# AFRICAN JOURNAL OF MEDICINE
## and Medical Sciences



## Aims

The aims of *The African Journal of Medicine and Medical Sciences* are: (1) to provide a medium for wide dissemination of information resulting from biomedical research in Africa and elsewhere; (2) to furnish a means whereby appropriate international medical and health organisations may transmit information to medical scientists throughout Africa; (3) to serve as a medium for publication of proceedings of international conferences on medical sciences in Africa; (4) to serve as a medium for the exchange of information and opinion among medical scientists in medical institutions of Africa and elsewhere; (5) to promote inter-regional cooperation amongst medical scientists in Africa.

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## Raising the bar in research designs and translational value of studies

Research is systemic investigation to proffer solution(s) to problems as well as contributing to generalizable knowledge. There are two buzz words in contemporary research: translation and implementation. Translation involves utilization of research findings to impact on lives of individuals in communities. Implementation, which is defined as putting a plan or system into operation, is not much different. It is important that our research studies are geared to solving health problems in societies and the findings directly relevant in bringing about desired changes, if implemented.

According to the Quality Standards Sub-committee of the American Academy of Neurology, the extent to which our research findings can have impact depends on the study design and the number of individuals studied. By far, the best scientific evidence is derived from well-designed, randomized, controlled clinical trials including meta-analysis and systematic reviews. Better still, if such studies are double-blinded. These form the basis of standards of treatment. The second level is data from well-designed observational studies with concurrent controls either cohort or case-control studies. These can be useful for deriving guidelines. At the third level is evidence from expert opinions, case series, case reports and studies with historical controls. In this category are questionnaire surveys.

Questionnaire studies can provide useful information on knowledge, attitude, practice and perception. They come in handy for needs assessment. They are fast and easy to conduct and are not very expensive. The source, representativeness of the population studied, honesty in completion and depth of information sourcing are very important in influencing medical opinion. The admonition by Sir Josiah Stamp some nine decades ago about data source is very germane. In this issue of the journal, more than 50% of the manuscripts were derived from questionnaire surveys. This was not done by random sampling but through collation of papers as they completed the review process. It is important that these are not stand-alone studies but should lead to the generation of hypotheses to answer the "why" and "how" questions about those studies. The next phase can also include qualitative studies through in-depth interviews to understand the reasons for the various choices or responses. Doing these will raise the bar in the quality of research studies and the necessary extrapolation of the findings for societal benefit. Our research designs need to move to a higher level for translational purposes.

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# "*Telfairia occidentalis* leaf extract mitigated Monosodium glutamate-induced behavioural and histological alterations in rat hippocampus"

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**Abstract**

*Background:* Monosodium glutamate (MSG) toxicity in rodents reportedly causes damage to the brain via oxidative stress. *Telfairia occidentalis* ethanolic extract (TOE) may mitigate this damage by virtue of its known antioxidant property. This study investigated the possible protective role of TOE against MSG-induced alterations in rat brain microanatomy.

*Materials and methods:* Forty two adult male rats (130-150 g) were randomized into six groups as follows: Group 1: Control, food and water; Group 2: TOE (400 mg/kg body wt.); Group 3: VIT E (500 mg/kg body wt.); Group 4: MSG (4 g/kg body wt.); Group 5: MSG (4 g/kg) + VIT E (500 mg/kg) and Group 6: MSG (4 g/kg) + TOE (400 mg/kg). MSG was given to induce neurotoxicity in rats one hour before treatment with TOE or VIT E. All treatments were given by gastric gavage for 14 days. Behavioural tests were conducted on day 15 and the rats were subsequently euthanized with i.p. Ketamine hydrochloride. The harvested brain tissues were fixed in neutral buffered formalin and hippocampal biopsies processed for light microscopy using haematoxylin and eosin stain. Granule and pyramidal neurons of hippocampus were assessed quantitatively.

*Results:* Monosodium glutamate significantly reduced the frequency of some behavioural tests while increasing others relative to control group. MSG induced degeneration of some granule and pyramidal neurons of the hippocampus and also significantly ($p<0.05$) reduced the neuronal count of both neuron types. Both MSG + VIT E and MSG + TOE co-treatments reversed the histologic alteration and significantly elevated neuronal density when compared with MSG group.

*Conclusion:* The ethanolic extract of *Telfairia occidentalis* demonstrated protective effects against MSG-induced histological alterations in rat hippocampus.

**Keywords:** *Monosodium glutamate, Telfairia occidentalis, dentate granule cells, CA3 pyramidal neurons, neurodegeneration.*

**Résumé**

*Contexte* : La toxicité du glutamate de mono-sodium (GMS) chez les rongeurs cause de manière constatée des dommages au cerveau par le biais du stress oxydatif. L'extrait éthanoïque de *Telfairia occidentalis* (ETO) peut atténuer ces dommages en raison de sa propriété antioxydant connue. Cette étude a examiné le rôle protecteur éventuel d'ETO contre les altérations induites par le GMS dans la micro-anatomie du cerveau du rat.

*Matériels et méthodes :* Quarante-deux rats mâles adultes ( 130-150 g) ont été randomisés en six groupes comme suit: Groupe 1: contrôle, nourriture et eau; Groupe 2 : ETO (400 mg / kg de poids corporel); Groupe 3: VIT E (500 mg / kg poids corporel); Groupe 4: GMS (4 g / kg de poids corporel); Groupe 5: GMS (4 g / kg) + VIT E (500 mg / kg) et groupe 6: GMS (4 g / kg) + TOE (400 mg / kg). On a administré le GMS pour induire une neuro-toxicité chez les rats une heure avant le traitement par ETO ou VIT E. Tous les traitements ont été administrés par gavage gastrique pendant 14 jours. Des tests comportementaux ont été effectués au jour 15 et les rats ont ensuite été euthanasiés avec le chlorhydrate de kétamine i.p. Les tissus cérébraux recueillis ont été fixés dans du formol à tampon neutre et des biopsies de l'hippocampe ont été traitées pour la microscopie optique en utilisant de la coloration à l' hématoxyline et à l'éosine. Les neurones granulaires et pyramidaux de l'hippocampe ont été évalués quantitativement.

*Résultats:* Le glutamate mono-sodique a réduit de manière significative la fréquence de certains tests comportementaux tout en en augmentant d'autres par rapport au groupe témoin. Le GMS a induit la dégénérescence de certains neurones granulaires et pyramidaux de l'hippocampe, ainsi qu'a significativement ($p <0,05$) réduit le nombre de neurones des deux types de neurones. Les deux co-traitements GMS + VIT E et GMS + ETO ont inversé

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l'altération histologique et ont significativement élevé la densité neuronale par rapport au groupe GMS.
*Conclusion:* L'extrait éthanoïque de *Telfairia occidentalis* a démontré des effets protecteurs contre les altérations histologiques induites par le GMS dans l'hippocampe de rat.

**Motsclés:** *Glutamate de mono sodium, Telfairia occidentalis, cellules granulaires dentées, neurones pyramidaux CA3, neuro-dégénérescence*

## Introduction

Monosodium glutamate (MSG) is the sodium salt of glutamic acid, one of the most abundant naturally occurring non-essential amino acids [1]. Monosodium glutamate is present in fruits and vegetables such as tomatoes and potatoes but its safety as a food additive has generated controversies both locally and globally [2]. Glutamate is an excitatory neurotransmitter in the mammalian brain which plays important roles in both physiological and pathological processes [3]. It is released from the vesicles in presynaptic terminals by a calcium-dependent mechanism that involves voltage-dependent calcium channels and is also recognized as an excitotoxin [4-6]. Despite experimental reports of the toxicity of MSG, the Food and Drug Administration and Control (FDA) of the United States reported that MSG was safe [7], a position that might have encouraged its continued use by many restaurants and families. It has been reported to be neurotoxic [7] and the neurotoxicity has been attributed to the mechanism of oxidative stress among other factors [8, 9], however, the use of antioxidant complexes like vitamin C, vitamin E and Quercetin has reportedly ameliorated this [10, 11].

*Telfairia occidentalis* commonly called fluted pumpkin is a vegetable which belongs to the family Cucurbitaceae. In Nigeria, it is called "Ugu" (Igbos), "Aporoko" (Yoruba), "Ubong" (Efik), "Umee" (Urhobo), and "Umeke" among the Edo people [12]. Fluted pumpkin is majorly cultivated for its leaves and eaten as potherb, and the seeds eaten as "egusi soup". This vegetable is known to contain protein, carbohydrate, fat, calcium, iron, magnesium, potassium and vitamins such as A, B2, B5, B12 and thiamine thus possessing health-maintaining potentials [13, 14]. Phytochemically, it contains oxalates, saponins, glycosides, alkaloids, resins and flavonoids, the latter being responsible for its antioxidant and free radical scavenging properties [15-17]. Its use in the treatment of anaemia in pregnant women is premised on the high iron content of its leaves [18].

Alpha-tocopherol (vitamin E) is a natural occurring vitamin found in a variety of fruits and beneficial to overall body functions as well as possessing antioxidants property thus helping the body to combat degenerative conditions. It is an intracellular compound associated with lipid-rich biological membranes; it is lipophilic making it a major free radical chain terminator [19].

The mammalian hippocampus is located in the temporal lobe of the cerebrum and consists of the Ammon's horn or cornu ammonis regarded as the hippocampus proprius and the dentate gyrus [20]. It is important in memory formation and consolidation [21]. Memory may be in form of either declarative (semantic, episodic or spatial) or non-declarative [22]. Memory formation depends on the intact hippocampal formation consisting of entorhinal cortex, dentate gyrus, hippocampus proprius and the subiculum which is a transitional zone between the entorhinal and hippocampal cortices [21]. Before the hippocampus is involved in memory formation, sensory information must pass through a hierarchically organized neocortical network involving primary sensory cortices activation, supplemental sensory areas and high-order association cortices. Following these events, information is then fed to the entorhinal cortex which is associated with the trisynaptic circuit, a pathway that relays information from the perforant path to the dentate gyrus, dentate to cornu ammonis3 (CA3), and CA3 to cornu ammonis1 (CA1) [23-25]. Damage to any part of this pathway would affect the functions of the hippocampus due to structural alterations which monosodium glutamate might elicit since it has been associated with neuronal injury and death [6].

The objective of this study was to investigate the effect of possible protective property of *Telfairia occidentalis* leaf extract and alpha-tocopherol on the hippocampal neurons of male Wister rats that have been exposed to monosodium glutamate.

## Materials and methods

*Plant materials and extraction process*

*Telfairia occidentalis* leaves were procured from a commodity market in Iwo, Nigeria. Botanical identification and authentication of the leaves were done at the herbarium of Department of Biological Sciences, Bowen University, Iwo, Nigeria where a voucher number: BUH08 was given and a specimen was deposited. The leaves were dried at room air, then processed into the powdery form. About 102.0g of the powder was used to obtain 11.7 g of the *Telfairia occidentalis* ethanolic extract (TOE) thus giving an 11.5 % yield.

*Experimental Animals*

Forty-two (42) adult male Wistar rats weighing between 130 g-150 g were acquired from the breeding colony and kept in the Animal House of the College of Health Sciences Medicine, Bowen University, Iwo, Nigeria. They were housed in netted wooden cages having dimensions 43 cm × 40 cm × 29 cm and soft wood shavings employed as bedding at room temperature in a 12 hour light/dark cycle. They were allowed to acclimatize for 4 weeks before randomization into different groups. They were fed with rat pellet diet and water *ad libitum.* Animal experiments were performed in accordance with the principle of humane care and use of laboratory animals [26].

*Preparation and administration of monosodium glutamate*

The Ajinomoto brand of monosodium glutamate (MSG) was used for the study. The crystals were dissolved in water and administered orally via cannula at a daily dose of 0.8 g/ml.

*Administration of vitamin E (VIT E)*

Vitamin E 100 mg capsules manufactured by Futurebiotic LLC, Hauppauge, New York, USA was used for the study. The content was aspirated with syringe and needle and a concentration of 500 mg / ml was administered to each animal orally.

*Research design and animal grouping*

The rats were randomized into 6 groups as shown below:

Group 1 (N=6): control group given food and water only; Group 2 (N=6): TOE (400 mg/kg); Group 3 (N=6): VIT E (500 mg/kg); Group 4 (N=8): MSG (4 g/kg); Group 5 (N=8): MSG (4 g/kg) + VIT E (500 mg/kg); Group 6 (N=8): MSG (4 g/kg) + TOE (400 mg/kg). All administrations were through oropharyngeal cannula and lasted 14 days as daily single doses. Dosages were based on published reports: TOE of 400 mg/kg [12]; VIT E of 500 mg/kg [27] and MSG of 4 g/kg [28]. More animals were randomized into the three MSG groups so as to take care of possible attrition secondary due to the effect of MSG administration.

*Behavioural tests*

On experimental day 15, the animals were subjected to behavioural tests namely: Open field test (to assess behaviour of rats), forelimb grip test (to assess forelimb muscle strength) and geotaxis test (to assess vestibular and cerebellar function) according to the methods described by Adebiyi *et al*. [29].

*Open field test*

A wide box approximately 120 cm by 120 cm with an open roof was used. The box had lines drawn horizontally and vertically forming square grids. Each animal was placed in the centre square quadrant and then left free to move around. The parameters checked for included frequency of grooming, rearing, line crosses and stretched attend posture with each animal allowed a period of 5 minutes. Thereafter, box was cleaned with 70% alcohol and dried before introduction of the next animal so as to reduce olfactory bias.

*Forelimb grip test:* The ends of a 1 metre long metal wire was placed on two stools with weights used to maintain the ends. The space between the stools on the floor had a soft cushioning surface should the animal lose its grip and fall down. The animal was gently placed on the metal wire so as to grasp it with the forelimbs supporting its body weight. It suspended itself in that position until it either fell down or used its hind limbs to support its weight. Duration of suspension for three trials was recorded and the mean taken with each rat allowed spending 2 minutes per trial.

*Geotaxis test:* A wooden slab was inclined at about 45° to the vertical surface and the animal placed on the slab at its upper end. Its downward movement was monitored to record the duration it moves down the slope before turning upward to climb up the slope. This maximum duration of attempt for each animal was 2 minutes. The mean of three trials was recorded.

*Tissue extraction, tissue processing, histology and morphometry*

Upon completion of the behavioural tests, the animals were euthanized same day by cervical dislocation and the harvested brains were processed for light microscopy using Haematoxylin and Eosin stain [30]. Images were acquired from the histological slides by means of a Sony Cybershot camera mounted on an Olympus microscope. The densities of the viable pyramidal neurons of the cornu ammonis3 (CA3) and granule neurons of the dentate gyrus of the hippocampus were measured using a microscope with a graticule mounted on a microscope according to published methods [31]. Briefly, the micrometer was calibrated with a stage micrometer slide with a customized 2 mm ruler engraved on it (Leitz, Wetzlar, Germany) using the eyepiece lens of an Olympus CH (Japan) binocular microscope at ×40 magnification. The radius of the eye piece at x40 was calibrated with the graticule to be 0.19 mm, and the area of the view at x40 magnifications was thus calculated to be 0.11 $mm^2$.

The densities of the viable neurons on the histological slides were determined by counting the number of viable neurons observed within a given square area in a section while excluding pyknotic eosinophilic neurons [32].

*Statistical analysis*

The numerical results were expressed as means ± standard error of mean. They were analyzed using one way analysis of variance (ANOVA) with Microsoft Office Excel 2011 and GraphPad Prism software (GraphPad software version 5.01, San Diego CA, 2010). Differences were considered statistically significant at $P < 0.05$.

## Results

*General observation*

Feeding habits in MSG-treated rats reduced along the course of the study. Rats in the control and TOE treated groups were the most active during the period of research study. A rat each was infected in both MSG + VIT E and MSG + TOE groups and were isolated from the groups. The animals given TOE only were observed to have more faecal drops in their cages than in other groups

*Relative brain weight changes*

The relative brain weight changes at the end of experiment were not statistically different across the groups as shown in Figure 1.

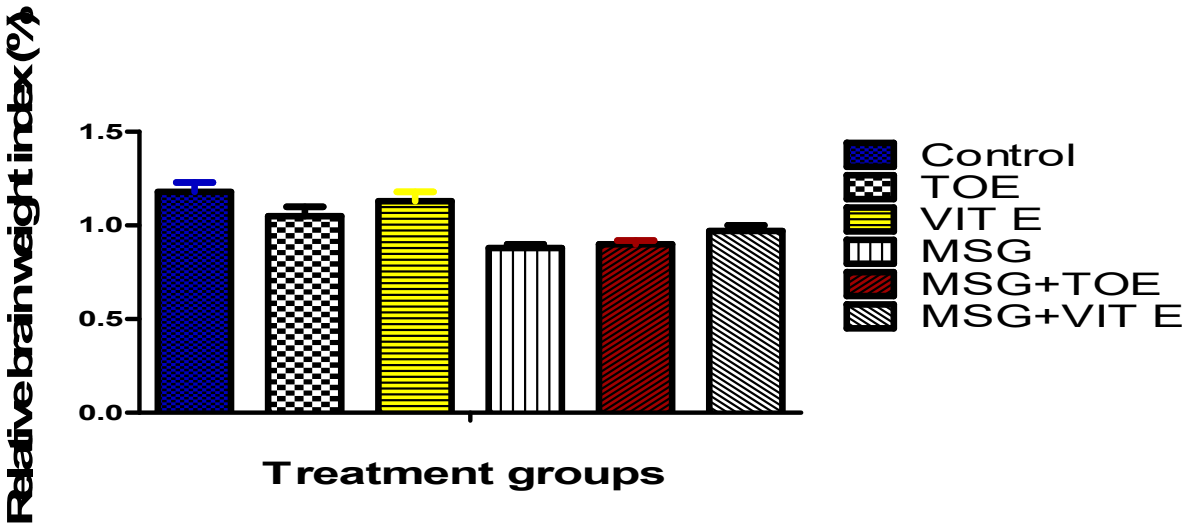


**Fig. 1:** Brain to body weight ratio of control and treated rats. Values were represented as mean ± S.E.M. of 5 rats. The alterations were not significantly different across the groups. MSG = Monosodium glutamate, TOE = *Telfairia occidentalis* ethanolic leaf extract, VIT E = Vitamin E.

