quinine	Halofantrine	Artesunate
No. of patients	6	7	7	8
No. of males	4 (66.7%)	4(57.1%)	3 (42.9%)	3 (37.5%)
No. of females	2 (33.3%)	3 (42.9%)	4(57.1%)	5 (62.5%)
Ave. age	-	19.3 ± 1.2yrs	19.6 ± 5yrs	19.4 ±4.2yrs
Ave. weight	34. 1 ± 2 kg	25 ± 5.5 kg	28 ± 2.2 kg	32 ± 4 kg
Initial temp. (fever	39.8^{oc}	40.1^{oc}	39.7^{oc}	40.0^{oc}
Pre-treatment (Parasitaemia)	20.8 ± 6%	20.2 ± 5%	20.3 ± 6%	20.8 ± 5%
Reduction Temp, in (fever	37.1^{oc}	36.8^{oc}	36.5^{oc}	36.8^{oc}
No. of cure rate	6(100%)	7 (100%)	6(85.7%)	8 (100%)
No. of failure rate	Nil (0%)	Nil (0%)	1 (85.7%)	Nil (0%)
Parasitaemia on day 7 (failure rate group)	Nil	Nil	18.2%	Nil

- (+ SEM)

Table 3 shows the efficacy of sulfadoxine/pyrimethamine, quinine and artesunate used in 28 malarial patients of HB-genotype SS (sickle cell disease). Artesunate, sulfadoxine/pyrimethamine and quinine have equal cure rates of 100% while halofantrine has 85.7%.

Discussion

The efficacy and tolerability of four antimalarials, quinine-dihydrochloride, sulfadoxine/pyrimethamine, halofantrine and artesunate were studied in malarial patients of different HB-genotypes AA, AS and SS. Artesunate has the highest efficacy and lowest failure rate and well tolerated as mild adverse effects were only reported. Halofantrine ranked second in efficacy and failure rate and sulfadoxine/pyrimethamine ranked third in efficacy and failure rate while quinine dihydroride ranked last in both efficacy and failure rate. In these drugs studied, their efficacies are not significantly different in AA HB-genotype patients treated ($P > 0.05$). This is due to the fact that the first two drugs especially artesunate; resistance has not been eleveloped because it has not been used extensively, unlike quinine dihydrochoride and sulfadoxine/pyrimethamine[7]. Resistance has not been reported in artesunate and mino resistance halofantrine. Artesunate is the drug of choice in the treatment of uncomplicated *Falciparum* malaria which compares favourably among other antimalarials studies. Mild to moderate side effects were recorded with these drugs which include nausea, vomiting weakness and generalized body pain which stopped once the treatment terminated. Artesunate ranked best in terms of efficacy and tolerability among the other antimalarials studied and, therefore, should be recommended, for the treatment of uncomplicated malaria in both AS and SS HB-genotypes. Although sickle-cell trait patients do not habour much malaria parasites as the parasitized sickled-cell is removed preferentially from circulation and, therefore, parasites could not complete their life cycle[5] and[8] had shown that the advanced stages of development of *P. falciparum* were not seen in the peripheral blood. [9]reported that under low oxygen tension, the cells would be giving up oxygen to both the tissue and the parasites, thus the erythrocytes of sickle-cell carriers with *falciparum* malaria would have a tendency to sickle in all the organs of the body except the lungs and be more easily phagocytized with the consequent interruption of the life cycle. These confer relative advantage to those patients with sickle-cell disease and might be the reason why artesunate, sulfadoxine/pyrimethamine and quinine dihydrochloride recorded 100% free parasitaemia in patients with HB-genotype SS.

CONCLUSION

We have been able to establish that these antimalarial drugs exhibited good efficacy and tolerability in the treatment of *P. falciparum* malaria especially in patients with HB-genotype SS group with uncomplicated *falciparum* attack.

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PERIPHERAL SENSORY PERCEPTION OF DIABETIC USING SEMMES WESTEIN 5.07 MONOFILAMENT