**Table 1:** Effect of TOE and VIT E administration on the behavioural tests of male Wistar rats treated with MSG.

| Group | LC | RE | GR | SAP | NGT (s) | FLG (s) |
|---|---|---|---|---|---|---|
| Control | 48.80±13.9 | 12.20±2.31 | 18.20±4.42 | 7.20±1.23 | 2.33±0.32 | 33.74±5.52 |
| TOE | 35.00±2.70* | 6.17±0.81* | 39.83±19.81* | 5.33±1.22 | 3.61±0.41 | 14.72±2.01* |
| VIT E | 22.67±3.80* | 6.83±2.42* | 28.00±8.23* | 6.83±1.52 | 5.39±0.51 | 52.45±19.03* |
| MSG | 20.25±3.11* | 5.50±1.31* | 48.88±15.81* | 7.63±1.13 | 5.13±0.52* | 21.31±3.41* |
| MSG + TOE | 18.67±6.02* | 3.33±1.41 | 31.50±23.53# | 5.67±2.13 | 4.56±0.53 | 16.33±3.21# |
| MSG + VIT E | 17.50±2.91* | 2.71±0.92# | 47.57±22.41 | 5.00±0.91 | 5.56±1.13 | 43.61±12.42# |

*Values are presented as mean ± S.E.M. of mean of 5 rats. TOE = Telfairia occidentalis ethanolic leaf extract, VIT E = Vitamin E, MSG = Monosodium Glutamate, LC = Line crossing, RE= Rearing, GR= Grooming, SAP= Stretch Attend Posture, NGT = Negative Geotaxis, FLG = Fore-Limb Grip. Posture. *P<0.05 versus Control. o&P<0.05 versus MSG.*

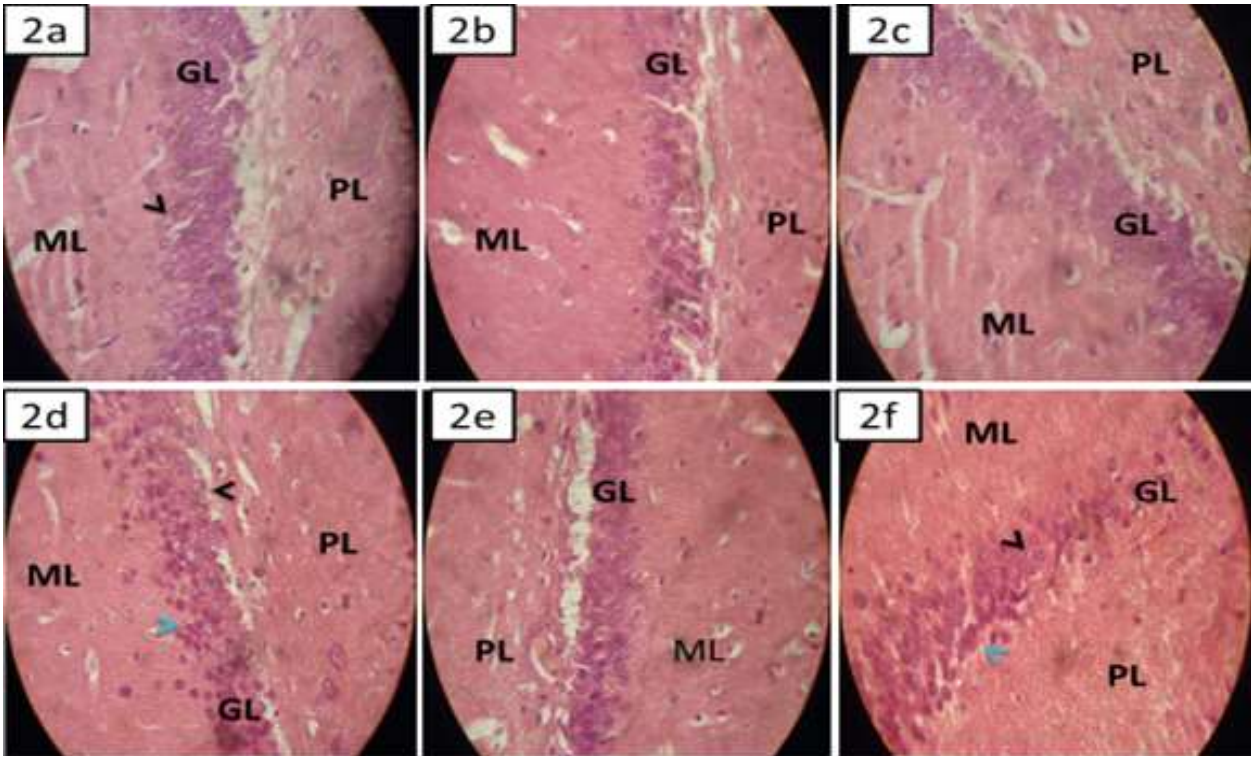


***Fig. 2:*** *Representative photomicrographs of dentate gyrus of rats. (A) Control (B) TOE (C) VIT E (D) MSG (E) MSG + TOE (F) MSG + VIT E. TOE = Telfairia occidentalis ethanolic leaf extract, VIT E = Vitamin E, MSG = Monosodium glutamate. MO = Molecular layer, GL = Granular layer, PL = Polymorphic layer. Black arrowhead = normal granule neurons, Blue arrowhead = degenerated granule neurons. H&E. X 768.*

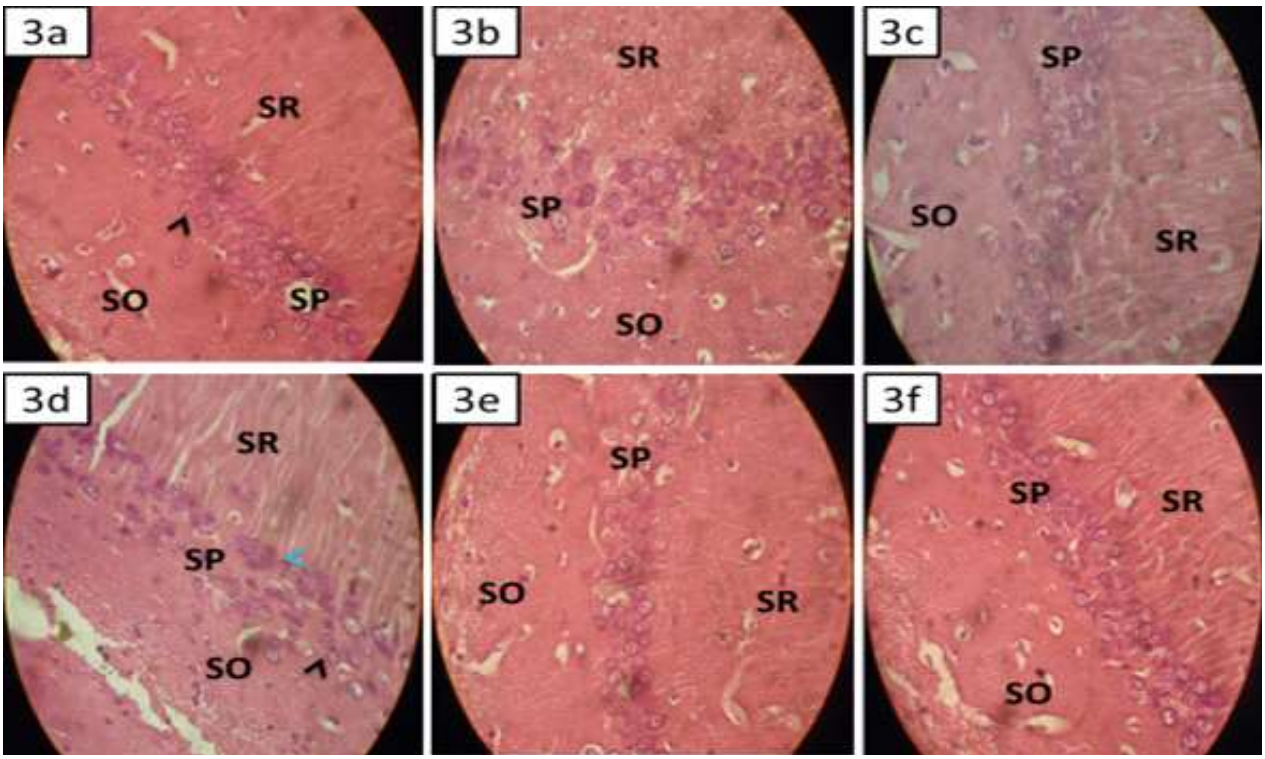


**Fig. 3:** *Representative photomicrographs of cornu ammonis3 (CA3) field of hippocampus of rats. (A) Control (B) TOE (C) VIT E (D) MSG (E) MSG + TOE (F) MSG + VIT E. TOE = Telfairia occidentalis ethanolic leaf extract, VIT E = Vitamin E, MSG = Monosodium glutamate. SO = Stratum oriens, SP = Stratum pyramidalis, SR = Stratum radiatum. Black arrowhead = normal pyramidal neurons, Blue arrowhead = degenerated pyramidal neurons. H&E. X 768.*

*Behavioural tests*

Table 1 showed that MSG significantly ($p<0.05$) reduced the frequency of LC, RE and the duration of FLG, but increased GR and NGT when compared with the control group. However, the concomitant treatment of MSG with TOE reduced all the parameters when compared with MSG treatment. In comparison, MSG+VIT E treatment increased FLG significantly ($p<0.05$) while reducing other parameters.

*Histological evaluation of dentate gyrus tissue*

Figure 2, shows that the layers of the dentate gyrus of the hippocampus namely: molecular, granular and polymorphic were well preserved in all groups. However, while the granule neurons in the control showed normal vesicular nuclei, some of the granule neurons in the MSG (Figure 2d) and MSG+VIT E (Figure 2f) groups showed some dark neurons scattered among the normal neurons.

*Histological evaluation of cornu ammonis3 (CA3) tissue.*

The photomicrographs of cornu ammonis3 of the hippocampus proprius (Figure 3) show a normal stratum oriens (SO), stratum pyramidalis (SP), stratum radiatum (SR) with normal microanatomic features in the control, TOE and VIT E groups. In the MSG group, various stages of degeneration (pyknosis and karyolysis) of pyramidal neurons of the SP layer were observed as shown in Figure 3d compared with the large vesicular nuclei of the control group.

*Morphometric evaluation of hippocampal tissue*

The density of viable pyramidal neurons of the CA3 and granule neurons of the dentate gyrus of the hippocampus were counted and displayed in Table 2. Both neurons were significantly ($p<0.05$) reduced by MSG relative to the control. In both MSG + VIT E and MSG + TOE co-treatment groups, density of viable neurons were significantly elevated when compared with MSG group as shown in table 2.

## Discussion

This study investigated the effect of *Telfairia occidentalis* ethanolic extract (TOE) and alpha-tocopherol (VIT E) on monosodium glutamate (MSG) alterations of the behavioural and histology of rat brain. The organ-to-body weight ratio can be used as an index for assessing the state of an organ: a significant reduction in the value can be traced to organ or tissue necrosis, while a significantly high value is a possible indication of tissue inflammation [33]. In agreement with the reports of Abbas and Abd El-Haleem [34], there was no significant brain weight increase in the MSG-treated rats.

According to Hogas et al. [35], the open field test is used to evaluate the emotional state and locomotor activity of an animal and thus examines anxiety-related behaviour characterized by the normal aversion of the animal to an open area. Animals express anxiety and fear when removed from their acclimatized cage and placed in a new environment by showing alteration in behavioural parameters. Locomotor activity represents a broad class of sensory, motor and integrative processes [36] and central nervous system (CNS) depressants inhibit locomotor activity of animals, though other agents can excite the function of the CNS thus inhibiting sedation [37]. The significant reduction of line crossing and rearing (vertical movement) by MSG and TOE groups, when compared with control suggested a depressant-like activity by MSG which might be attributed to its toxicity. This observation regarding TOE was in agreement with report of Ajao and Akindele [12] indicating its sedative activity. The

**Table 2:** Effect of TOE and VIT E administration on mean densities of viable hippocampal neurons in male Wistar rats treated with MSG.

| Groups | Density of CA3 pyramidal neurons(no/0.11mm$^2$) | Density of granule neurons (no/0.11mm$^2$) |
|---|---|---|
| Control | 9.39±0.78 | 13.81±0.75 |
| TOE | 8.62±0.52 | 12.83±0.75 |
| VIT E | 8.93±0.83 | 12.82±1.12 |
| MSG | 4.91±1.41* | 6.03±14.41* |
| MSG + TOE | 9.07±0.56# | 13.42±0.49# |
| MSG + VIT E | 9.04±0.86# | 13.23±0.75# |

*Values are presented as mean ± S.E.M. of 5 rats. TOE = Telfairia occidentalis ethanolic leaf extract, VIT E = Vitamin E. MSG = Monosodium Glutamate. *P<0.05 versus Control. o&P<0.05 versus MSG.*

reduction in locomotor activities of rats by MSG + TOE and MSG + VIT E treatments groups suggested that these treatments were unable to ameliorate the effect of MSG on these parameters. The exhibition of a depressant-like activity by these agents on the CNS is in agreement with the report of Adebiyi *et al*. [29]. However, MSG + VIT E elevated the forelimb grip strength of the rats suggesting increased muscular strength. The increased frequency of grooming by MSG, MSG + TOE and MSG + VIT E treatment suggested absence of anxiety in the animals in agreement with the report of Umukoro *et al.* [38] who reported the absence of anxiety following MSG administration.

The duration a rat was able to hold on to the hanging wire is considered to be an indirect measure of grip, muscle strength and co-ordination which was significantly ($p<0.05$) increased in the VIT E group but reduced in the MSG group. This may suggest increased grip strength in the VIT E group, however, the reduction in the MSG group could be due to alteration in motor coordination and muscle tone [29]. Prolongation of time spent in negative geotaxis suggested the possibility of reduced vestibular sensitivity integrity and motor coordination in MSG-treated rats since ability to quickly turn uphill along the plane is dependent on an undisturbed vestibular system for body balance [39].

The histology of the hippocampus of the MSG group demonstrated neuronal alteration as evidenced by the presence of degenerating pyramidal neurons in the cornu ammonis3 (CA3) subfield of the hippocampus and those of granule cells of the granule layer of the dentate gyrus of hippocampal formation. This is in comparison to the histology of the CA3 and dentate gyrus (DG) of the control group which showed distinct large soma with vesicular nuclei and visible nucleoli in the pyramidal and granule neurons. In addition, the number of layers of the CA3 neurons was observed to have reduced (Figure 2). The hippocampus has been associated with roles in emotions, behaviour and memory (episodic, semantic and spatial) and damage to the hippocampus bilaterally would affect emotional behaviour (especially those related to pain) and inability to form new long-term memories [24, 22]. The consequence of degeneration or damage to granule cells by MSG as shown histologically would be an alteration of the quality of the excitatory projections of the entorhinal cortex (EC) layer II cells with the apical dendrites of DG granule cells from which Mossy fibres project to synapse with CA3 neurons [23].

Furthermore, as part of the trisynaptic pathway, impulses project from CA3 via its glutamatergic Schaffer collaterals onto ipsilateral CA1 pyramidal neurons thereby completing the hippocampal trisynaptic circuit [24, 25]. Damage by MSG to the pyramidal neurons as in this experiment could have affected the projections emanating from CA1 to the subiculum and entorhinal cortex layers IV and V neurons, which in turn project to superficial layers or high-order association cortices. To sum up, there might be reduction or alteration in the proper functions of these hippocampal parts which was partly demonstrated in this study by increased grooming and behavioural (reduced locomotion and rearing) alterations. Furthermore, acquisition and recall of episodic and spatial memories might be affected in these animals [22]. The histologic demonstration of protection of both granule and pyramidal neurons by TOE and VIT E when co-treated with MSG, however, suggested that normal hippocampal function in the rats of those groups might be restored thus supporting the hypothesis that TOE and VIT E can ameliorate the damaging effect of MSG on hippocampal neurons in this present study.

The toxicity attributed to MSG was (among other factors) generated via oxidative stress [8, 6], and it has been shown that substances with antioxidant capabilities can neutralize or reduce the oxidative damage of MSG [10, 11]. Although biochemical tests were not conducted in this present study, TOE and VIT E have been reported to possess antioxidant activities and able to scavenge free radicals, quench singlet and triplet oxygen and decomposing peroxides [15, 16, 27]. We therefore, reasonably assume that in part, the antioxidant activities of both TOE and VIT E might have participated in mitigating the MSG-induced damage observed in the hippocampus of rats thus mitigating the neural effects we observed and hence reduce or prevent all the potential associated consequences of the lesions on the microanatomy and function of the hippocampus of the brain.

## Conclusion

Taken together, MSG elicited behavioural changes and histological alterations in the neurons of the dentate gyrus and cornu ammonis3 of the hippocampus of rats evidenced by alteration of the microanatomy of their granule and pyramidal neurons respectively. Concurrent administration of MSG with TOE and VIT E demonstrated amelioration of the behavioural changes and histological alterations of the hippocampal neurons.

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# Knowledge and vaccination status for hepatitis B infection among health workers in Ibadan, Nigeria

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**Abstract**

*Background***:** Health workers are at increased risk for Hepatitis B virus (HBV). Although vaccination provides protection against this virus, there is inadequate information on health workers' knowledge, and status of vaccination.

*Objective:* To investigate knowledge and utilization of Hepatitis B vaccination among health workers in Ibadan, Nigeria.

*Methodology***:** A total of 384 health care workers in secondary health facilities in Ibadan North and South West Local Government Areas of Oyo State Nigeria were surveyed. Data were collected using a 46-item validated self-administered, semi-structured questionnaire that assessed knowledge, practice and uptake of HBV vaccination. A 12 point scale was developed to assess knowledge; 0-4= poor knowledge, 5-8 =fair knowledge, 9-12= good knowledge. An 11- point practice scale was used; 0-5 as unhealthy practice and 6-11 as healthy vaccination practice.

*Results:* The majority (76.3%) of the respondents had a good knowledge on Hepatitis B mode of transmission. Also, 71.4% of the health workers had unhealthy practices with risk of HB viral infection. There was a low uptake of HBV vaccine as only 119 (33%) health workers have been completely vaccinated. A significant difference exits between cadre of health worker and HB vaccine use from regression analysis p=0.03

*Conclusion:* The finding of this study highlights the importance of Hepatitis B vaccination of HCWs in Ibadan, Nigeria where high exposure rates are combined with low levels of vaccine coverage and uptake. There is a need for reorientation of health workers coupled with subsidized Hepatitis B vaccination to HCW who are at high risk to address this gap.

**Key words:** *Hepatitis B virus, vaccination and health care workers*.

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**Résumé**

*Contexte* **:** Les agents de santé sont à un risque accru de contracter le virus de l'hépatite B (VHB). Bien que la vaccination assure une protection contre ce virus, les informations sur l connaissances des agents de santé et leur état de vaccination sont insuffisantes.

*Objectif:* Pour étudier la connaissance et l'utilisation de la vaccination contre l'hépatite B chez les agents de santé à Ibadan, Nigéria.

*Méthodologie* **:** Un total de 384 agents de santé dans les établissements de santé secondaires dans les communes d'Ibadan Nord et d'Ibadan Sud-Ouest, de l'État d'Oyo, Nigéria, ont été enquêtés. Les données ont été recueillies à l'aide d'un questionnaire semi-structuré, auto-administré à 46-items validé, qui évaluait la connaissance, la pratique et la participation à la vaccination contre le VHB. Une échelle de 12 points a été développée pour évaluer la connaissance; 0-4 = mauvaise connaissance, 5-8 = connaissance passable, 9-12 = bonne connaissance. Une échelle de pratique de 11 points a été utilisée; 0-5 comme pratique malsaine et 6-11 comme pratique de vaccination saine.

*Résultats:* La majorité (76,3%) des répondants avaient une bonne connaissance du mode de transmission de l'hépatite B. En outre, 71,4% des agents de santé avaient des pratiques malsaines présentant un risque d'infection du virus HB. Il y avait une utilisation modique du vaccin contre le VHB car seulement 119 (33%) agents de santé ont été complètement vaccinés. Une différence significative existe dans l'analyse de régression entre le cadre des agents de santé et l'utilisation du vaccin contre le VHB p = 0,03.

*Conclusion:* Les résultats de cette étude soulignent l'importance de la vaccination des agents de santé contre l'hépatite B à Ibadan, Nigéria, où des taux d'exposition élevés sont associés à de bas niveaux de couverture et de participation au vaccin. Il y a un besoin pour la réorientation des agents de santé couplé à une vaccination subventionnée contre l'hépatite B des agents de santé qui sont au risque élevé pour remédier cette lacune.

**Mots-clés:** *virus de l'hépatite B, vaccination et agents de santé*.

## Introduction

A third of the world population (two billion people) has been documented to have Hepatitis B exposure

and an estimated 400 million are actively infected [1]. Hepatitis B virus (HBV) is the major cause of acute and chronic liver disease, cirrhosis and hepatocellular carcinoma worldwide [2]. It is also an occupational hazard among non-immunized health care workers (HCW) with a risk of work place infection [3]. National and regional prevalence rates of HBV infection vary widely between 8-10% in Sub-Saharan Africa and South East Asia, 2-7% in Eastern and Southern Europe, and 0.5-2% in the United States and Northern Europe [4]. HBV is also reported to be almost 100 times more infectious than HIV [5]. Since the professional duties of doctors, nurses, dental and other health workers involve the use of small, sharp instruments contaminated with blood or other fluids, there is ample opportunity for inadvertent skin wounds to the health care service provider and staff. Such accidents include the possibility of transmission of Hepatitis B, Hepatitis C and human immunodeficiency virus (HIV) [6].

HBV infection is endemic in Nigeria; results from previous studies among health workers show the prevalence of HBV to range from 15 to 39% [7], compared to a prevalence of 10-15% in the average risk Nigerian population [8], and consequently, the risk of occupational exposure to HBV among HCWs in Nigeria remains high. By contrast, studies conducted on selected HCWs in Nigeria indicate low rates of HBV vaccination coverage of 20%–50% [9]. In Ibadan, Oyo state, the prevalence of Hepatitis B vaccination is at 20- 50% among health care workers [10]. Hence, timely vaccination will prevent infection (acute disease and chronic carriage) as well as cross contamination of HBV from health workers to patients.

The Hepatitis B vaccine has been available globally since 1982 and in Nigeria since 1995, the World Health Organization (WHO) has recommended it since 1990 for all health workers whose activities frequently expose them to blood [8, 11,12]. Hepatitis B vaccine usually creates a long-term immunity, help in eliminating the risk of HBV infection and also decreases the risk of chronic liver disease, cirrhosis of the liver and liver cancer [13]. Despite these potential benefits, Hepatitis B vaccine remains under-utilized by health workers. Hepatitis B vaccination is yet to be offered en masse to health care workers in Nigeria who are more occupationally at risk of the infection despite risk of infection in this population [14].

There are different reasons for non-utilization of HBV vaccine among health care workers including lack of awareness of where to obtain vaccine (57.1%), lack of money to pay for the vaccine (23.1%) non recommendation of the vaccine (17.1%) and concerns about side effects from HBV vaccine uptake (14.3%) [15]. Health workers have a key role to play not only for protecting themselves against HBV but can also be a major source of HBV infection. Appropriate health care programmes targeting vaccination against HBV infection among healthcare workers are not available even in most secondary health care institutions in Nigeria, and where such HBV vaccine is available the adherence to recommendations remain low a situation further complicated by absence of HBV vaccination policy in the country [16-18]. Hence this study aims to find out the reason for the differential vaccination status among the different cadre of health workers. The findings from this study could help in designing necessary intervention to promote the uptake of the vaccine among health workers in Nigeria.

## Method

The research was a descriptive cross-sectional survey conducted between September and October 2015 among health care workers in two urban Local Government Areas (LGA) situated in Ibadan metropolis, South West Nigeria. The protocol for the study was approved by the Oyo State Ministry of Health Ethics Review Committee with reference number: AD 13/479/949.

### *Study sites*

The population of Ibadan North and South West LGAs are 306,795 and 320,536 respectively. As at 2015 when the survey was conducted, Ibadan NLGA has six secondary health care facilities controlled by the state government with a total of six hundred and eighty three staff (683). Ibadan SWLGA has eight secondary health care facilities controlled by the state government with a total of four hundred and thirty two health workers (432).

### *Study population*

The population for this study were all consenting health workers which consist of doctors, nurses, dental technicians, community health officers, physiotherapist, ward attendants laboratory scientists, laboratory technologists and laboratory attendants who work in selected state secondary healthcare facilities.

### *Measures*

A 46-item validated self-administered semi-structured questionnaire was used for data collection. The questionnaire consisted of socio-demographic profile such as year(s) of practice, professional designation, age, sex, highest level of education and

marital status, knowledge of Hepatitis B virus and safety practices of Hepatitis B vaccination status. The questions were derived from relevant literature guided by the research objectives and pretested on field among health care workers to refine ambiguous questions and confirm its validity. The study included all consenting health worker who had practices for more than six month while those who did not fulfil this criteria were excluded from the study.

*Sample size and sampling procedure*

The sample size for the study was a total of 384 health workers which was determined by using Leslie Kish Formula for descriptive cross sectional studies [19]. The prevalence of HBV vaccination coverage among health workers was given as 50% [10]. A Multi-stage sampling technique was used in selecting the respondents and the selection was based on the proportion of workers in each professional group from the selected public secondary health facilities in the study sites. A total of 384 questionnaires were distributed and all were retrieved from the health workers; this number was allocated based on the number of staffs in each health facility. Six (6) trained research assistants distributed and collated the questionnaires in all the identified hospitals with 100% response rate.

*Data management and analysis*

The data were analysed using SPSS package version 20 and the results presented in tables. Analysis was done using descriptive statistics, percentages and proportion, while inferential statistics was done using Chi-square test, Anova and Binary logistic regression to analyse categorical variables. A 12 point scale was developed to analyse knowledge, using 0-4= poor knowledge, 5-8 fair knowledge, 9-12 good knowledge on Hepatitis B mode of transmission and a mean knowledge score of 9.56±1.5. The practice scale was assessed using an 18 point practice scale, using the range 09 as low risk-healthy practice, and 10-18 as a high risk-unhealthy practice on Hepatitis B virus prevention. The interpretation of these scores is that, the higher the score, the higher the risk of the disease, the lower the score the lower the risk of contracting Hepatitis B virus.

## Results

Of the 384 respondents, (79.4%) were females and (20.6%) were males. The mean age of respondents was 35.4 ±10.6 years with the minimum age of 18 and maximum of 59 years. A large majority (70.1%) had university degree. The year of practice was 9.9 ±9.3 years, a median of 6.0 years with those who had practised for <10 years forming 40.8% (Table 1).

**Table 1:** Table the socio-demographic characteristics of the respondents

| *Demographic characteristics* | No | % |
|---|---|---|
| *Sex* | | |
| Male | 79 | 20.6 |
| Female | 305 | 79.4 |
| *Actual age in years* | | |
| *(Age in groups)* (N=368)* | | |
| <30 | 150 | 39.1 |
| 31-40 | 104 | 27.1 |
| 41-50 | 77 | 20.1 |
| 51-60 | 37 | 9.6 |
| Non Response | | |
| *Ethnicity* | 16 | 4.17 |
| Yoruba | 352 | 91.7 |
| Igbo | 26 | 6.8 |
| Others** | 6 | 1.6 |
| *Highest Level Education (N=384)* | | |
| Primary school | 2 | 0.5 |
| Secondary school | 12 | 3.1 |
| NCE and OND | 42 | 10.9 |
| Higher National Diploma | 31 | 8.1 |
| University | 269 | 70.1 |
| Post Graduate and Above | 28 | 7.3 |
| *Religion (N=381)* | | |
| Christianity | 294 | 77.2 |
| Islam | 84 | 22 |
| Traditional | 3 | 0.8 |
| *Marital Status (N=384)* | | |
| Married | 233 | 60.7 |
| Single | 151 | 39.3 |

*Mean=35.4, Median=34.5,Range=41 **Edo 3(0.8) Urobho 2(0.5) Igala1(0.3)

*Knowledge of hepatitis B infection*

The percentage of respondents with correct knowledge of the 12 statements is shown in Table 2. Virtually all (99%) of the respondents knew that HBV was caused by a virus and 62% believed it could be transmitted by drinking polluted water or contaminated food. There was no significant difference between the level of education and knowledge scores of the respondents using ANOVA test statistics (F=0.722, df =2, p-value=0.46 with level of significance set at 0.05). (Table 3).

Majority (76.3%) of the health workers had a good knowledge on Hepatitis B mode of transmission (As seen in Table 4).

*Safety practices*

It was observed that majority, 71.4% of the respondents had an unhealthy practice with moderate risk of contracting Hepatitis B viral infection (Table 5).

*Practice that can increase the respondents' risk of contracting Hepatitis B virus*

The result of the study shows the mean practice score of the HCWs as 1.97±0.51. A total of 65.3% of the

**Table 2:** Representation of the knowledge of the respondents on Hepatitis B

| Knowledge statements | Percent answering Correctly (%) |
|---|---|
| Hepatitis B is caused by a virus | 99.0 |
| Hepatitis B is a common disease in Nigeria | 83.0 |
| Hepatitis B can affect all age groups | 97.0 |
| Hepatitis B can be transmitted by used blades of barbers, pins, lancet, needles and other sharp objects | 90.0 |
| Hepatitis B cannot be transmitted by polluted water or food | 62.0 |
| HBV can be contracted through unprotected sexual relationships | 81.0 |
| Hepatitis B is a curable disease | 68.0 |
| Hepatitis B has vaccination | 97.0 |
| Needle stick injury has 10% risk of causing an infection. | 80.0 |
| Health worker to patient transmission of HBV is as common as the reverse situation | 38.0 |
| Hepatitis B infection indicates infection with a new subtype of Hepatitis B | 57.0 |
| HIV carries a greater risk to health workers than Hepatitis B | 39.0 |
| Hepatitis B core antigen carries no clinical importance | 61.1 |

**Table 3:** Relationship between socio-demographic characteristics and knowledge scores of the respondents

| Demographics | Total knowledge scores | | | $\bar{X}$ | SD | F | Df | P value |
|---|---|---|---|---|---|---|---|---|
| | Poor | Fair | Good | | | | | |
| Year of practice | 2 | 87 | 282 | 1.58 | 0.85 | 0.44 | 2 | 0.65 |
| Marital Status | 2 | 89 | 291 | 1.39 | 0.49 | 0.15 | 2 | 0.86 |
| Ethnicity | 2 | 89 | 291 | 1.1 | 0.52 | 0.14 | 2 | 0.87 |
| Religion | 2 | 89 | 290 | 1.75 | 7.0 | 0.29 | 2 | 0.75 |
| Level of education | 2 | 89 | 293 | 9.62 | 10.3 | 0.72 | 2 | 0.48 |

**Table 4:** Table showing the knowledge category of respondents

| Knowledge score* | Frequency (No) | Percentage (%) |
|---|---|---|
| Poor Knowledge(0-4) | 2 | 0.5 |
| Fair Knowledge(>4-8) | 89 | 23.2 |
| Good Knowledge(>-8) | 293 | 76.3 |
| Total | 384 | 100 |

respondents said that they recap needle from syringe after use. Majority of the respondents 79.4% said that they sometimes manipulate needles. Most of the respondents, 76.7% said they sometimes bent needles and 87.6% said that they sometimes broke needles with their hands (table 6).

**Table 5:** Total number of Health workers engaging in risky practices (N= 384)

| Practice scale | Frequency | Percentage |
|---|---|---|
| Unhealthy practice | 274 | 71.4 |
| Healthy practice | 110 | 28.6 |
| Total | 384 | 100.0 |

Majority of the respondents 35.2% said they never made use of water proof gowns and only 17.9% of the respondents made use of double visors to prevent HBV infection. About, 38.8% never made use of single surgical gloves during operations when attending to patients (table 8). Also, majority of the respondents reported not knowing their vaccination status. (table 9).

Respondents with >10 years practice had the highest frequency of HBV vaccine usage 71 (31.1%), followed by those with 11-20 years' experience (31.7%) see table 10. There was a significant relationship between the frequency of Hepatitis B vaccine usage and the respondents' age ($X^2$=13.14, df =3, p-value=0.04) as shown in table 11.

**Table 6:** Reported hepatitis B Virus related risky practices

| Statement | Always (%) | Sometimes (%) | Never (%) | Total |
|---|---|---|---|---|
| Recap needle from syringe after use | 131(34.4) | 248( 65.3) | 1(0.3) | 380(100) |
| Bending of needle | 87 (23.0) | 291(76.7) | 1(0.3) | 379(100) |
| Do you break needles with your hand after use | 46 (12.1) | 331(87.6) | 1(0.3) | 378(100) |

**Table 7 :** Accidental needle stick piercing and injuries among respondents

| Statement | Yes (%) | No (%) | Total |
|---|---|---|---|
| Have you accidentally pierced yourself before | 178(50) | 178(50) | 356 |

**Table 8:** Use of barrier methods by health care workers in wards

| Barrier method used | Never (%) | Always (%) | Sometimes (%) | Total |
|---|---|---|---|---|
| Use of water proof gowns | 133 (35.2) | 117 (30.9) | 128 (33.9) | 378(100) |
| Use double gloving and visors | 68 (17.9) | 185 (48.7) | 127(33.4) | 380(100) |
| Use single surgical gloves during operations | 148 (38.8) | 177 (46.5) | 56 (14.7) | 381(100) |
| Use single surgical gloves when attending to patients. | 75 (19.6) | 214 (56.0) | 93 (24.4) | 382(100) |

**Table 9**: Vaccination for HBV

| Hepatitis B vaccination status of health workers in Ibadan | No. | (%) |
|---|---|---|
| Positive | 125 | 32.6 |
| Negative | 244 | 63.5 |

About 18% of the respondents said that they recapped or detached needle from syringe or manipulate needles (bending, breaking) used for Hepatitis B patients in the last three months (See table 6 for details). Half, 50% of the respondents had accidentally pierced themselves before (table 7).

In Table 12 below, Logistic regression analysis was used to determine the magnitude of relationship between respondents' demographic profile and HBV vaccine usage. Predictors of HB vaccine use were age, education and professional cadre using regression analysis. The model showed that health workers less than 30 years of age

(OR=1.056; CI= 0.498- 2.238, p<0.05) were more likely to utilize Hepatitis B vaccine compared to health workers aged 31-40 years (OR=0.633; CI=0.288-1.393, p>0.05).

However Health workers aged 41-50 years (OR=1.676; CI= 0746-3.766, p>0.05) were more likely to utilize Hepatitis B vaccine compared to health workers aged 51-60 years. Hepatitis B vaccine

**Table 10:** How often respondent use Hepatitis B vaccine and the Years of practice

| Vaccine Use | Year of Practice in years | | | | |
|---|---|---|---|---|---|
| | <10 | 11-20 | 21-30 | 31-40 | Total |
| Yes | 71(31.1%) | 26(31.7%) | 17(37.8%) | 5(33.3%) | 119 |
| NO | 157(68.9%) | 56(68.3%) | 28(62.2%) | 10(66.7%) | 239 |
| Total | 228(100%) | 82(100%) | 45(100%) | 15(100%) | 370 |

**Table 11** Ever tested for Hepatitis B virus

| Demographics | Ever tested for Hepatitis B virus before | | | $X^2$ | Df | P value |
|---|---|---|---|---|---|---|
| | Yes (%) | No (%) | Total (%) | | | |
| *Sex* | | | | | | |
| Male | 28(36.4) | 49(63.6) | 77(100) | 0.332 | 1 | 0.56 |
| Female | 99(32.9) | 202 (67.1) | 301(100) | | | |
| *Marital status* | Yes | No | Total | | | |
| Married | 69(30.0) | 161(70.0) | 230(100) | 6.45 | 1 | 0.11 |
| Single | 58(39.2) | 90(60.8) | 148(100) | | | |
| *Age in groups* | Yes | No | Total | | | |
| <30 | 59(39.9) | 89(60.1) | 148(100) | 13.14 | 3 | 0.04 |
| 31-40 | 24 (23.3) | 79(76.7) | 103(100) | | | |
| 41-50 | 24(31.6) | 52 (68.4) | 76(100) | | | |
| 51-60 | 15(41.7) | 21(58.3) | 36(100) | | | |
| *Year of practice* | | | | | | |
| 10 Years | 71(31.1) | 157(68.9) | 228(100) | 0.77 | 3 | 0.85 |
| 11-20 Years | 26(31.7) | 56(68.3) | 82(100) | | | |
| 21-30 Years | 17(37.8) | 28(62.2) | 45(100) | | | |
| 31-40 Years | 5(33.3) | 10(66.7) | 15(100) | | | |

**Table 12:** Binary logistic regression of relationship between Hepatitis B vaccine use and covariates

| | Covariates | Odds Ratio | 95%CI | P-value | df |
|---|---|---|---|---|---|
| *Age* | <30 | 1.056 | 0.498- 2.238 | 0.024** | 3 |
| | 31-40 | 0.633 | 0.288-1.393 | 0.256 | |
| | 41-50 | 1.676 | 0746-3.766 | 0.211 | |
| | 51-60* | | | | |
| *Highest level of education* | Secondary school | 1.497 | 0.317-7.058 | 0.020** | 3 |
| | Degree | 1.227 | 0.345-4.366 | 0.752 | |
| | BSC | 0.496 | 0.169-1.453 | 0.201 | |
| | *Post graduate diploma and above** | | | | |
| *Professional Cadre* | Medical Doctor | 0..278 | 0.121-0.640 | 0.003** | 2 |
| | Nurse | 0.276 | 0.144-0.530 | 0.07 | |
| | *Other paramedical staffs ** | | | | |
| *- 2 Log likelihood* | *477.113* | | | | |
| *Cox & Snell R Square* | *0.060* | | | | |
| *Nagelkerke R Square* | *0.081* | | | | |

**Reference category ** p<0.05 (Binary logistic analysis was used)*

usage was significantly associated with the cadre of health worker in the secondary health care facility. The Medical doctors (OR=0.278; CI=0.121-0.640, p<.0.05) were more likely to use hepatitis B vaccine compare to nurses (OR=0.276; CI=0.144-0.530, p>.0.05). Health workers who had secondary level education were more likely to utilize Hepatitis B vaccine (OR=1.497; CI= 0.317-7.058, p<0.05) compared with those who had degree education (OR=1.227; CI= 0.345-4.366, p>0.05). B.Sc holders were less likely (OR=0.496; CI= 0.169-1.453, p<0.05) to have utilized Hepatitis B vaccine compared to health workers with postgraduate diploma qualification and above.

Few, (2.2%) of the respondents with poor knowledge engaged in unhealthy practice which exposed them to the risk of contracting HBV. Less than one-third 23.0% of the respondents who had fair knowledge about HBV engaged in unhealthy practices while 76.3% with good knowledge also engaged in unhealthy practices. Therefore, there was no significant association between knowledge and the practice that influenced their risk of contracting Hepatitis B infection using Fishers exact test (*$X^2$=0.04, df =2, p-value=1.0). (table 13).

Despite their relatively high level of education, and the advanced level of knowledge about the modes of transmission of the pathogens, there were great disparities among health practitioners knowledge and vaccination uptake as only 33.9% has been fully vaccinated [23].

Most of them had low vaccine coverage as Hepatitis B virus could be transmitted through many other routes, and inadequate knowledge of the essence of vaccination against Hepatitis B virus among health workers may reflect their behavioural pattern to vaccination and safety measures [25]. A study had found out that lack of knowledge and negative attitudes were the main reasons for refusal, in a vaccination programme against Hepatitis B virus [26]. These were found to improve significantly after the dissemination of information, with acceptance rates increasing from 56.9% to 77.7% [26].

It was observed that more than half of the respondents reported practices that increased their risk of contracting Hepatitis B viral infection through needle recap and manipulations. The risk of non-percutaneous exposure may account for a significant proportion of HBV transmission in the healthcare setting. Indeed, some healthcare workers infected

**Table 13** Relationship between knowledge and total practice (N=384)

| *Total Knowledge GroupScales | Unhealthy practice (%) | Healthy practice(%) | Total | *$X^2$ | Df | P-value |
|---|---|---|---|---|---|---|
| Poor Knowledge (0-4) | 1(0.5) | 1(0.5) | 2 | 0.04 | 2 | 1.00 |
| Fair Knowledge (5-8) | 44(23.0) | 45(23.3) | 89 | | | |
| Good Knowledge (9-12) | 146(76.4) | 147(76.2) | 293 | | | |
| Total | 191(100) | 193(100) | 384 | | | |

**Fishers Exact test was used*

## Discussion

Majority of the respondents had good knowledge of Hepatitis B and this could be linked to the fact that they had residual knowledge about HBV from the medical training institutions. This study also found out that over a third 38.0% of the respondents were not aware of the routes of transmission of HBV which indicated a significant problem in the health sector as they stated that HBV can be transmitted by polluted water or food [22]. Most (61.1%) of the respondents said that Hepatitis B core antigen carried no clinical importance whereas, this is contrary to other studies [24] it is the core antigen that indicates the presence of a chronic or an acute HBV infection thus indicating the need for better reorientation of the health workers [20].

with HBV could not recall an overt needle stick injury, but could remember caring for a patient with Hepatitis B. New staff with less than ten years of practice may be at a higher risk of acquiring Hepatitis B infection in the hospitals as they are learning to do procedures and may be less cautious than other health workers [7]. They are also less likely to practice universal precautions and are more likely to sustain needle stick injuries due to inexperience [30]. Immunization with Hepatitis B vaccine is the most effective means of preventing Hepatitis B infection and its consequences [31]. The recommended strategy for preventing this infection is selective vaccination of persons with identifiable risk factors [27].