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ABSTRACT

Gradual loss of sensation in the foot is a major consequence of diabetes mellitus. It is a precursor to foot ulcers, which may necessitate amputation eventually. Early detection of peripheral sensory loss in the foot would help to prevent further complications. In developed countries the ability to perceive 5.07 monofilament is accepted as normal, but in Nigeria the assessment of peripheral sensory perception with 5.07 monofilament method is not common. The aim of this study was to compare peripheral sensory perception (PSP) in patients with diabetes and apparently healthy controls without diabetes. Subjects were 100, and were diagnosed as having diabetes mellitus and 100 apparently healthy controls. The subjects were recruited using purposive non-probability sampling technique. The design was ex-post facto research design. The sensation was tested on eleven pressure points on the sole and dorsum of the right foot using 5.07 semmes weinstein monofilament in all the subjects. Data were analyzed using independent student t-test to compare the scores between Group I and II subjects. The effect of gender on peripheral sensory perception in each group was analyzed using the independent student t-test. One way analysis of variance was used to determine if peripheral sensory perception scores of subjects in each group differed significantly across the age groups. Level of significant was set at 0.05. Results showed that 71% of subjects with diabetes had intact sensation and 29% had impaired sensation. While 96% control subjects had intact sensation and 4% had impaired sensation. Subjects with diabetes had significantly lower peripheral sensory perception than the control subjects ($p<0.05$). Age and gender have no influence on subjects peripheral sensory perception ($p>0.05$). It was concluded that peripheral sensory perception was significantly lower in subjects with diabetes than in apparently healthy control subjects. The gender or age of the subject had no significant effect on peripheral sensory perception. The use of semmes-westein 5.07 monofilament is recommended for preliminary diagnosis of peripheral neuropathy in subjects with diabetes. Also, more studies involving subjects with peripheral neuropathy and studies of other monofilament sizes as well as data on associated risk factors such as duration of diabetes, smoking habits, and height of diabetics are advocated.

Keywords: *Diabetics, Non-diabetics, Semmes-Westein 5.07 monofilament, Sensation*

INTRODUCTION

Patients with diabetes mellitus are found having hyperglaecemia[1], which causes microvascular and neurological complications seen in diabetes mellitus [2, 3]. The neurological complications, often referred to as neuropathy, are characterized by a progressive loss of nerve fibers. Pathologically, numerous changes have been demonstrated in both myelinated and unmyelinated fibers, although, Schwann cells involvement may be the primary pathological change[3].

Neuropathy affects sensory, motor, and autonomic fibers bilaterally [4]. Involvement of sensory fibers leads to early reduction in sensation [5] with resultant numbness (insensitive foot), which renders sufferers unable to appreciate injury [6]. Therefore, it is a prime ingredient necessary for the formation of the diabetic foot ulceration, which is present in over 80% of diabetic patients with pedal wound [4]. In fact, of approximately 125, 000 lower extremity amputations carried annually in Australia, 56-83% of the causative factors were directly attributed to complication attributed to diabetes mellitus [4]. Risk factors

such as smoking, age, gender (male), height, and duration of the disease are associated with the likelihood of neuropathy in diabetes [7].

Early detection of peripheral neuropathy in diabetes is important considering its role as the main risk factor for lower limb lesions [8]. As a result of this, tests for screening patients with diabetes for loss of sensation such as Sensorimotor Conduction Test (SCT), Sensory Nerve Action Potential (SNAP) and Quantitative Sensory Test (QST) have been developed [9]. Qualitative sensory test, also in use, involved testing for pressure, vibration, and temperature. However, another quantitative test, which is simple and inexpensive, is used in developed countries. This involves the use of the semmes-weistein monofilament nylon described by Armstrong [4]. In these countries, manufacturers-assigned number of the monofilament accepted for this test is 5.07 as against other assigned values (4.17 and 6.10) also in use [7].

In Nigeria, the assessment of peripheral sensory perception in diabetic patients using 5.07 monofilament is not common and where it is used, there is not yet a scientific evidence for its appropriateness. This study, therefore, examined the Peripheral Sensory Perception (PSP) of diabetics in South-Eastern Nigeria with respect to the use of semmes-weistein 5.07 monofilament.

METHODS

The study was an ex-post facto design involving one hundred diabetic subjects recruited purposively from Nnamdi Azikiwe University Teaching Hospital, Nnewi, Anambra State, Nigeria (50 males and 50 females) and 100 apparently healthy non diabetic control subjects (50 males and 50 females) that were also recruited from staff members of the same hospital. All the participants gave their informed consent to participate prior to commencement of the study. Ethical approval was obtained from the University of Ibadan/University College Hospital Institutional Review Committee. Before commencing the study, permission was obtained from the hospital management and consultant in charge of diabetic clinic of the medical outpatient department of the hospital from where the diabetics were recruited.