The study identified the predictors of hepatitis B vaccine usage as a significant relationship was found

between professional cadre, level of education, age of the respondents and hepatitis B vaccine usage using logistic regression analysis. Health workers less than 30 years of age were 1.06 times more likely than health workers aged 31-40 years while the Medical doctors were 0.2 8 times more likely to use hepatitis B vaccine compare to nurses (Table 12).

It was observed that over two third of the respondents had a poor practice that may influence the risk of contracting Hepatitis B virus infection,. Almost half (46.4%) of the respondents had been accidentally pierced before which was high compared to similar studies [28]. The study has shown that general hygienic measures as well as protective equipment use in hospitals in Nigeria to reduce the risk of HIV/ Hepatitis B infections among health workers are insufficient. A finding corroborated by earlier studies in similar settings [29].

Unhealthy practice in the use of barrier methods poses a risk to the health workers. The main reason for this may be attributed to poor practice of universal precautions owing to organizational problems and a lack of necessary materials such as non-availability/ use of gloves during emergency operations as reported by 38.8% of the respondents. Also, data on the frequency and circumstances of occupational exposures in developing countries are sparse especially in Nigeria, frequency of exposures and prevention criteria, circumstances of exposures, and post exposure practices are poorly managed and only few cases are documented in the hospitals which could be one of the risk factors for Hepatitis B virus spread among health workers. From the results of the study, one third 31.0% of the respondents with less than ten (10) years working experience are more likely to receive Hepatitis B vaccination than other respondents with more years of practice. The most likely reason for this high uptake level Hepatitis B vaccine maybe due to the fact that, the majority of the respondents were Nurses (53.9%) and doctors (14.8%) thus, more likely to be educated than the lower cadre of health care workers with more years of practice.

The result of the study also indicates that (31.1%) about one third of the respondents had taken at least one dose out of the recommended three doses of Hepatitis B vaccine before, while at least 33% of the respondents had taken more than one dosage of the vaccine, thus, factors such as availability of the vaccine in their respective health centres, low level of awareness on the availability of the vaccine to health workers at vaccination centres, the cost of vaccine which costs up to #1,200 ($3.81) per vaccine and 3,600 ($11.42) for a dose may be one of the "factors responsible for the low uptake of the vaccine as stated by 18.9% of the respondents, a finding similar in a study" [23].

## Conclusion

This study indicates that there is a low HBV vaccination uptake among the health care workers. They must be sufficiently well informed to be able to improve the knowledge, attitudes and behaviour of other HCWs and patients. It also seems evident that additional research on HBV is needed in this regard. Although they claimed high knowledge of preventive measures, the findings of standard HBV prevention practices and HBV vaccine uptake were to the contrary and majority engaged in high risky practices which may predispose them to HBV infection. In conclusion**,** the Hepatitis B vaccination rate among health workers in Ibadan North and South west local government area is low. This study shows that, the present system of vaccination, in which the health workers have to take the initiative and sometimes pay is not very efficient, therefore a national and institutional legislation for adult vaccination against Hepatitis B needs to be promulgated especially for all health workers who are at higher risk. Thus, hospital workers from these institutions have moderate perceived risk of HBV infection and low vaccination coverage despite a high level of awareness of HBV vaccine.

## Recommendations

In light of the findings of this study which shows a high exposure rate coupled with an abysmally low vaccine uptake, it is recommended that a capacity building of all health workers whose duties place them in direct contact with blood be complimented with prompt vaccination at the start of their careers. Vaccination should be provided free or at least subsidized rate local government administrators as (18.9%) in this study reported high cost of vaccine as a barrier, Vaccination program should be preceded by rigorous educational programmes targeting all health workers on the importance of vaccination for HBV. Such programs must also remove barriers to vaccination such as concern for social consequences and personal financial burden of the HBV vaccine costs. The government should also provide resources that will enable all health workers practice universal precaution.

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# Ear biometrics and naso-aural proportions of hausas and yorubas using an image-processing algorithm.

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**Abstract**

*Background***:** Anthropology is the study of human biology and culture. This study aims to develop an image-processing algorithm for computing anthropometric measurements in forensic investigations in order to produce ear biometric databases of Hausas and Yorubas of Nigeria.

*Materials and methods***:** Hausas of Kebbi State (150 males and 150 females, aged 18 to 36 years) and Yorubas of Osun State (150 males and 150 females, aged 15 to 33 years) were selected as subjects after their informed consents were obtained and when established as Hausas or Yorubas by parents and grandparents. Height, Bodyweight and cephalometric parameters (evaluated on ear photographs) were measured on all subjects. The Akinlolu-Raji image-processing algorithm used in this study was developed using modified computer programming principle of row method. Ear Length, Length of Ear Insertion, Ear Breadth, Ear Index, Iannarelli System (1 - 12) of Ear Biometrics and Naso-aural proportion computed from readings of the Akinlolu-Raji image-processing algorithm were analyzed using z-test ($P \leq 0.05$) of 2010 Microsoft Excel statistical software.

*Results:* Statistical analyses showed non-significant higher values ($P > 0.05$) in Hausa and Yoruba males compared to females in most ear parameters. Non-significant higher values ($P > 0.05$) of ear parameters were observed in Yorubas compared to Hausas in both gender. Naso-aural proportions were non-significantly higher in Hausa males compared to females, lower in Yoruba males compared to females, higher in Hausa males compared to Yoruba males and lower in Hausa females compared to Yoruba females.

*Conclusions:* The developed Akinlolu-Raji image-processing algorithm can be employed for computing anthropometric, forensic, diagnostic or any other measurements on 2-D and 3-D images, and data computed from its readings can be converted to actual or life sizes. Males have higher ear sizes compared to females in Hausas and Yorubas. In addition, Yorubas of Osun State have higher ear sizes compared to Hausas of Kebbi State in both gender.

**Keywords:** *Ear, biometrics, naso-aural proportion, yoruba, hausa, image-processing algorithm, forensic investigations*

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**Résumé**

*Contexte* : L'anthropologie est l'étude de la biologie et de la culture humaine. Cette étude vise à développer un algorithme de traitement d'image pour le calcul de mesures anthropométriques lors des enquêtes criminologiques afin de créer des bases de données biométriques auriculaires sur les Hausas et les Yorubas du Nigéria.

*Matériels et méthodes* **:** Les Hausas de l'État de Kebbi (150 hommes et 150 femmes âgés de 18 à 36 ans) et les Yorubas de l'État d'Osun (150 hommes et 150 femmes de 15 à 33 ans) ont été sélectionnés comme sujets après que leur consentement a été obtenu et quand établis en tant que Hausas ou Yorubas par les parents et les grands-parents. Les paramètres de taille, de poids corporel et céphalométriques (évalués sur des photographies de l'oreille) ont été mesurés sur tous les sujets. L'algorithme de traitement d'images Akinlolu-Raji utilisé dans cette étude a été développé en utilisant le principe de programmation informatique modifié de la méthode des lignes. Longueur de l'oreille, longueur de l'insertion de l'oreille, largeur de l'oreille, indice de l'oreille, système Iannarelli (1 - 12) de la biométrie de l'oreille et proportion auriculo-nasale calculée à partir de la lecture de l'algorithme de traitement d'images Akinlolu-Raji ont été analysés à l' aide du test z ( $P$ d" 0,05) du logiciel statistique Microsoft Excel 2010.

*Résultats:* Les analyses statistiques ont montré des valeurs supérieures non significatives ($P > 0,05$) chez les hommes hausa et yoruba par rapport aux femmes pour la plupart des paramètres auriculaires. Des valeurs non significativement plus élevées ($P > 0,05$) des paramètres de l'oreille ont été observées chez les Yorubas par rapport aux Hausas parmi les deux sexes. Les proportions auriculo-nasales étaient non significativement plus élevées chez les hommes que les femmes hausa, plus bas chez les hommes que les femmes Yoruba, élevé chez les hommes hausa par rapport aux hommes yoruba et moins chez les femmes hausa que les femmes yoruba.

*Conclusions:* L'algorithme de traitement d'images développé par Akinlolu-Raji peut être utilisé pour calculer des mesures anthropométriques, criminologiques, diagnostiques ou toute autre mesure sur des images 2D et 3D, et les données calculées à partir de ses lectures peuvent être converties en tailles actuelles ou réelles. Les oreilles des hommes sont plus grandes que celles des femmes chez les Hausas

et les Yorubas. En outre, les Yorubas de l'État d'Osun ont une taille d'oreille supérieure à celle des Hausas de l'État de Kebbi entre les deux sexes.

**Mots clés:** *Oreille, Biométrie, proportion auriculo-nasale, Yoruba, Hausa, algorithme de traitement d'image, enquêtes criminologiques*
*Yoruba, Hausa, Image-processing algorithm, Forensic investigations*

## Introduction

Anthropology is the study of human biology and culture while forensic anthropology deals with the establishment of human identity. [1] The ear is directly related to the face and is of relevance in biometric studies and craniofacial surgical reconstructions [2.3]. The ear is the organ of hearing, and is involved in the maintenance of equilibrium and balance [2.3]. It is divisible into three parts, the external, middle and internal ear [2.3]. The shape or appearance of the outer ear had long been noted as a useful physical feature for forensic identification by law enforcement officers [4-6]. The ear becomes a very useful biometric feature when the face may become not completely recognized due to illumination changes, facial expression changes, eye glasses and facial make-up [4-6]. The ear could easily be captured from a distance either in cooperative or non-cooperative subjects, hence ear biometrics is an interesting feature of surveillance investigations [4-6]. Furthermore, the use of earmarks or ear prints left in crime scenes in criminal trials is expanding [7], which further emphasizes the role of ear biometrics in forensic identifications of individuals.

Nigeria is comprised of over two hundred and fifty ethnic groups [8], with the Hausas, Igbos and Yorubas as the three major ethnic groups constituting more than 60 percent of its population [8]. Therefore, to provide further information on ear cephalometry and to pioneer the use of face recognition technology in Nigeria, this study aims to develop an image-processing algorithm which can be used to compute cephalometric measurements for face recognition of individuals of any ethnic group. In addition, this study aims to provide a preliminary forensic ear database of Hausas and Yorubas.

## Materials and methods

*Pilot-study*

A pilot-study was conducted to determine the reliability of the developed Akinlolu-Raji image-processing algorithm using 40 Yoruba subjects (20 males and 20 females), aged 15 to 23 years, who were undergraduate students of Osun State School of Health Technology, Ilesa and Osun State University, Okuku Campus. Informed consents of subjects were obtained in accordance with ethical guidelines of the Helsinki Declaration of 1975, as revised in 2000. Facial parameters evaluated from readings of the algorithm on three-dimensional (3-D) facial photographs were converted to life sizes and the results were statistically compared using t-test of the Statistical Package for the Social Science software Statistics 23, with measurements of same facial parameters computed from readings of the Vernier Caliper (one-dimensional or 1-D anthropometry).

Pairwise comparative statistical analyses of computed mean values of cephalometric parameters (Mean ± SD) in millimeters between Vernier Caliper (1-D anthropometry) and the developed Akinlolu-Raji image-processing Algorithm (3-D anthropometry) measurements in male and female control subjects showed lower or higher, but no significant differences ($P_B$>0.05) in 100% of measured parameters: Total Face Height (trichion to gnathion), Forehead Height (trichion to nasion), Upper Face Height (trichion to subnasale), Morphological Face Height (nasion to gnathion), Nose Height (nasion to subnasale) and Lower Face Height (subnasale to gnathion). (Figure 1). The Bonferroni correction ($P_B$) method was employed to reduce the chances of obtaining false-positive results (type I errors) declaring wrong significant difference when no significant difference exists. [9,10].

*Selection of subjects and determination of sample size*

Letters of approval for conduct of the study were received from managements of Kebbi State University of Science and Technology, Aliero; Adamu Augie College of Education, Argungu; School of Health Technology, Jega and Kebbi State School of Nursing and Midwifery, Birnin Kebbi, from where Hausa subjects (150 males and 150 females, aged 18 to 36 years) were locally selected; and Osun State University, Okuku Campus from where Yoruba subjects (150 males and 150 females, aged 15 to 33 years) were locally selected for the study using the purposive technique or judgment sampling method, [11-15] only when established via distributed questionnaires as Hausas of Kebbi State or Yorubas of Osun State by parents and grandparents. Informed consents were obtained from selected subjects in accordance with ethical guidelines of the Helsinki Declaration of 1975, as revised in 2000.

*Data collection and evaluated ear parameters*

Data on height and bodyweight, parents and grandparents ethnic origin, local government area, state of origin and ear photographs were obtained from each subject. Photographs of subjects were

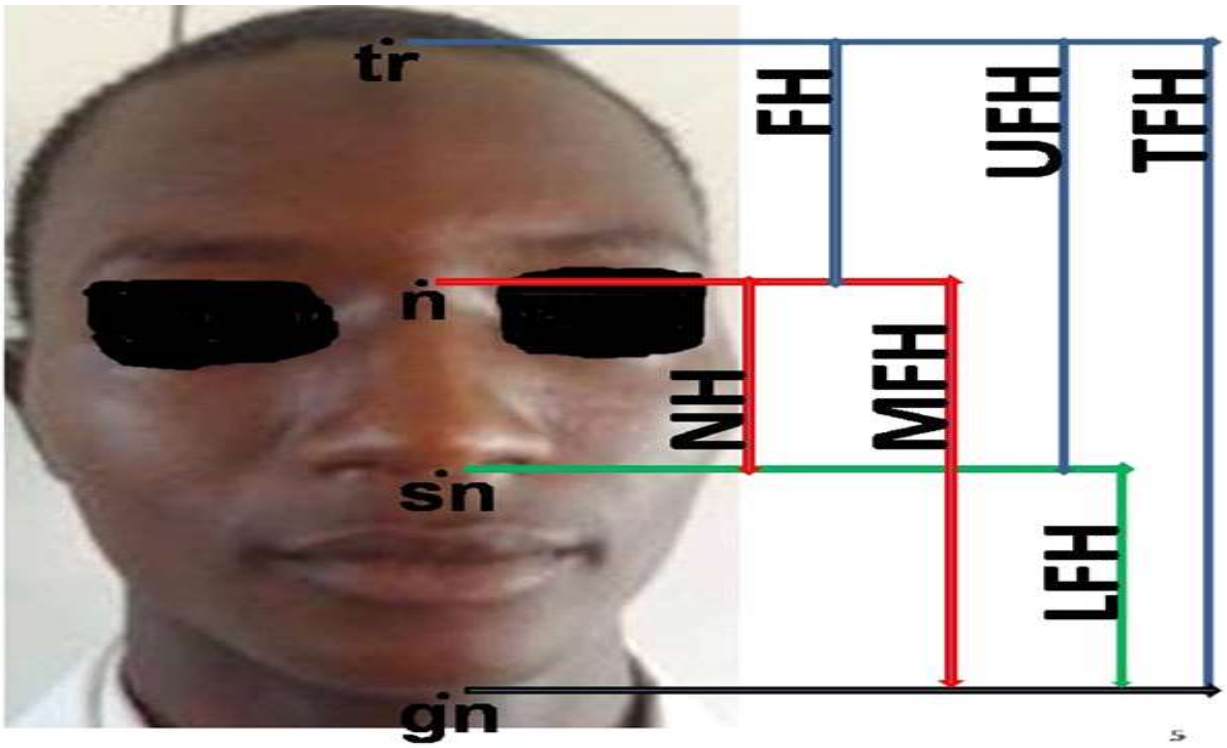


**Fig. 1.** Biometric Measurements of the Face.
tr = trichion, n = nasion, sn = subnasale and gn = gnathion. TFH = Total Face Height, FH = Forehead Height, UFH = Upper Face Height, NH = Nose Height, MFH = Morphological Face Height and LFH = Lower Face Height.

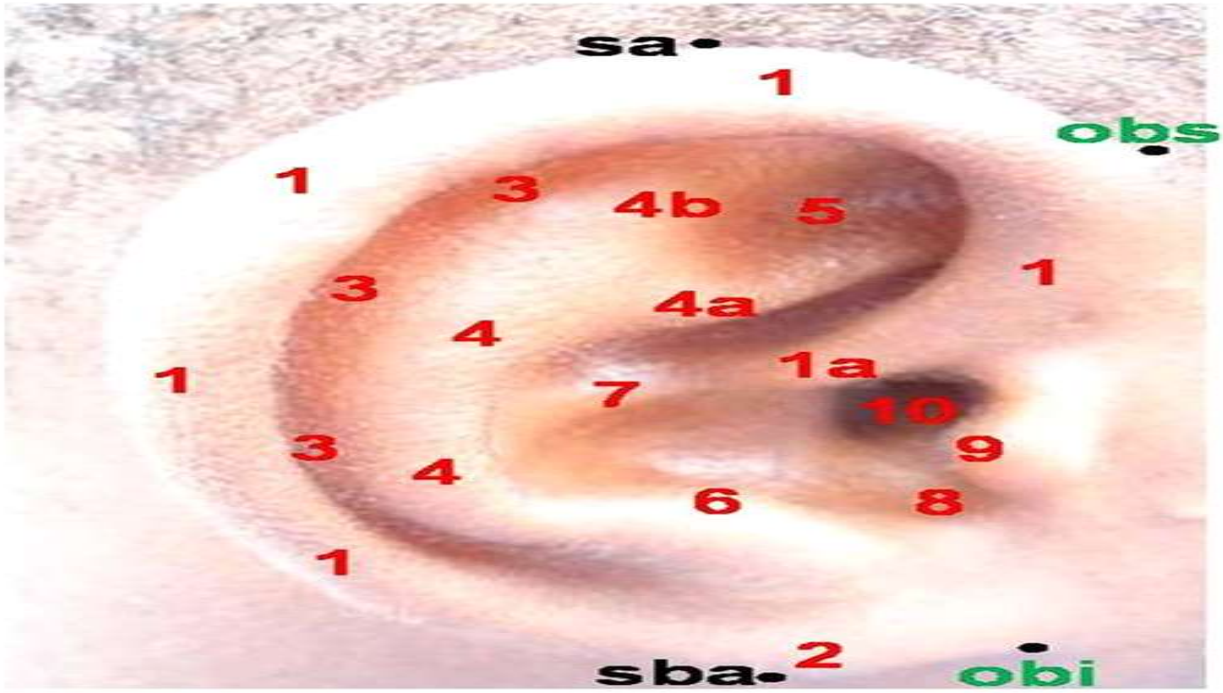


**Fig 2**. Cephalometric features of the Ear.
sa = superaurale, sba = subaurale, obs = otobasion superius and
obi = otobasion inferius.

| | | |
|---|---|---|
| 1. Helix | 1a. Crus Helicis | 2. Lobule |
| 3. Scaphoid Fossa | 4. Antihelix | 4a and 4b. Crura Antihelicis |
| 5. Triangular Fossa | 6. Antitragus | 7. Concha |
| 8. Incisure Intertragica | 9. Tragus | 10. Opening of External acoustic meatus |

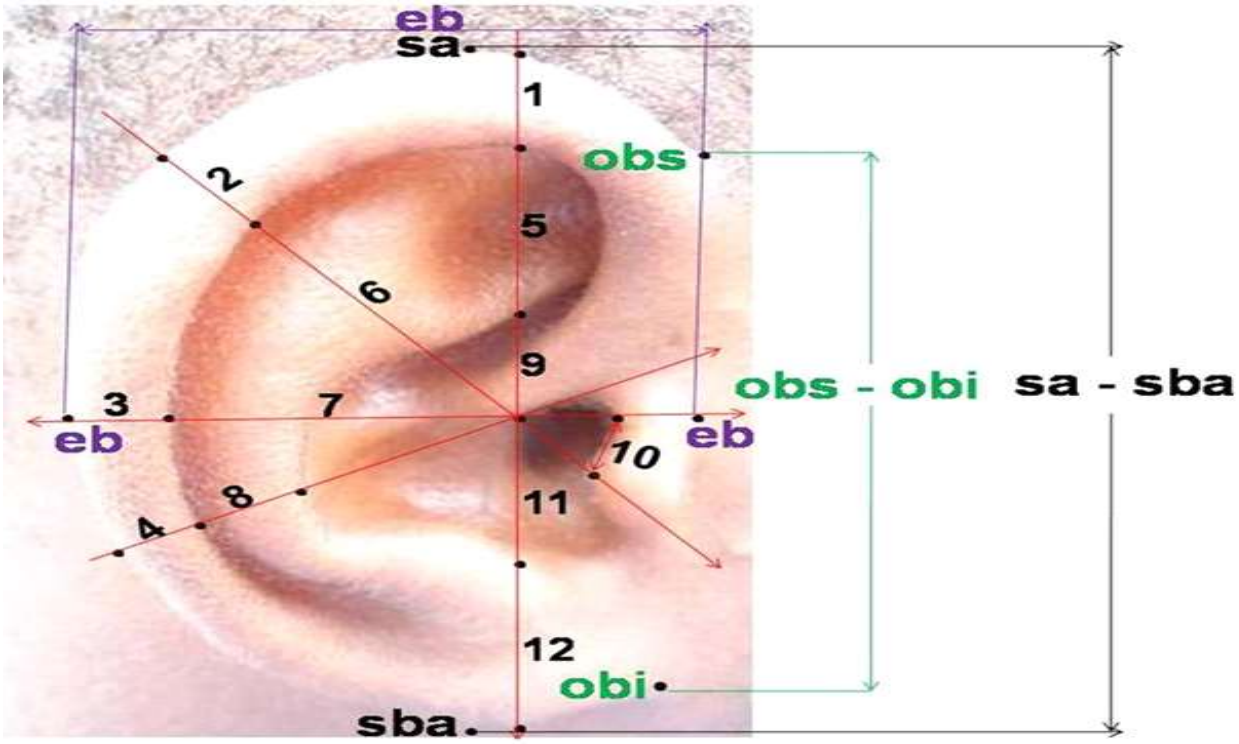


**Fig. 3**. Biometric Measurements of the Ear.
Height (Length) of the Ear: (sa - sba)
Length of Ear Insertion: (obs - obi)
Ear Breadth: (eb - eb)
Ear Index: Ear Breadth/Ear Length X 100.
Iannarelli 1 - 12 = Iannarelli System of Ear Biometrics, sa = superaurale, sba = subaurale, eb = ear breadth; obs = otobasion superius and obi = otobasion inferius.

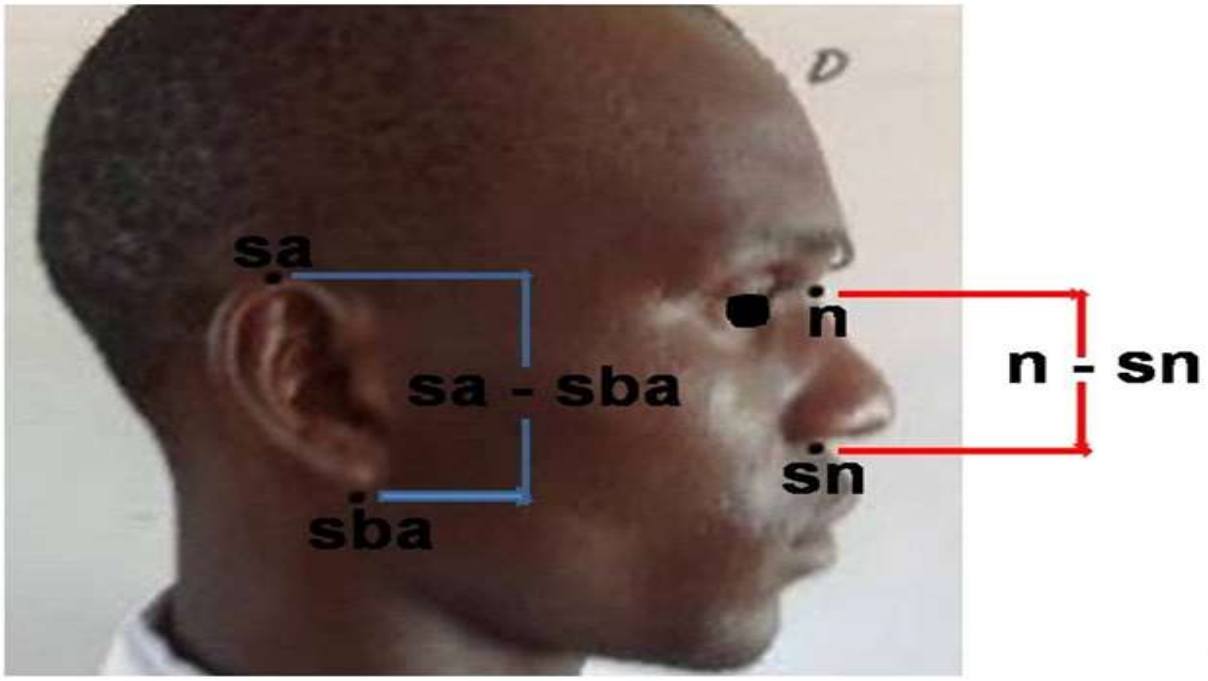


**Fig.** 4. Naso-aural Proportion.
Naso-aural Proportion: Nose Length (n - sn)/Ear Length (sa - sba).
n = nasion, sn = subnasale, sa = superaurale and sba = subaurale.

taken with 3-D SONY Cyber-shot DSC-HX7V camera (Sony Electronics Incorporated, San Diego, USA) using modified procedures for standardized photography. [15] Ear parameters (in millimeters) were computed from readings of the developed Akinlolu-Raji image-processing algorithm on ear photographs of each subject. Measured height (meters) in Hausas ranged from 1.6 - 1.9 in males and 1.3 - 1.8 in females while the range of Bodyweight in kilograms was 45 - 85 in males and 43 - 70 in females. Measured height (meters) in Yorubas ranged from 1.5 - 1.8 in males and 1.2 - 1.7 in females while the range of bodyweight in kilograms was 46 - 80 in males and 45 - 72 in females.

Height (Length) of the Ear (superaurale - subaurale), Length of Ear Insertion (otobasion superius - otobasion inferius), Maximum Ear Breadth, Ear Index, Iannarelli System (1 – 12) of Ear Biometrics and Naso-aural proportion were evaluated in this study. (Figures 2 - 4).

*Development of Akinlolu-Raji Image-processing algorithm for face recognition*

Akinlolu-Raji image-processing algorithm for forensic face recognition was developed using the modified computer programming principle of row method. [16-18] In the row method, each picture element (pixel) given by a number or three-set of numbers called grey scale depending on the color and texture of the image portion being represented, was considered column by column along a row until all the rows were covered. The grey scale of each cell was confirmed to represent the color of the marked points previously set as the threshold grey scale. The coordinates of any detected point was noted and recorded [16-18]. Since some of the detected points were not at same horizontal or vertical levels, the Pythagoras theorem was used to calculate the pixel distance before converting to actual distance using the pixels of the reference points and their computed distances as read by the Akinlolu-Raji image-processing algorithm [16-18].

*Statistical analyses*

Data collected from measurements of ear parameters and calculations of indices and proportions were statistically analyzed using the 2010 Microsoft Excel Statistical software. The two sample z-test method (used when the sample size is > 30) was employed for statistical significance pairwise comparisons of computed means of ear parameters by sex and tribe. The alpha value for test of significance was set at $P \leq 0.05$.

**Results**

*Ear biometrics by gender*

Statistical analyses of ear measurements (Mean ± S.D. in millimeters) in Hausas showed significantly higher mean value ($P<0.05$) in 6.7% of measured parameters: Iannarelli 5, but non-significantly higher mean values ($P>0.05$) in 46.7% of measured parameters: Ear Length, Length of Insertion, Ear Breadth, Iannarelli 3, 6, 9 and 10 in males compared to females. (Table 1). In contrast, there were non-significantly higher mean values ($P>0.05$) in 46.7% of measured parameters: Iannarelli 1, 2, 4, 7, 8, 11 and 12 in females compared to males (Table 3). The ear index was lower in Hausa males than in females. (Table 1).

Analyses of ear measurements (Mean ± S.D. in millimeters) in Yorubas showed significantly higher mean values ($P<0.05$) in 26.7% of measured parameters: Ear Length, Length of Insertion, Iannarelli 5 and 11, but non-significantly higher mean values ($P>0.05$) in 60% of measured parameters: Ear Breadth, Iannarelli 1, 2, 6, 7, 8, 9, 10 and 12 in males compared to females. In contrast, there were non-significantly higher mean values ($P>0.05$) in 13.3 % of measured parameters: Iannarelli 3 and 4 in females compared to males. (Table 1). The ear index was lower in Yoruba males than in females. (Table 1).

*Ear biometrics by tribe*

Statistical analyses of ear measurements (Mean ± S.D. in millimeters) showed non-significantly higher mean value ($P>0.05$) in 6.7% of measured parameters: Iannarelli 3 in Hausa males compared to Yoruba males. In addition, there were significantly lower mean values ($P<0.05$) in 26.7% of measured parameters: Ear Breadth, Iannarelli 6, 7 and 8 in Hausa males compared to Yoruba males. (Table 2). There were non-significantly lower mean values ($P>0.05$) in 66.7% of measured parameters: Ear Length, Length of Insertion, Iannarelli 1, 2, 4, 5, 9, 10, 11 and 12 in Hausa males compared to Yoruba males (Table 2). The ear index was lower in Hausa males than in Yoruba males. (Table 2).

Comparative statistical analyses of ear measurements (Mean ± S.D. in millimeters) showed non-significantly higher mean values ($P>0.05$) in 20% of measured parameters: Iannarelli 10, 11 and 12 in Hausa females compared to Yoruba females. In addition, there were significantly lower mean values ($P<0.05$) in 13.3% of measured parameters: Iannarelli 7 and 9 in Hausa females compared to Yoruba females. (Table 2). There were non-significantly lower mean values ($P>0.05$) in 66.7% of measured parameters: Ear Length, Length of

Table 1. Ear Biometrics (Mean ± S.D.) in millimeters by Sex in Hausas and Yorubas.

| Cephalometric Parameters | Hausa Males | Hausa Females | Sig. Dif. $P<0.05$ | Yoruba Males | Yoruba Females | Sig. Dif $P<0.05$ |
|---|---|---|---|---|---|---|
| Ear Length (sa - sba) | 64.7 ± 11 | 62.7 ± 9.2 | 0.80 | 77 ± 3.9 | 63.9 ± 8.3 | 0.01 |
| Ear Breadth (eb - eb) | 35.1 ± 6.3 | 34.8 ± 6.7 | 0.95 | 45.8 ± 4.7 | 41.1 ± 7.0 | 0.24 |
| Ear Index = Ear Width/Ear Length X 100 | 54.3 | 55.5 | NIL | 59.5 | 64.3 | NIL |
| Length of Insertion (obs -obi) | 60.1± 9.5 | 56.4 ± 9.6 | 0.60 | 69.4 ± 4.2 | 57.6 ± 8.6 | 0.02 |
| Iannarelli 1 | 5.2 ± 1.5 | 5.6 ±1.6 | 0.70 | 7.1 ± 2.3 | 6.9 ± 1.3 | 0.83 |
| Iannarelli 2 | 4.2 ±0.6 | 4.9 ±0.9 | 0.20 | 5.9 ± 3.0 | 5.7± 1.7 | 0.87 |
| Iannarelli 3 | 4.7 ± 1.0 | 4.6 ±0.5 | 0.96 | 4.6 ± 2.0 | 4.9 ± 1.8 | 0.81 |
| Iannarelli 4 | 4.5 ± 0.2 | 5.1 ± 1.1 | 0.30 | 5.0 ± 2.1 | 6.3 ± 2.2 | 0.39 |
| Iannarelli 5 | 15.7 ± 3.7 | 11.1 ±2.0 | 0.04 | 18.2 ± 4.8 | 11.7 ± 3.2 | 0.04 |
| Iannarelli 6 | 25.1 ± 5.8 | 21.4 ± 5.4 | 0.30 | 34.7 ± 2.9 | 29.5 ± 5.9 | 0.11 |
| Iannarelli 7 | 12.9 ± 3.7 | 14 ± 4.0 | 0.70 | 25.9 ± 1.9 | 23.8 ± 5.6 | 0.50 |
| Iannarelli 8 | 7.9 ± 2.6 | 8.1 ± 1.4 | 0.90 | 11.5 ± 1.8 | 9.0 ± 1.6 | 0.05 |
| Iannarelli 9 | 11.6 ± 4.0 | 9.9 ± 2.0 | 0.80 | 15 ± 3.0 | 13.9 ± 3.1 | 0.57 |
| Iannarelli 10 | 9.9 ± 2.7 | 9.5 ± 1.6 | 0.80 | 10.7 ± 0.7 | 9.1 ± 2.1 | 0.13 |
| Iannarelli 11 | 20.1 ± 3.3 | 21.5 ± 3.3 | 0.50 | 21.9 ± 2.0 | 18. ± 2.4 | 0.02 |
| Iannarelli 12 | 13.8 ± 3.6 | 16.2 ±1.5 | 0.20 | 15.5 ± 2.6 | 14.6 ± 3.0 | 0.61 |

S.D. = Standard Deviations of 150 determinations; Sig. Diff. = Significant Difference; *P*d"0.05 = z-test; sa = superaurale; sba = subaurale; eb = ear breadth; obs = otobasion superius; obi = otobasion inferius and Iannarelli 1 - 12 = Iannarelli System of Ear Biometrics.

Insertion, Ear Breadth, Iannarelli 1, 2, 3, 4, 5, 6 and 8 in Hausa females compared to Yoruba females (table 2). The ear index was lower in Hausa females than in Yoruba females. (table 2).

**Naso-aural proportions by gender and tribe**

Naso-aural proportion was higher in Hausa males compared to females, but lower in Yoruba males compared to females. Naso-aural proportion was higher in Hausa males compared to Yoruba males, but lower in Hausa females compared to Yoruba females. (Table 3).

**Discussion**

The obtained results of ear measurements (tables 1 and 2) implied sexual dimorphism between males and females of Hausa and Yoruba ethnic groups (with males having higher computed values than females), and that males differ from females in ear sizes. This is in agreement with the findings of earlier studies, which reported sexual dimorphism with males having higher computed values than females in comparisons of the mean values of measurements of Ear Length and/or Ear Breadth, in male and female adults in Maiduguri, Borno State [19], Hausas in Kano, Kano State [20], Australians [21], Italians [22] and India [23]. The results of ear measurements in this study are in disagreement with reported sexual dimorphism, but with males having higher mean value of Ear Width and lower mean value of Ear Length in Urhobos of Abraka, Delta State [24]. Sexual dimorphism between males and females could be due to genetic factors, which vary with gender and auricle expansion which begins earlier in males than in females and which continues till older age [20].

In addition, results of ear measurements (tables 1 and 2), implied that Hausas and Yorubas are of similar ear sizes. However, higher mean values of measured parameters were observed in Yorubas when compared to Hausas in both gender.

The computed mean values in millimetres of Ear Length (64.7 in males and 62.7 in females), Ear Breadth (35.1 in males and 34.8 in females), Length of Insertion (60.1 in males and 56.4 in females) and Ear Index (54.3 in males and 55.5 in females) in Hausas were similar, but higher than mean values of the Ear Length (60.82 in males and

Table 2. Ear Biometrics (Mean ± S.D.) in millimeters by Sex and Tribe.

| Cephalometric Parameters | Hausa Males | Yoruba Males | Sig. Diff .*P*<0.05 | Hausa Females | Yoruba Females | Sig. Diff. *P*<0.05 |
|---|---|---|---|---|---|---|
| Ear Length (sa - sba) | 64.7 ± 11 | 77 ± 3.9 | 0.05 | 62.7 ± 9.2 | 63.9 ± 8.3 | 0.84 |
| Ear Breadth (eb - eb) | 35.1 ± 6.3 | 45.8 ± 4.7 | 0.02 | 34.8 ± 6.7 | 41.1 ± 7.0 | 0.19 |
| Ear Index = Ear Width/Ear Length X 100 | 54.3 | 55.5 | NIL | 59.5 | 64.3 | NIL |
| Length of Insertion (obs -obi) | 60.1 ± 9.5 | 69.4 ± 4.2 | 0.08 | 56.4 ± 9.6 | 57.6 ± 8.6 | 0.85 |
| Iannarelli 1 | 5.2 ± 1.5 | 7.1 ± 2.3 | 0.15 | 5.6 ± 1.6 | 6.9 ± 1.3 | 0.19 |
| Iannarelli 2 | 4.2 ± 0.6 | 5.9 ± 3.0 | 0.25 | 4.9 ± 0.9 | 5.7 ± 1.7 | 0.38 |
| Iannarelli 3 | 4.7 ± 1.0 | 4.6 ± 2.0 | 0.94 | 4.6 ± 0.5 | 4.9 ± 1.8 | 0.78 |
| Iannarelli 4 | 4.5 ± 0.2 | 5.0 ± 2.1 | 0.62 | 5.1 ± 1.1 | 6.3 ± 2.2 | 0.33 |
| Iannarelli 5 | 15.7 ± 3.7 | 18.2 ± 4.8 | 0.40 | 11.1 ± 2.0 | 11.7 ± 3.2 | 0.74 |
| Iannarelli 6 | 25.1 ± 5.8 | 34.7 ± 2.9 | 0.01 | 21.4 ± 5.4 | 29.5 ± 5.9 | 0.05 |
| Iannarelli 7 | 12.9 ± 3.7 | 25.9 ± 1.9 | 0.00 | 14 ± 4.0 | 23.8 ± 5.6 | 0.01 |
| Iannarelli 8 | 7.9 ± 2.6 | 11.5 ± 1.8 | 0.03 | 8.1 ± 1.4 | 9.0 ± 1.6 | 0.36 |
| Iannarelli 9 | 11.6 ± 4.0 | 15 ± 3.0 | 0.16 | 9.9 ± 2.0 | 13.9 ± 3.1 | 0.04 |
| Iannarelli 10 | 9.9 ± 2.7 | 10.7 ± 0.7 | 0.50 | 9.5 ± 1.6 | 9.1 ± 2.1 | 0.74 |
| Iannarelli 11 | 20.1 ± 3.3 | 21.9 ± 2.0 | 0.30 | 21.5 ± 3.3 | 18. ± 2.4 | 0.09 |
| Iannarelli 12 | 13.8 ± 3.6 | 15.5 ± 2.6 | 0.41 | 16.2 ± 1.5 | 14.6 ± 3.0 | 0.29 |

*S.D. = Standard Deviations of 150 determinations; Sig. Diff. = Significant Difference; Pd"0.05 = z-test; sa = superaurale; sba = subaurale; eb = ear breadth; obs = otobasion superius; obi = otobasion inferius and Iannarelli 1 - 12 = Iannarelli System of Ear Biometrics.*

**Table 3.** Naso-aural proportion by sex and tribe.

| Cephalometric Parameters | Hausa | | Yoruba | |
|---|---|---|---|---|
| | Males | Females | Males | Females |
| Nose Lenght (nasion - subnasale) | 39 ± 7.8 | 34 ± 1.7 | 43 ± 15 | 39 ± 8.1 |
| Ear Lenght (superaurale - subaurale) | 64.7 ± 11 | 62.7 ± 9.2 | 77 ± 3.9 | 63.9 ± 8.3 |
| Naso-aural Proportion = Nose Lenght/Ear Lenght | 0.60 | 0.54 | 0.56 | 0.61 |

*S.D. = Standard Deviations of 150 determinations*

59.46 in females), Ear Breadth (30.85 in males and 29.82 in females) and Ear Index (50.81in males and 50.24 in females) in Hausas of Kano, Kano State, aged 18 to 25 years [20], Ear Length (56.73 in males and 56.86 in females) of Urhobos in Delta State, aged 6 to 60 years [24], Ear Length (60.4 in males and 57.4 in females) in Indians, aged 17 - 25 years [23] obtained from 1-D anthropometry, Length of Insertion (49.3 in males and 44.3 in females) of Australians older than 18 years of age [21] obtained from two-dimensional anthropometry, lower in males, but higher in females than the mean values of Ear Length (65.7 in males and 59.6 in females) of Australians older than 18 years of age, obtained from 2-D anthropometry [21], and higher than the Ear Length (61.93 in males and 56.11 in females) of Italians, aged 18 – 30 years obtained from 3-D anthropometry [22].