The diabetics and non-diabetics had no healed or ongoing ulcer, at the right foot presented during the test and had sound cognitive status which was confirmed by a mini mental state examination score ranging from 25-30 [10]. Both the diabetics and non-diabetic participants were neither on prolonged steroid therapy nor suffering from any of the following conditions. Vitamin B1, B6, and B12 deficiency, leprosy, alcoholism, malignancy causing neuropathy, nerve injury, Guillain-Barre syndrome, and thick callus on the skin of the right foot. At the point of participants recruitment for this study, information was collected concerning their smoking habits, alcohol consumption, drug usage, occupation, and physical complaints suggestive of any of the above conditions[11] the sex and age at the last birthday of the participants were also recorded. The recorded age was used to categorize participants into three age groups: <40 years, 40-49 years, and ≥50 years.

Before carrying out the peripheral sensory perception test on the participants, the procedure involved and expectations were explained in details to the participants. The participants were instructed to lie supine on a plinth while the test was carried out on them with the eyes open and then asked to close the eyes to eliminate visual input. Both the dorsum and the plantar surface of only the right foot were tested. The research instrument was semmes-weistein 5.07 monofilament and the psychometric properties of the instrument have been determined in previous study by Burke [12] and were applied perpendicularly to the skin, on eleven sites (Fig one), with enough force to cause the monofilament to buckle for approximately 1 second [7]. The sites of application were the sites of pressure where ulcers often develop in patients with diabetes [7, 13].

The participants were required to indicate feeling or no feeling of sensations, the responses, which were recorded as 'felt' or 'unfelt' respectively. Ten trials were carried out on each site randomly, and the participants needed to indicate "feeling" 80% of the trial before scoring the maximum score (2), 60-70% to score one (1), while indicating "feeling" less than 60% of the trial attracted zero (0). Therefore, the maximum obtainable score for the eleven points of application is twenty-two (22). After the test, participants were informed of the outcome, and advised accordingly with regard to foot care.

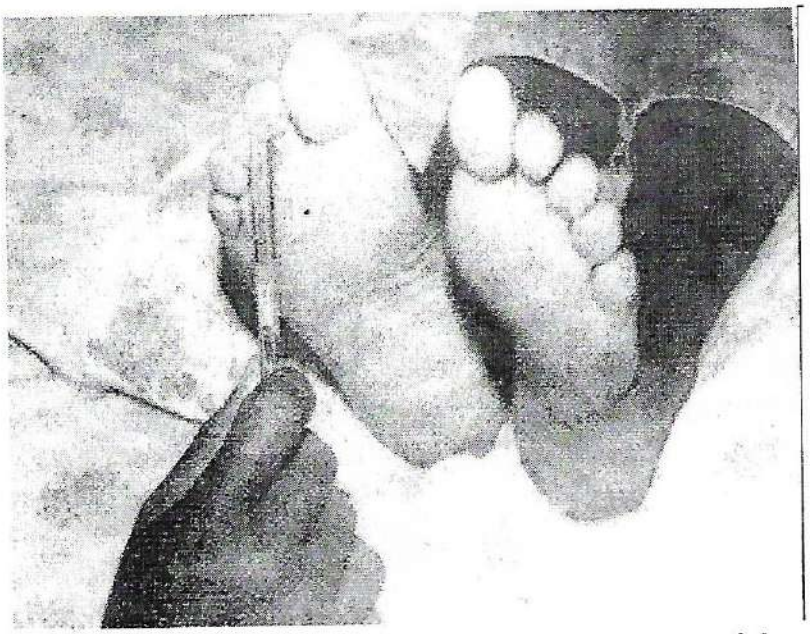

Fig. 1: Application of monofilament testing on a participant

RESULTS

The mean age of the diabetics was 46.12 ± 7.48 years while that of the non-diabetics was 43.75 ± 8.24 years (Table 1). Forty-nine percent of the diabetic participants were ≥50 years while only 16% were <40 years. Among the non-diabetics, the participants were fairly evenly distributed to the age categories except for those ≥50 years constituting only 28% (Table 2).

Table 1: Age (years) distribution of participants

	Diabetics	Non-diabetics
	X±S.D	X±S.D
Age (years): Overall	48.12±7.48	43.75±8.24
Male	48.58±7.39	45.80±8.14
Female	47.66±7.62	41.70±7.90

Table 2: Frequency distribution of participants in different age groups

	Diabetics (100)		Non-diabetics (100)	
Age Group (years)	Male	Female	Male	Female
<40	8	8	14	21
40-49	17	18	18	19
≥50	25	24	18	10
Total	50	50	50	50

After the peripheral sensory perception test, 71% of the diabetics had intact sensation as opposed to 96% among non-diabetics while 3% as against 0% participants had impaired sensation respectively (Table 3).