The computed mean values in millimetres of Ear Length (77 in males and 63.9 in females), Ear Breadth (35.1 in males and 34.8 in females), Length of Insertion (69.4 in males and 57.6 in females) and

Ear Index (59.5 in males and 64.3 in females) in Yorubas of Osun State were similar, but higher than the mean values of Ear Length (60.82 in males and 59.46 in females), Ear Breadth (30.85 in males and 29.82 in females) and Ear Index (50.81 in males and 50.24 in females) of Hausas in Kano, Kano State, aged 18 to 25 years [20], Ear Length (56.73 in males and 56.86 in females) of Urhobos in Delta State, aged 6 to 60 years [24], Ear Length (60.4 in males and 57.4 in females) in Indians, aged 17 – 25 years ]23] obtained from 1-D anthropometry, Ear Length (65.7 in males and 59.6 in females) and Length of Insertion (49.3 in males and 44.3 in females) of Australians obtained from 2-D anthropometry older than 18 years of age [21] and the Ear Length (61.93 in males and 56.11 in females) of Italians, aged 18 – 30 years obtained from 3-D anthropometry [22].

The observed differences in mean values of ear measurements in this study (in Hausas, aged 18 to 36 years and Yorubas, aged 15 to 33 years) compared to those of previous 1-D anthropometric studies could be due to differences in anthropometric methods, age differences of subjects selected in the different studies, ethnic and regional variations.

The results of Naso-aural proportions implied greater Ear Length than Nose Length in both gender of Hausas and Yorubas. (Table 3). This is in agreement with a previous study which reported greater Ear Length than Nose Length in African-American females, aged 18 to 30 years. [25]. Similarly, Yorubas have greater mean values of Ear Length and Nose Length than Hausas in both sexes.

## Conclusions

The developed Akinlolu-Raji image-processing algorithm can be employed for computing anthropometric, forensic, diagnostic or any other measurements on 2-D and 3-D images, and data computed from its readings can be converted to actual or life sizes. Males have higher ear sizes compared to females in Hausas and Yorubas. In addition, Yorubas of Osun State have higher ear sizes compared to Hausas of Kebbi State in both gender.

## Recommendations for future studies

Biological determination of ancestral origins of subjects should be carried out to provide definitive and representative anthropometric data as well as determine the true nature of the heterogeneity and ethnic diversity of the Nigerian population.

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# Hyperimmunoglobulin-E Syndrome (HIES) in a Nigerian child: case report and review of literature

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**Abstract**
*Introduction***:** Hyperimmunoglobulin-E syndrome (HIES), also called Job's syndrome, has an autosomal dominant (AD-HIES) form caused by mutations in the STAT3 gene and autosomal recessive (AR-HIES) forms caused by mutations in the dedicator of cytokinesis 8 (DOCK8) tyrosine kinase 2 (TYK2) mutations or phosphoglucomutase 3 (PGM3) genes.
*Case:* A 7 year old boy presented with the classical triad of staphylococcal skin infections, recurrent sinopulmonary infections, and elevated IgE levels. He had characteristic facial and dental features, and a high National Institutes of Health HIES (NIH HIES) score suggestive of AD-HIES. His chest CT showed multiple abscess cavities in the lungs, and infection with *Acinetobacter baumannii*. Genetic testing was not available, and therefore not done to confirm diagnosis of HIES. He is presently on bacterial and fungal prophylaxis and chest physiotherapy.
*Discussion:* AD-HIES is a rare primary immune deficiency condition that presents with a plethora of dental, musculoskeletal and immunological features. Genetic testing aids in the diagnosis, but this is often not available in resource limited settings. The NIH HIES scoring system retains clinical utility and is very useful in resource poor settings to facilitate early diagnosis and prevention of pulmonary complications which are associated with poor outcomes.

**Keywords***: Hyperimmunoglobulin-E, Job's syndrome, Nigerian, Child*

**Résumé**
*Introduction* **:** Le syndrome d'hyper-immunoglobuline E (SHIE), aussi appelé syndrome de Job, présente une forme autosomique dominante (AD-SHIE) causée par des mutations du gène STAT3 et des formes autosomiques récessives (AR-SHIE) causées par des mutations dans le dédicateur de la cytokinèse 8 (DOCK8) mutations de la tyrosine kinase 2 (TYK2) ou gènes de la phosphoglucomutase 3 (PGM3).
*Cas:* Un garçon de 7 ans s'est présenté avec la triade classique d'infections cutanées à staphylocoques, d'infections sino-pulmonaires récurrentes et de taux élevés d'IgE. Il présentait des caractéristiques faciales et dentaires et un score élevé de l'Institut National de Santé INS (INS SHIE) suggérant AD-SHIE. Le scanner thoracique présentait de multiples cavités d'abcès dans les poumons et une infection à *Acinetobacter baumannii* .Les tests génétiques n'étaient pas disponibles et n'ont donc pas été effectués pour confirmer le diagnostic du SHIE. Il suit actuellement une prophylaxie bactérienne et fongique et une physiothérapie pulmonaire.
*Discussion:* AD-SHIE est une rare condition de déficit immunitaire primaire qui présente une pléthore de caractéristiques dentaires, musculo-squelettiques et immunologiques. Le test génétique facilite le diagnostic, mais ceci n'est souvent pas disponible dans les contextes où les ressources sont limitées. Le système de notation INS SHIE conserve son utilité clinique et est très utile dans les environnements à ressources limitées pour faciliter le diagnostic précoce et la prévention des complications pulmonaires qui sont associées à des résultats médiocres.

**Mots - clés** *: Hyper-immunoglobuline E, Syndrome de Job, Nigérian, Enfant*

## Introduction

Hyperimmunoglobulin-E syndrome is a rare Primari Immune Deficiency PID characterized by a triad of markedly elevated IgE level, recurrent staphylococcal skin abscesses and pneumonia. In the initial report by Davis *et al* in 1966 [1], its characteristic multiple recurrent cold abscesses, often staphylococcal, akin to that seen in the biblical Job earned it the name Job's syndrome. This report in two red haired girls detailed the typical features of severe dermatitis, recurrent cold staphylococcal skin abscesses and sinopulmonary infections. In 1972, Buckley *et al* [2] reported similar features with dermatitis, characteristic coarse facies and markedly elevated IgE levels. This was thought

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to be a different syndrome from Job's syndrome and termed Buckley's syndrome. The initial two cases by Davis *et al* were later found to have elevated IgE levels as well and the name Hyperimmunoglobulin-E syndrome (HIES) was adopted. While most cases of HIES are sporadic, there appears to be two distinct phenotypes, an autosomal dominant HIES (AD-HIES) [3] and an autosomal recessive HIES (AR-HIES) [4]. The exact aetiology remained unknown for a long time until 2007 when mutations in signal transducer and activator of transcription 3 (STAT3) gene was found to be the cause of AD-HIES [5, 6]. Subsequent studies found AR-HIES was due to dedicator of cytokinesis 8 (DOCK8) [7-9] and tyrosine kinase 2 (TYK2) mutations [10]. Recent reports suggest phosphoglucomutase 3 (PGM3) mutations are also associated with AR-HIES [11-13]. The phenotypic presentation of AD-HIES and the various forms of AR-HIES appears to be quite distinct [4]. In general, while all have the typical triad of markedly elevated IgE level, recurrent staphylococcal skin abscesses and pneumonia, patients with AD-HIES in addition have cyst forming sinopulmonary infections, characteristic facies with protruding forehead and broad base of the nose, oral, dental, skeletal and connective tissue anomalies [3]. Most infections are initially due to common respiratory pathogens like *Staphylococcus aureus*, S*treptococcus pneumoniae* or *Haemophilus influenzae* but later colonization by P*seudomonas aeruginosa*, fungi like *Pneumocystis jiroveci*, *Aspergillus fumigatus, Cryptococcus* and disseminated histoplasmosis occurs. Other gram negative bacilli, usually *Pseudomonas*, are not uncommon. The pulmonary infections in them tend to be cavitary. These patients typically live into adulthood. In contrast, most AR-HIES tends to have marked allergic manifestations, including asthma, viral infections, CNS malformations and mortality in childhood is common. Infections in AR-HIES are often due to viruses like herpes simplex virus (HSV), herpes zoster virus (HZV), Epstein barr virus (EBV), human papillomavirus (HPV) and molluscum contagiosum virus (MCV). The pulmonary infections in them are usually not cavitary. Due to the variability in phenotypic expression of AD-HIES, a scoring system was developed in 1999 by Grimbacher *et al* and other researchers at the National Institute of Health to determine those likely to have the AD-HIES genotype [14]. This has been validated in a cohort of 78 patients with suspected HIES and retains clinical utility needed to facilitate initiation of appropriate therapy [15]. This is especially important in settings where genetic testing is not available.

A little over 500 cases have been reported in published English literature, very few in Africa and none identified from Nigeria [16]. We here report a case from Nigeria and review the current literature on HIES with a discussion in the context of a resource limited setting.

**Case**

In May 2015, a 7-year old boy presented with fever and haemoptysis. He had been admitted four times since age 5years for pneumonia and multiple cold suppurative skin infections, mostly due to *Staphylococcus aureus*. He recently completed a 6months course of anti-tuberculosis medications (he had four drugs for 2 months then 2 drugs for four months) 3 months before presentation. He was delivered at term; normal sized, birth weight unknown and had completed the Nigerian primary immunization schedule. His parents and younger sister were well with no history of similar features and no history of consanguinity in the family.

**Fig.1**: Scaphocephaly with marked frontal and occipital bossing, wide base of the nose and mandibular hyperdontia.

**Table 1**: National Institutes of Health HIES (NIH HIES) score of the patient

| Clinical feature | Findings in patient | Score |
|---|---|---|
| Highest Serum IgE level | >3000KU/L | 10 |
| Skin abscesses | 1-2 | 2 |
| Pneumonia episodes | >3 | 8 |
| Parenchymal lung anomalies | Pneumatocoeles | 8 |
| Retained primary teeth | >3 | 8 |
| Scoliosis, maximum curvature | None | 0 |
| Fractures with minor trauma | None | 0 |
| Highest eosinophil count | <700 | 0 |
| Characteristic face | Present | 5 |
| Midline abnormality | None | 0 |
| Newborn rash | None | 0 |
| Eczema (worst stage) | Moderate | 2 |
| Upper respiratory infections per year | 3 per year | 3 |
| Candidiasis | Oral | 1 |
| Other serious infections | Severe | 4 |
| Fatal Infections | Present | 4 |
| Increased nasal width | <1SD | 0 |
| High palate | None | 0 |
| Hyperextensibility | None | 0 |
| Lymphoma | None | 0 |
| Young age correction | >5 years | 0 |
| Total | | **55** |

On examination he had coarse facial features, scaphocephaly with marked frontal and occipital bossing and wide base of the nose (Figure 1). He had oral thrush, mandibular hyperdontia, multiple cold abscesses on the scalp and axillae with a healed incisional scar in the left axilla. In addition, he had generalized lymphadenopathy, grade 4 digital clubbing with eczematous lesions on the forearms and trunk. His weight was 18kg and height, 105cm with Z-scores of weight-for-age of +1.0, height-for-age of +1.0 and weight-for-height of +0.77. The percussion notes were dull over the left hemithorax with reduced air entry and crepitations. He also had genu varum deformity of both lower limbs. The NIH score for HIES was 55, highly suggestive of AD-HIES (Table 1).

The full blood count revealed mild anaemia, normal white cell count, no eosinophilia and normal

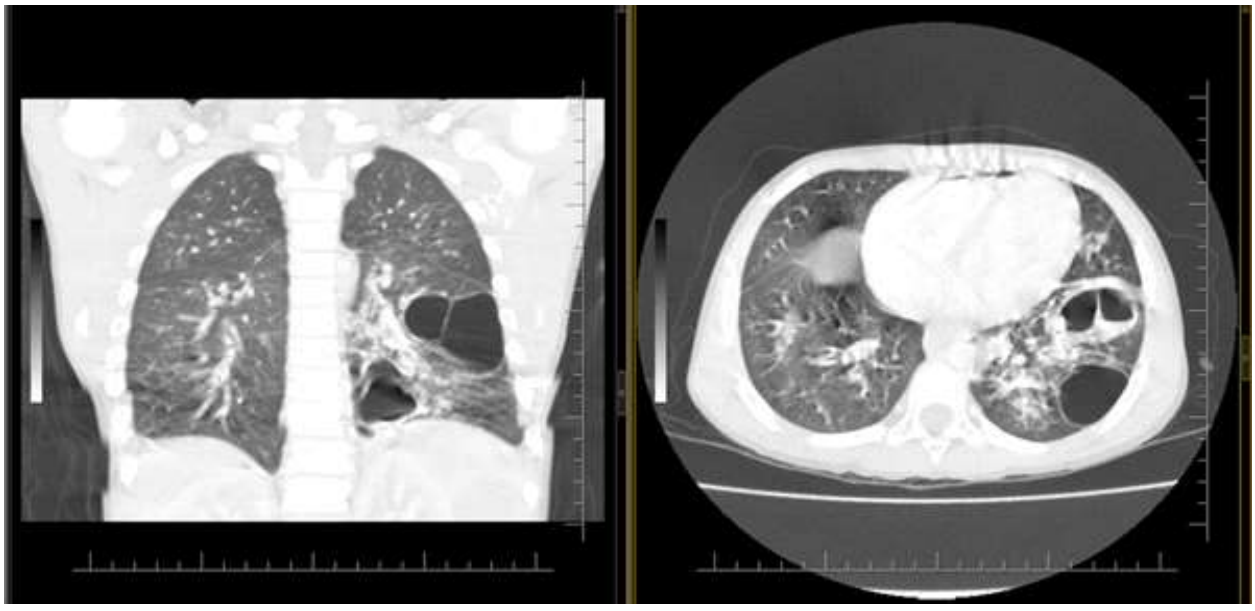

**Fig.2**: Coronal and Axial Chest CT, lung window showing multiple large thin-walled cysts in the left lower lobe, some having air-fluid levels consistent with an abscess cavity other having septations.

platelets. His haemoglobin genotype was Hb-AA, rapid HIV screen was negative. The serum IgE was >3,000KU/L (Range 1.0-5.6). Sputum was negative for acid-fast bacilli and GeneXpert MTB/RIF did not detect mycobacterium tuberculosis complex. Sputum microscopy and culture yielded *Acinetobacter baumannii* sensitive to gentamycin, cefuroxime, ceftriaxone and ceftazidime but resistant to meropenem, augmentin and amikacin. Chest CT revealed multiple cystic lesions in the left lung, some with abscesses and some huge pneumatoceles, with background consolidative changes. Multiple focal consolidations were also noted in the right lung (Figure 2). Genetic testing for STAT3 gene mutation to confirm HIES and other immunological assessments were not done as these are not available in our setting. He completed a 2-week course of cefuroxime with significant improvement. A decision was made to defer surgery at this point as he remained stable following medical management and in view of the high risk associated with surgery and anaesthesia. He remains on follow up on prophylaxis with cotrimoxazole, itraconazole and chest physiotherapy.

**Discussion**

HIES is a relatively rare PID with a prevalence of about 1 in 1,000,000, with just about 500 cases reported in literature [17]. This patient presented with the classic triad of recurrent cold skin abscesses, cavity forming pneumonia and elevated IgE level. His symptoms date back to infancy with repeated episodes of pneumonia and the chest CT showed multiple cavities with pneumatoceles and abscesses. The initial isolates were *Staphylococcus aureus*, and later a carbapenem-resistant *Acinetobacter baumannii* was isolated, most likely a colonizer. This organism is a common pathogen in our ICU, though he has never been admitted to the ICU, previous admissions to this hospital might have exposed him to this organism. Sinopulmonary infections are one of the hallmarks of HIES and include recurrent pneumonia, sinusitis, otitis media, otitis externa and mastoiditis.

If not diagnosed early and treated, with prophylaxis commenced, patients with AD-HIES and TYS2 AR-HIES may develop complications such as bronchiectasis, bronchopleural fistulae and cavitary lung lesion, with lung abscesses or pneumatoceles from the recurrent pulmonary infections. In earlier reports, these pulmonary infections are usually due to *Staphylococcus aureus*, *Streptococcus pneumoniae* or *Haemophilus influenzae* and later colonization with *Pseudomonas aeruginosa*, other gram negatives or fungi such as *Aspegillus fumigatus*. These can get disseminated and are often responsible for morbidity and mortality in them. Opportunistic infections with *Pneumocystis jiroveci [18]*, disseminated Histoplasmosis and disseminated infection following *Bacillus Calmette Guerin* (BCG) immunization are also seen in them [17, 19].

This patient also had other features of AD-HIES. The characteristic facies, prominent fore head and broad base of the nose were all manifestations of the initial and subsequent reports of AD-HIES. Other facial features seen in AD-HIES include deep set eyes, increased inter-alar distance, full lower lip and thickening of the nose and ears [3]. This characteristic facie has been correlated with oral findings in an attempt to define oral phenotypes of HIES [20]. In the report, mid-line intraoral lesions were found in 76.7% of patients and included various forms of palatal defects, fissures and grooves on the tongue, keratosis and fissures on the oral mucosa and lips. Eczematous dermatitis often without associated elevated eosinophils is common in children with AD-HIES, unlike patients with AR-HIES where eczematous dermatitis is often associated with eosinophilia and other allergic manifestations like asthma. These eczematous skin lesions are often difficult to manage and in patients treated with hematopoietic stem cell transplant (HSCT), most symptoms resolved except the eczema. Other skin lesions, often seen in AR-HIES, are of viral origin and include infection with herpes simplex, molluscum contagiosum and varicella zoster viruses. This is likely responsible for the higher proportion of squamous epithelial cancers observed in these individuals.

Dental and skeletal anomalies as well as malignancies, usually lymphomas, are also common features of AD-HIES, often not seen in AR-HIES [3, 4]. In this patient he had hyperdontia and genu varum deformity. In a series by Grambacher *et al,* 72% of patients studied had at least one form of dental anomaly [3]. Reported dental anomalies include retained primary dentition, double row of teeth with delayed eruption of permanent teeth and supernumerary teeth [3, 20]. Skeletal anomalies seen in AD-HIES include fractures following unrecognized or minimal trauma, scoliosis, craniocynostosis and reduced bone density. The scoliosis tends to present with advancing age and was seen in 76% of those aged 16years or above [3]. This patient did not have clinical or radiologic evidence of scoliosis. The phenotypic features of HIES has varying penetrance and some, especially the skeletal and connective tissue features, are age

dependent, becoming apparent with time. Connective tissue abnormalities manifest in the form of hyperextensible joints, arterial tortuosity and dilatations, and aneurysms, with reports of strokes resulting from these.

Markedly elevated IgE as observed in this patient, is a common feature of HIES. In a study of 30 patients with HIES and 70 relatives by Grimbacher *et al*, 97% of patients with AD-HIES had IgE level of >2000IU/L [3]. In neonates and infants who usually do not have such high IgE levels, a ten-fold increase in IgE levels is considered significant. Though eosinophilia was not observed in our patient, this is not uncommon in AD-HIES. It is often seen in AR-HIES where allergic features are common, often without evidence of parasitic infestations [4].