Table 3: Frequency distribution of subjects by Peripheral Sensory Perception Levels (PSPL)

PSPL	Diabetics (100)	Non-diabetics (100)
Equivocal (60-70%)	26	4
Impaired (<60%)	3	0

There was a significant difference in PSPs of the diabetics and non-diabetics (P=0.00) (Table 4). The PSPs of male and female for the diabetics (P=0.33) and non-diabetics (P=0.31), however, showed no significant difference (Table 5). In the like manner, the PSPs of the participants across the age groups (<40; 40-49; and ≥ 50 years) showed no significant difference for the diabetic (P=0.16) and non-diabetics (P=0.30) Table 6).

Table 4: Comparison of peripheral sensory perception of diabetic and non-diabetic participants

Diabetics (100)	Non-diabetics (100)	t-value	P-value
X±S.D	X±S.D		
18.35+2.16	19.61+1.27	- 5.03	0.00*

* = Significant.

Table 5: Peripheral Sensory Perceptions (PSPs) between male and female diabetics and non-diabetics

Gender	Diabetics (100)	Non-diabetics (100)
	X±S.D	X±S.D
Male (50)	18.56+1.80	19.48+1.13
Female (50)	18.14+2.47	19.74+1.40
t-value	0.97	-1.02
P-value	0.33	0.31

Table 6: Peripheral Sensory Perception (PSPs) of the diabetics and non-diabetics across different age groups

Age Groups (years)	Diabetics (100)	Non-diabetics (100)
	X±S.D	X±S.D
<40	19.06 +2.08	19.37+1.44
40-49	18.57+1.85	19.84+1.07
t-value	1.90	1.22
P-value	0.16	0.30

Discussion

The diabetics in the study were older than the non-diabetics in contrast to the study by Mayne [14] . This disparity may, hence, have influence on the result of this study relative to age-matched studies. Furthermore, as expected, fewer diabetics had intact sensation than the non-diabetics while more diabetics had equivocal and impaired sensation than the diabetics. Although, the difference in peripheral sensory perception between the diabetic and non-diabetics is not very large and this may mean that the majority of the diabetics did not have long-standing cases. Anyway, the semmes-westein 5.07 monofilament had proven a diagnostics device differentiating diabetics (commonly affected by neuropathy) from non-diabetics (rarely affected by neuropathy). On this note, it will make possible identification of patients with high risk of skin breakdown, hence their timely education of the care of their feet, in terms of foot wears, and avoidance of injury as well as self-examination. This will go a long way in reducing the prevalence of ulcer, hence the reduction of need for amputation. Furthermore, patients and relatives will be saved from the emotional stress of coping with discomfort, disability and financial burden that often result from amputation.

There was a significant difference in the peripheral sensory perception among the diabetics and non-diabetics. This conforms to the finding in the studies of Chia [15] and Mueller [6]. The differences in peripheral sensory perception between male and female diabetics and non-diabetics were, however,

not significant. Also, the distribution of peripheral sensory perception between male and female follows no particular trend in diabetes and non-diabetics, which indicates no influence of gender on neuropathy. Anyway, male tends to have higher perception than female. This finding is consistent with that by Raelene (1989) [16], who stated that prevalence of neuropathy in all the participants more than 18 years showed no difference by sex. Also, Ives-Smith [7] linked his study with neuropathy and being male; and this explains the trend of sensory perception for the diabetics, albeit, not significant.

Across different age groups, the diabetics and non-diabetics showed no significant difference. Also, the distribution of the peripheral sensory perception across the different age groups nor particular trend for the non-diabetics, which indicates no influence of age on neuropathy. However, for the diabetics, peripheral sensory perception decreases with advancing age. This finding conforms to the studies [17, 18] who stated that the incidence and severity of impaired sensory perception correlate with duration of diabetes and age.

CONCLUSION

In view of the forgoing, it is obvious that peripheral sensory perception was significantly influenced by diabetic morbidity and that gender or age had no significant influence on peripheral sensory perception in diabetic and non-diabetics neuropathy.

The use of semmes-westein 5.07 monofilament is hereby, recommended for reliable, simple, and inexpensive screening for preliminary diagnosis of peripheral neuropathy in subjects with diabetes. Also, more studies involving diabetic subjects with peripheral neuropathy and use of other monofilament sizes as well as data on duration of diabetes, smoking habits, and height of diabetics, as risk factors indicated by IVES-Smith [7] are advocated.

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