The exact immunologic deficiency in HIES remains unclear. A variety of immunologic impairments in neutrophil, lymphocyte and NK function with low CD4+ and CD8+ and reverse CD4+/CD8+ ratio have been reported. Most of these findings are consistent but their import in the diagnosis and management is still unclear. However, reduced IL-17 appears to be responsible for the infections seen in HIES [21, 22]. This is needed for bacterial and fungal killing [23] and defects in IL-17 receptors with increased susceptibility to S*taph. aureus* and candida infections has been reported [24]. In the absence of STAT3 signalling, there is impaired Th17 differentiation leading to reduced IL-17 production [21, 25]. Impaired neutrophil killing due to impaired INF-γ production has also been demonstrated [26].

The first report of genetic mutations in HIES was in 2006 by Minegishi *et al*, who identified TYK2 mutation in a patient who had been clinically diagnosed with HIES [10]. In 2007, STAT3 mutation were shown to be the cause of AD-HIES, the same mutation was later found in the original patient described with Job's syndrome [5, 27]. AR-HIES has predominantly immunologic features and appears to be caused by a variety of genetic mutations, DOCK8, TYK2 and PMG, albeit with distinct phenotype variations [28]. Following the identification of mutations associated with HIES, genetic testing has significantly improved the certainty with which HIES is diagnosed.

Unfortunately, access to this and immunologic evaluations like immunoglobulin levels or lymphocyte subsets are not available in resource constrained settings like ours. This is a major challenge in the evaluation of children with PID and has been highlighted by similar reports from Africa [16]. Therefore detailed immunologic evaluation and genetic testing to confirm STAT3 mutation were not carried in this patient. But, the limited evaluation, characteristics of AD-HIEs and high NIH HIES score, strongly supports a diagnosis of AD-HIES. The NIH HIES scoring guide therefore remains a very important tool for diagnosis of HIES. This is particularly important in resource limited settings to facilitate early institution of prophylactic therapy which has been found to improve quality of life and outcomes in HIES [29].

The management of HIES remains a challenge and optimal therapy remains unclear. Antimicrobial prophylaxis is an important management focus, mainly cotrimoxazole for anti-staphylococcal prophylaxis and itraconazole for fungal prophylaxis. Prophylaxis with cloxacillin having good outcomes has been reported, but development of resistance with repeated exposure and increasing prevalence of methicillin resistant *staphylococcus aureus* (MRSA) are issues of concern. In this regard, cotrimoxazole appears to be a good option, as it also provides additional prophylaxis against Pneumocystis pneumonia. Itraconazole appears to be the ideal choice for fungal prophylaxis as it is effective against most fungi; including *Aspergillus* spp.

Various modalities have been employed with variable success rates [19]. There have been reports of successes with IVIG and IFN-gamma therapy [30]. Some other studies have reported favourable outcomes following HSCT) with some patient being cured of the immunologic and haematologic dysfunctions [31-36]. There appears to be better response in AR-HIES, and in some it has been curative [36, 37]. However, in some AD-HIES, HSCT was curative while in others the eczematous and pulmonary complications did not resolve after HSCT [32, 38-40]. In another report, the features of HIES resolved in the patient, but he later died from a complication of HSCT [41].

Pulmonary complications with cavity formation and severe haemoptysis are a major cause of morbidity and mortality in patients with HIES. Once the pulmonary complications develop, the management becomes very challenging and optimal surgical management remains unclear. Surgical management is often associated with perioperative complications, with bronchopulmonary fistulae being the commonest post-op complication [42]. Wound healing and tissue remodelling is impaired probably as a result of the underlying defect from STAT3 mutation. The other parts of lungs often do not compensate enough after surgery and anaesthesia remains a major risk in them [43]. Therefore, surgery

is generally not advised, except in cases of recurrent severe haemoptysis and failed medical therapy [42]. It is therefore imperative that the diagnosis of HIES be made early and infections adequately treated, with early institution of antibacterial and antifungal prophylaxis.

In general, the outcome of HIES is poorer in patients with AR-HIE and in patients with sinopulmonary complications or malignancies. In resource limited settings, advanced therapeutic options for evaluation and diagnosis are generally unavailable, or extremely expensive. Early identification and characterization, using the NIH HIES scoring system, *Staphylococcus aureus* decolonization therapy, and antimicrobial prophylaxis along with patient education will continue to form the main stay of management.

**Ethics**

The manuscript was prepared in full compliance with the principles of the revised Helsinki declaration and written consent was obtained from the parent of the patient for use of the clinical details and pictures for publication.

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# Experience and satisfaction with institutionalised medical check-up: case study of the staff of the College of Medicine, University of Ibadan, Nigeria

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**Abstract**

*Background***:** Institutionalised Medical Check-up (IMC) is to ensure optimal health. While the efforts are in the right direction, the uneven demand and perceptions of poor health service delivery that plague the general public may influence the uptake of this service. The study investigated the experience and satisfaction of the staff of College of Medicine, University of Ibadan with IMC.

*Method:* Self-developed validated semi-structured questionnaire was administered on a cross-section of 301 staff of College of Medicine, University of Ibadan.

*Result:* Respondents' age was 43.9±15.7 years, 36.5% were from the service departments, 32% were senior non-teaching staff and only 11% teaching staff. Majority (69.4%) participated to know their health status while 38.9% did it to satisfy the establishment. Majority (89.7%) completed the IMC, 84% collected all their results and 67.7% returned for a feedback. Overall, 40.9% of respondents were satisfied with the medical check-up; 70% of these were least satisfied by time spent, while provider-client interaction had the highest satisfied respondents (88.0%). Majority (88.4%) of respondents recommended that the IMC should continue. Educational level of respondents was significantly inversely associated with level of satisfaction (p=0.0222), with secondary education and below (65%) showing higher level of satisfaction.

*Conclusion:* Client satisfaction among staff in relation with the University of Ibadan medical check-up was low. Respondents with higher education were less satisfied with the service. Incorporation of effective communication and continuous health education into standard of healthcare and health system review could increase participation and effectiveness of Institutionalised Medical Check-up.

**Keywords**: *Institutionalised medical check-up, Experience, Satisfaction, University staff*

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**Résumé**

*Contexte* **:** L'examen médical institutionnalisé (EMI) vise à assurer une santé optimale. Tandis que les efforts vont dans la bonne direction, la demande inégale et les perceptions de la mauvaise manière de prestation des services de santé qui affectent le grand public peuvent influencer l'utilisation de ce service. L'étude a examiné l'expérience et la satisfaction avec l'EMI, du personnel du Collège de Médecine de l'Université d'Ibadan.

*Méthode:* Un questionnaire semi-structuré, validé, auto-développé, a été administré à 301 membres du personnel du Collège de Médecine de l'Université d'Ibadan.

*Résultat:* L'âge des répondants était de 43,9 ± 15,7 ans, 36,5% provenaient des départements de service, 32% étaient des cadres non enseignants et seulement 11% du personnel enseignant. La majorité (69,4%) a participé pour connaître leur état de santé, tandis que 38,9% l'ont fait pour satisfaire l'établissement. La majorité (89,7%) a rempli l'EMI, 84% ont recueilli tous leurs résultats et 67,7% sont revenus pour un feedback. Dans l'ensemble, 40,9% des répondants étaient satisfaits du bilan médical. 70% d'entre eux étaient moins satisfaits par le temps passé, alors que l'interaction fournisseur-client avait les répondants les plus satisfaits (88,0%). La majorité (88,4%) des répondants ont recommandé que l'EMI soit maintenu. Le niveau de formation des répondants était significativement inversement associé au niveau de satisfaction (p = 0,0222), avec l'enseignement secondaire et inférieur (65%) affichant un niveau de satisfaction plus élevé.

*Conclusion:* Le niveau de satisfaction des clients vis-à-vis de la visite médicale à l'université d'Ibadan était faible. Les répondants avec des niveaux d'études supérieures étaient moins satisfaits du service. L'intégration d'une communication efficace et d'une éducation sanitaire continuée dans les normes de santé et la révision du système de santé pourrait accroître la participation et l'efficacité de l'examen médical institutionnalisé.

**Mots - clés** : *Examen médical institutionnalisé, Expérience, Satisfaction, Personnel universitaire*

## Introduction

In primary care practice, the general health check (also termed periodic health evaluation or routine medical examination) is the usual mechanism used to screen asymptomatic people for diseases [1]. The term is generally not meant to include visits for the purpose of new-born checks, pap smears for cervical cancer, or regular visits for people with certain chronic medical disorders (for example, diabetes). This involves a medical history, a (brief or complete) physical examination and sometimes laboratory tests. Some more advanced tests include ultrasound and mammography [2].

Client satisfaction is the level of satisfaction that clients experience having used a service. It therefore reflects the gap between the expected service and the experience of the service, from the client's point of view [3, 4]. Donabedian (1988), emphasized that client satisfaction is of fundamental importance as a measure of the quality of care [5, 6]. Client experience is what happens to people when they are interacting with the health care system and trying to have their needs met [7]. The relative success of a given health care intervention depends largely on patient's perspective vis-à-vis the health care provider's perspective [8].

In Nigeria, health care delivery systems have attracted many negative comments. These negative comments range from poor quality of service delivery to service delay, discontinuity of care, indifferent staff attitude, and bureaucratic procedures. These have led to poor public confidence in healthcare [9]. Few studies have sought patients' views on satisfaction with IMC, and there is little effort to involve them in measuring satisfaction or defining health service standards [10].

The University of Ibadan administration in a pioneering action mandated its health services to provide free comprehensive medical check-up for all staff. This exercise was to promote good health and prevent sudden death from preventable diseases for staff of the University. The screening exercise focused on six (6) major diseases; hypertension, diabetes, glaucoma, obesity, lipid disorders, hepatitis B infection and malignancies such as cervical, prostate and breast cancer. An assessment of the extent of client satisfaction with health services is relevant, as satisfied clients are more likely to comply with treatment, take an active role in their own care, continue using medical care services and stay within a health provider and maintain with a specific system [11]. The study therefore investigated the experience and level of satisfaction with IMC among staff of University of Ibadan who participated in the general MC.

## Materials and method

*Settings*

The College of Medicine (formerly the faculty of Medicine) was one of the first faculties created when the University College, Ibadan came into being in 1948. The College is situated on the grounds of the University College Hospital, which is the teaching Hospital for the University of Ibadan. It consists of four faculties: Faculty of Basic Medical Sciences, Faculty of Clinical Sciences, Faculty of Public Health, and the Faculty of Dentistry. The total population of staff of College of Medicine is 951; 421 teaching staff, 388 senior non-teaching and 142 junior non-teaching staff [12].

*Study design*

The study was cross sectional and descriptive in design, using a two-stage sampling technique to select respondents who participated in the general medical check-up and willing to give an informed consent. Staffs of College of Medicine were stratified into 4 faculties and service departments and the respondents were purposively selected.

*Sample size*

The required sample size of 301 respondents was obtained using Epi-info statistical calculator for estimating minimum sample size in descriptive health studies. The minimum sample size was increased by 10% to take care of non-response, incomplete responses and refusals.

*Data collection and management*

A pre-tested self-administered, semi-structured questionnaire was used for the survey. The questionnaire was divided into three (3) sections and contained questions addressing research variables namely: socio-demographic information, experience of respondents with the institutionalized medical check-up and level of satisfaction with IMC. An open-ended question was used to elicit information on how IMC may be improved. Satisfaction was measured on a 14-point scale; scores less than 14 was categorised as not satisfied. Experience was assessed using 16 selected domains of what happened during the MC exercise. Four undergraduate students were trained as research assistants. Data from the questionnaires were entered and analysed using SPSS version 16 software from which descriptive and inferential statistics were derived ($p=0.05$) and results were presented in form of frequencies and percentages.

*Ethical consideration*

This study protocol was duly reviewed and approval to conduct the study was given by the UI/UCH Institutional Review Committee. Oral informed consent was obtained from respondents before questionnaire administration. Ethical issues like voluntariness, confidentiality, opportunity to decline interview at any stage and non-exposure to risk was also discussed with each respondent before data collection commenced.

## Results

*Socio-demographic characteristics*

Ages of respondents ranged from 21 to 61years with a mean of 43.9±15.7 years. Majority (65.2%) were within 30 and 49years. About fifty-four percent (53.8%) of the respondents were males, (86.7%) were married and 87% of respondents had tertiary education. Some (19.6%) had spent 20 or more yearsin employment at the institution while 29.2% had spent less than five years. Respondents' average monthly income ranged from less than ¦ 50,000 to over ¦ 201,000; 49.7% earned less than ¦ 50,000 (see table 1). Additionally, 36.5% of respondents were from the service, 22.9% each from faculties of Basic Medical Sciences and Clinical Sciences while only 5.3% were from the faculty of Dentistry. Thirty-two percent of the respondents were senior non-teaching staff while only 11% were teaching staff.

**Table 1**. Socio-Demographic information of respondents (N=301)

| Variables | Frequency | Percentage |
|---|---|---|
| *Age (years)* | | |
| <30 | 29 | 9.6 |
| 30-39 | 98 | 32.6 |
| 40-49 | 98 | 32.6 |
| 50+ | 76 | 25.2 |
| *Sex* | | |
| Male | 162 | 53.8 |
| Female | 139 | 46.2 |
| *Marital status* | | |
| Single | 33 | 11.0 |
| Married | 261 | 86.7 |
| Separated | 3 | 1.0 |
| Divorced | 3 | 1.0 |
| Widowed | 1 | 3 |
| *Educational status* | | |
| Primary education | 8 | 2.7 |
| Secondary education | 32 | 10.6 |
| Tertiary education | 261 | 86.7 |
| *Years of employment* | | |
| <5 | 88 | 29.2 |
| 5-9 | 74 | 24.6 |
| 10-19 | 80 | 26.6 |
| 20+ | 59 | 19.6 |
| **Average monthly Income (Naira) (N=300)* | | |
| ≤50000 | 149 | 49.7 |
| 51000-100000 | 75 | 25.0 |
| 101000-200000 | 52 | 17.3 |
| ≥201000 | 24 | 8 |

**Table 2**: Perception of Medical Check-up (N= 301)

| Variables | Frequency | Percentage |
|---|---|---|
| *Respondents' health rating* | | |
| Excellent | 87 | 28.9 |
| Very good | 143 | 47.5 |
| Good | 67 | 22.3 |
| Fair | 4 | 1.3 |
| *Respondents who had undergone medical check-up in the past 12 months* | | |
| Yes | 194 | 64.5 |
| No | 105 | 34.9 |
| Don't know | 2 | 0.7 |
| *Frequency of medical check-up* | | |
| Monthly | 95 | 31.6 |
| Every 6 months | 141 | 46.8 |
| Yearly | 51 | 16.9 |
| Every 2 years | 5 | 1.7 |
| I don't know | 9 | 3.0 |

*Perception and practice of medical check-up before the mandatory medical check up*

As shown in table 2, an assessment of the perception and practice of medical check-up before the mandatory medical check-up showed that 47.5% and 28.9% of the respondents rated their health as being very good and excellent respectively. Out of the total of 301 respondents, 64.5% had undergone medical check-up within 12 months before the mandatory IMC in 2011. In addition, 141(46.8%) respondents opined that an individual should undergo a medical check-up twice a year. Table 3 showed that 64.8% reported previous practice of medical check-up. However, only 181 reported to frequency of MC out if which only 29.6% had once a year. On further query, about 47.2% of these had their last heck-up one to four years before the mandatory IMC. Among these, the most frequent reason for medical check-up was to check their health status (78.3%).

*Experiences with University of Ibadan institutionalized medical check-up*

As shown on Table 4a, 69.6% of the respondents claimed that they got the information about the

**Table 3**: Practice of Medical check-up before the mandatory medical check-up by the University (N=301)

| Variable | Frequency | Percentage |
|---|---|---|
| *Respondents who had undergone medical check-up before the one mandated by the University of Ibadan (N=301)* | | |
| Yes | 195 | 64.8 |
| No | 106 | 35.2 |
| *Frequency of medical check-up (N=181)* | | |
| Monthly | 35 | 11.6 |
| 2-4 times a year | 50 | 16.6 |
| once a year | 89 | 29.6 |
| Can't remember | 3 | 1.0 |
| whenever ill | 4 | 1.3 |
| *Respondents' last medical check -up before the one mandated by the University (N=161)* | | |
| <1 year | 62 | 31.8 |
| 1-4 years | 92 | 47.2 |
| 5+ | 8 | 4.1 |
| Can't remember | 7 | 3.8 |
| *Purpose of the medical check-up (N=180)* | | |
| check health status | 141 | 78.3 |
| Medical examination for pre- employment | 16 | 8.9 |
| medical appointment | 7 | 3.9 |
| Staff games | 6 | 3.3 |
| Antenatal | 5 | 2.8 |
| Post-surgery | 2 | 1.1 |
| routine for all drivers of the institution | 2 | 1.1 |
| Can't remember | 1 | 0.6 |

**Table 4a:** Experiences with institutionalized medical check-up in the University of Ibadan

| Variable | Frequency | Percentage |
|---|---|---|
| *Means of Information (N=300)* | | |
| Internal memorandum | 209 | 69.6 |
| Seminar/conference | 23 | 7.7 |
| Email | 4 | 1.3 |
| Friends | 26 | 8.7 |
| Colleagues | 38 | 12.7 |
| *Adequacy of the Information (N=299)* | | |
| Yes | 271 | 90.6 |
| No | 28 | 9.4 |
| *Respondent felt compelled to undergo the medical check-up (N=301)* | | |
| Yes | 192 | 63.8 |
| No | | 109 |
| 36.2 | | |
| *Health status before undergoing the medical check-up mandated by the University(N=301)* | | |
| Poor | 12 | 4.0 |
| Fair | 23 | 7.6 |
| Good | 186 | 61.8 |
| Excellent | 80 | 26.6 |
| ***Reasons for undergoing the medical check-up at that time.* | | |
| To satisfy the establishment. | 117 | 38.9 |
| Early diagnosis and treatment. | 67 | 23.3 |
| Body fitness | 119 | 39.5 |
| Know your Health status | 209 | 69.4 |

***Multiple responses were allowed*

medical check-up through internal memorandum while 12.7% heard from their colleagues. Majority, (90.6%) of the respondents acknowledged that the information was adequate and well understood, however, 63.8% of the respondents felt compelled to participate in the medical check-up programme. The major reason for participating was to know health status (69.4%) and to satisfy the establishment (38.9%). Although 82.8% of respondents spent between one to five days to complete the medical check-up, 75.7% considered the timing of the medical check-up convenient for them (Table 4b).

Waiting time for consultation experienced by 66.7% of respondents was about 30 minutes while 2.8% reportedly spent over two hours waiting before consultation. One hundred and forty-one (47.2%) of respondents acknowledged that the healthcare staff gave them opportunity to ask questions and 53.8% had information explained to them in the way they could understand. Out of the 277 respondents who said the medical check-up was beneficial to them, 84.5% acknowledged that it enabled them to know their health status (Table 4c). As shown on table 4d, 89.7% of the respondents completed the medical check-up, 84% collected all their results and only 67.7% went back for a feedback. Out of the 32.3% of respondents who did not take their results back to the doctor, 15(24.2%) said the results were fine and saw no need to return to the doctor. Respondents with major findings that required referral or further investigation were 40.1%.

*Satisfaction with institutionalized medical check up*

Table 5 showed the domains of satisfaction of services by respondents. Time spent for the medical check-up programme had the least percentage of satisfied respondents (67.8%) while provider-client interaction had the highest satisfied respondents (88.0%).

**Table 4b**: Experiences with institutionalized medical check-up in the University of Ibadan

| Variable | Frequency | Percentage |
|---|---|---|
| *Timing of the medical check-up convenient for the respondents (N=301)* | | |
| Yes | 228 | 75.7 |
| No | 73 | 24.3 |
| *Days spent in completing the medical check-up(days) (N=297)* | | |
| 1-5 | 246 | 82.8 |
| 6-10 | 41 | 13.8 |
| 11-15 | 9 | 3.1 |
| Don't remember | 1 | 0.3 |
| *Medical check-up is a waste of time (N=301)* | | |
| Yes | 85 | 28.2 |
| No | 216 | 71.8 |
| *Waiting time before consultation started (N=282)* | | |
| d"30 minutes | 188 | 66.7 |
| 31-60 minutes | 69 | 24.5 |
| 61-120 minutes | 17 | 6.0 |
| e"121 minutes | 8 | 2.8 |
| *Respondents given the time and opportunity to ask questions about anything (N=299)* | | |
| Yes, at every point in time | 141 | 47.2 |
| Yes, most of the time | 79 | 26.4 |
| Yes, some of the time | 55 | 18.4 |
| No, I was not given the opportunity | 15 | 5.0 |
| I don't know/ I can't remember | 9 | 3.0 |
| *Healthcare staff explain things to respondent in a way that you could understand (N=299)* | | |
| Yes, completely | 161 | 53.8 |
| Yes, to some extent | 113 | 37.8 |
| No, they did not | 18 | 6.0 |
| I didn't need an explanation | 7 | 2.4 |

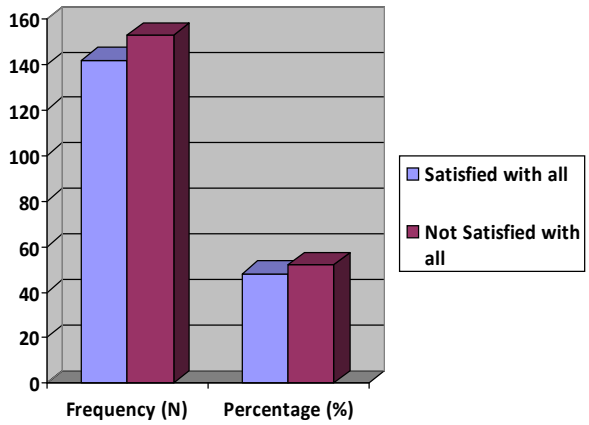


**Fig.1:** Category code for Satisfaction level with Institutionalized medical check-up (IMC) (N=295)

*Overall satisfaction with services*

As shown in Fig 1, if those who selected satisfactory and not satisfactory were pooled across the categories, 48.1% of the patients were satisfied with the services received from the institutional health centers.

*Association between IMC and selected sociodemographic characteristics*

As shown in table 6, the association of institutional medical check-up and selected related socio-demographic characteristics of respondents revealed a significance only with their educational status; where an inverse relationship was observed.

**Table 4c:** Experiences with institutionalized medical check-up in the University of Ibadan

| Variable | Frequency | Percentage |
|---|---|---|
| *Medical check-up was beneficial to respondents (N=301)* | | |
| Yes | 277 | 92.3 |
| No | 23 | 7.7 |
| *Ways in which medical check-up was beneficial to respondents (N=277)* | | |
| Able to know the present health status | 234 | 84.5 |
| Reduced medical expenses | 6 | 2.2 |
| follow up on previous test to ascertain the fitness of my health | 15 | 5.4 |
| It gave me room to make other complaints known to the doctors and got treatment where necessary | 2 | 0.7 |
| Rekindled the consciousness of medical check up | 1 | 0.4 |
| No reason | 17 | 6.1 |
| *Reasons why some respondents didn't see the Medical check-up as beneficial (N= 23)* | | |
| I have a personal doctor | 1 | 4.3 |
| I was not sick | 3 | 13.0 |
| Waste of time | 1 | 4.3 |
| No need to participate | 5 | 21.7 |
| Improper coordination and planning for the programme | 2 | 8.9 |
| No reason | 11 | 47.8 |

Respondents with secondary educational level and below were more satisfied with the IMC compared with those with tertiary level of education.

**Table 4d**: Experiences with institutionalized medical check-up in the University of Ibadan

| Variable | Frequency | Percentage |
|---|---|---|
| *Respondents who completed the medical check-up (N=300)* | | |
| Yes | 269 | 89.7 |
| No | 31 | 10.3 |
| *Reasons why some respondents did not complete the medical check-up (N=31)* | | |
| Travelled | 3 | 9.7 |
| Time factor | 10 | 32.6 |
| Large Population of people waiting to see the doctor | 3 | 9.8 |
| Unable to do Pap smear | 1 | 3.2 |
| Could not do cervical test because I was pregnant | 2 | 6.5 |
| Staff were not patient enough so I left | 1 | 3.2 |
| No money | 1 | 3.2 |
| No reason | 10 | 31.8 |

Ibadan main campus; since most of the college teaching staff were based on the University College Hospital premises, this could further make access difficult. Secondly, also, the teaching staffs of the College of Medicine are likely to be more knowledgeable about health matters and this could make them less enthusiastic about undergoing such institutionalised medical checks. Studies have shown a relatively poor utilization of health services among healthcare professionals [13-15]. Additionally, it could have resulted from the non-probability sampling technique adopted for the study which does not guarantee a representative sample.

In accordance with the religious mentality of many Nigerians, majority of respondents rated their health as very good, thus care should be taken in totally accepting this result as there is a high chance of underreporting of poor health. Furthermore, the use of self-rated health as a measure of health status has been criticized as factors such as age; ethnicity and educational status could highly influence and constitute a major limitation to it [16]. An

**Table 5:** Satisfaction with institutionalized medical check-up (N=301)

| Statements | Satisfactory N (%) | Not Satisfactory N (%) | Not Sure N (%) |
|---|---|---|---|
| During my visit to the health clinic, the doctors/health officers explained things in a way I could understand (N=298) | 265 (88.0) | 29 (9.6) | 4 (1.3) |
| The time spent for the medical check-up programme (N=300) | 204 (67.8) | 92 (30.6) | 4 (1.3) |
| The quality of the screening tests I did during my visit | 259 (86.0) | 31 (10.3) | 11(3.7) |
| The time spent to discuss with the doctor during consultation (N=299) | 239 (79.4) | 53 (17.6) | 7 (2.3) |
| The quality of courtesy I received during my visit (N=299) | 232 (77.1) | 53 (17.6) | 14 (4.7) |
| I received adequate answers to the questions I asked (N=299) | 241 (80.1) | 48 (15.9) | 10 (3.3) |
| I had enough time to discuss my medical problem with the doctors/ health officers or nurse (N=296) | 225 (74.8) | 57 (18.9) | 14 (4.7) |

## Discussion

Many of the respondents recruited were senior non-teaching staff and from the service departments of the College of medicine. The preponderance of non-teaching staff in the sample could be due to the burden of teaching, research and other administrative duties could prevent teaching staff from utilizing the services, the services were provided at the University Health Services (Jaja clinic) on the University of

encouraging aspect of individual consciousness towards health seeking is shown in this study as about half of the respondents opined that medical check-up should be done twice in a year. This is demonstrated in the self-report of about two-third of respondents of having undergone medical check-up in the past twelve months. , it is of note that hospital visits in itself is an important first step in disease prevention through early diagnosis and

**Table 6:** Association between IMC and selected socio-demographic characteristics

| Demographic Characteristics | Satisfaction with all aspects of care Yes (%) | No (%) | Total | $\chi^2$-value (p-value) |
|---|---|---|---|---|
| *Sex* | | | | 2.284 |
| Male | 83(52.2) | 76(47.8) | 159 | (0.131) |
| Female | 59(42.4) | 77(56.6) | 136 | |
| *Age (in year)* | | | | 2.310 |
| <30 | 15 (55.6) | 12(44.4) | 27 | (0.511) |
| 30-39 | 48 (49.5) | 49(50.5) | 97 | |
| 40-49 | 41 (42.3) | 56(57.7) | 97 | |
| 50+ | 38 (51.4) | 36(48.6) | 74 | |
| *Years of Employment* | | | | 1.444 |
| <5 | 43(50.6) | 42(49.4) | 85 | (0.695) |
| 5-9 | 31(42.5) | 42(57.5) | 73 | |
| 10-19 | 38(48.1) | 41(51.9) | 79 | |
| 20+ | 30(51.7) | 28(48.3) | 58 | |
| *Cadre* | | | | **3.114** |
| Teaching Staff | 13(40.6) | 19(69.4) | 32 | (0.211) |
| Senior non-teaching staff | 77(45,6) | 92(54.4) | 169 | |
| Junior non-teaching staff | 52(55.3) | 42(44.7) | 94 | |
| **Marital Status* | | | | 1.294 |
| Single (not married) | 19(57.6) | 14(42.4) | 33 | (0.255) |
| Married | 120(47.1) | 135(52.9) | 255 | |
| *Education* | | | | 5.272 |
| Secondary and Below | 26(65) | 14(35) | 40 | (0.022)** |
| Tertiary | 116(40.5) | 139(54.5) | 255 | |

- *Missing responses were left out* *** significant*

prompt treatment. The importance of regular medical check cannot be overemphasized; according to the WHO, two thirds of about 55 million people that died worldwide in 2011 were due to non-communicable diseases such as cancer, diabetes, and chronic cardiovascular and lung diseases [17].

The major purpose of undergoing the medical check was to check individuals' health status. The relatively long period between the respondents' last medical check (1-4 years) and the one introduced by the University shows that the University's programme may have reawakened many respondents about knowing their health status. These further stress the importance of the IMC for staff even though health services in a country like Nigeria faces potential barriers of lack of time and funds especially since health care is obtained through out-of-pocket expenditure. [18]

The major medium of information about the medical check-up was internal memorandum while information through electronic and other media remained very low. Hence the use of traditional methods of communication such as internal memo still appears to be popular and the authorities should take advantage of this medium for future dissemination of information. The very low proportion that reported getting the information through email could be attributed to inadequate electronic and internet facilities within the system [190]. Almost all the respondents testified that the information about the medical check was adequate and well understood, thus increasing their perceived need for the exercise. However, despite seeing the need to participate in the medical check-up, more than half of the respondents felt compelled by the University administration to undergo the medical check-up. This result implies that some respondents perceived they were being forced to take the check-up, a situation that could have affected their attitudes to the programme. An exercise such as a medical check-up should be voluntary; rather than using a coercive approach to change staff's health seeking behaviour, a normative-re-educative approach should be adopted for behavioural change.

The study also revealed that majority of the respondents spent a short period (1-5days) for the investigation. This prompt service portends well for future similar programmes and staffs are more likely

to participate based on a good first experience. Waiting time of respondents before consultation started was fair enough as majority of them spent less than about half an hour before consultation started. Respondents were also given the time and opportunity to ask questions during the consultation and also the providers explained things to them in a way they could understand. The finding that only 67% returned to the doctor with their test results for feedback affirmed the reasons mentioned for participating in the exercise which is to satisfy the University management. Perhaps more would have returned if the normative-re-educative approach of behavioural change was adopted.

The overall satisfaction of patients with different aspects of care was good, over three quarters of respondents in six out of seven aspects investigated were satisfied with the service. Several authors have reported the relatively high level of satisfaction found in this study. For instance Iliyasu *et al* (2010)[20], Olusina *et al* (2004)[21] and Eze (2006)[22] reported that 83%, 75% and 53% of out-patients in Kano, Ibadan and Enugu respectively were satisfied with the services received from different units although in teaching hospitals.

This study shows that there is a significant relationship between level of education and satisfaction. This is in agreement with Iliyasu *et al* (2010) [21] who stated that the satisfaction levels could be affected by socio-cultural differences and variation in levels of literacy. The lower satisfaction expressed by those with higher educational level could indicate higher expectations about quality of care from the more educated especially since they more likely utilize private facilities or hospitals with higher charges and possibly better services. However, studies have shown that patients differ in their satisfaction with the quality of care and is influenced by a variety of factors such as patient demographics health status, characteristics of the health care provider i.e. technical expertise, interest in patient oriented care and waiting time influence the perceived quality of care in hospitals [23-26].

Patient waiting time in outpatient clinics is often the major reason for patients' complaints regarding their experiences in outpatient clinics. Therefore, patient satisfaction with waiting time plays a crucial role in the overall satisfaction with services. In the present study, time spent for the medical check-up programme had the lowest percentage of satisfied staff (67.8%). Studies have shown that long waiting times are usually an issue in government owned hospitals [27].

This study found that a high proportion of patients (88%) were satisfied with care provided by doctors, nurses and other health workers. Patients were particularly satisfied with their explanation and their listening abilities. Good communication between patients and care providers has been described as the single most important component of good medical practice, not only because it identifies problems quickly and clearly, but it also defines expectation and help to establish trust between the clinician and the patient [28-30].

## Conclusion

Overall, this study has revealed that staff of the College of Medicine reportedly have acceptable experiences during the mandatory, University of Ibadan, institutional medical check-up. However, waiting time was a main domain of expressed dissatisfaction. In addition, respondents with higher than secondary level of education were less satisfied with the services received during the institutional medical check–up. Periodic health assessment by individuals at different stages of live is of import as emphasised by this study. The innovation of the mandatory institutional check-up for the staff of the University of Ibadan could be viewed as a major strategy to early detection and treatment of both communicable and non-communicable diseases which could bring about a reduction in the double burden of diseases in most developing countries of which Nigeria is one. In order to ensure sustainability and continuity, it is recommended that an effective communication and continuous health education, which could be in form of routine health seminars and short text messages, be incorporated in standard of healthcare delivery to give service improvement and utilisation which would in turn increase participation and effectiveness of Institutionalised Medical Check-up.

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# Haematology day care service for adult sickle cell disease patients

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**Abstract**

*Background:* Non communicable diseases have overtaken infectious diseases as a cause of death in resource poor countries, making it necessary to introduce interventions and management policies in their control. Sickle Cell Disease (SCD) is a prevalent disorder in this category. This survey evaluated the use of a day care facility in the care of SCD patients in Nigeria.

*Methods:* This is a questionnaire based, cross-sectional survey carried out in tertiary hospitals in Nigeria. Information obtained included number of patients per week with vaso-occlussive crises (VOC), blood transfusion and hospital admissions through the haematology day care unit (HDCU) or Emergency Room(ER). Also obtained were the number of sickle cell deaths in the preceding year and the use of hydroxyurea by the patients.

*Results:* Eight (61.5%) of the thirteen hospitals have HDCU and such hospitals were less likely to transfuse patients in the ER (OR=0.5). Admissions through the ER also differ between hospitals with and without HDCU 1.75 vs 2.4 respectively (p=0.2). Sickle cell deaths did not differ between the two groups ($X^2$=3.6; p=0.46). Experience per consultant year differed between teaching and non-teaching hospitals (p=0.02), teaching and state hospitals (p=0.09).

*Conclusions:* This survey showed that hospitals without HDCU are more likely to use the ER for the care of SCD patients where care for the patients may not be optimal. It is important for countries with a high disease burden to consider HDCU as a suitable intervention in optimizing SCD care.

**Keywords:** *Hospital services; Intervention; Sickle cell death; Vaso-occlussive crises; Hydroxyurea; Haematologist*

**Résumé**

*Contexte:* Les maladies non transmissibles ont surpassé les maladies infectieuses en tant que cause de décès dans les pays pauvres en ressources, rendant nécessaire la mise en place d'interventions et de politiques de gestion dans leur contrôle. La drépanocytose (MCS) est un trouble répandu dans cette catégorie. Cette enquête a évalué l'utilisation d'un établissement de soins de jour dans le traitement des patients atteints de MCS au Nigeria.

*Méthodes:* Il s'agit d'une enquête transversale basée sur un questionnaire et réalisée dans des hôpitaux tertiaires au Nigeria. Les informations obtenues incluaient le nombre de patients par semaine présentant avec des crises vaso-occlusives (CVO), des transfusions sanguines et des hospitalisations via l'unité de soins de jour hématologique (USJH) ou la salle d'urgence (SU). On a également obtenu le nombre de décès dus à la drépanocytose au cours de l'année précédente et l'utilisation d'hydroxy urée par les patients.

*Résultats:* Huit (61,5%) des treize hôpitaux sont dotés d'un USJH et ces hôpitaux étaient moins susceptibles de transfuser des patients à l'urgence (OR = 0,5). Les admissions aux urgences diffèrent également entre les hôpitaux avec et sans USJH 1,75 vs 2,4 respectivement (p = 0,2). Les décès dus à la drépanocytose ne différaient pas entre les deux groupes ($X^2$ = 3,6; p = 0,46). L'expérience par année de consultant diffère entre les hôpitaux universitaires et non universitaires (p = 0,02), les hôpitaux universitaires et les hôpitaux publics (p = 0,09).

*Conclusions:* Cette enquête a montré que les hôpitaux sans USJH sont plus susceptibles d'utiliser l'urgence pour les soins des patients atteints de MCS, où la prise en charge des patients peut ne pas être optimale. Il est important que les pays fortement touchés par la maladie considèrent l'USJH comme une intervention appropriée pour optimiser les soins de la MCS.

**Mots clés:** *Services hospitaliers; Intervention; La mort due à la drépanocytose; Crises vaso-occlusales ; L'hydroxy urée ; Hématologue*

## Introduction

The epidemiological history of sickle cell disease (SCD) in Nigeria is changing for the better with more patients surviving to adulthood and the reproductive age [1,2]. However, it is believed that the global burden of the disease will increase because of this improved survival with Nigeria becoming the country most in need of interventions and management policies [3]. Interventions like

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vaccination against Streptococcus pneumoniae and Haemophilus influenzae infections have recently been incorporated into the National Immunization Programme while prophylaxis against malaria and the daily use of folic acid have long been practiced. Another age long practice is the use of a day care facility, a practice that was likely borrowed from the care of sickle cell patients in Jamaica [4]. Unfortunately, most of these interventions have never been evaluated, it is important to evaluate these interventions to assess their benefits and cost effectiveness.

Sickle cell painful crises are not only recurrent but are unpredictable necessitating that they are attended to promptly and this is possible in either the medical emergency department or in a day care facility. Timely intervention is not only useful in the management of painful episodes but also for the management of severe anaemia with blood transfusion or in the urgent treatment of infections, all of which could prevent mortality and reduce morbidity. However, there could be delay in responding to the medical needs of SCD patients in a busy emergency unit, hence the need for a day care unit. The day care unit not only attends to walk-in patients but also transfer patients from the emergency room i.e. patients seen there after the working hours of the day care unit [5]. In Nigeria, day care service is used in the provision of care for sickle cell disease patients and patients with other haematological disorders. This survey was carried out to determine how common the use of haematology day care services is in the country and its bearings on the care of SCD patients.

## Methods

This is a descriptive, cross sectional, questionnaire based survey using a list of hospitals with qualified haematologist. Each haematologist contacted per hospital was invited to partake in the survey which was sent by e-mail. A reminder email was sent monthly on two other occasions with the same questionnaire attached. If no response was received after this third contact, it was taken that the haematologist was not interested in responding to the survey. The survey was carried out between April and September 2015.

The questionnaire was semi-structured to find out about the presence of a Haematology Day Care Unit (HDCU) and an emergency department. Information obtained included the average number of adult sickle cell disease patients treated per week for vaso-occlusive crises (VOC) or blood transfusion, the number admitted to the wards through either of these facilities, the number of deaths in the previous year in the various hospitals. The use of hydroxyurea by the patients was also assessed. The information obtained was compared between those with and without HDCU. Information was also sought about the category of each hospital, whether teaching or non- teaching and whether federal or state along with the number of bed spaces and the years of experience of the attending haematologists. Since the years of experience of each haematologist and the number of haematologists vary between the institutions, an aggregate was computed by multiplying the number of years of experience of each haematologist by the number of haematologists to give the experience per consultant years for each hospital.

A comparison of the mean of each parameter between hospitals with and those without HDCU and between Teaching and Non-Teaching hospitals was made using Student's t test, the confidence interval and a two tailed p value were reported. Chi square test was used to compare mortality between hospitals with or without HDCU and between Teaching and Non-teaching hospitals. Odds ratio with confidence interval was used in comparing the likelihood of blood transfusion in the emergency room. A p value of 0.05 was taken as significant for the t test while an odd ratio not including 1 was taken as significant.

## Results

There were 13 responses from the 21 hospitals contacted giving a response rate of 61.9%. There was a better response from the Teaching Hospitals compared to the Federal Medical Centres (FMCs) (76.9% vs 20%).

**Table 1:** Distribution of facilities across the different levels of hospitals

| Level of Hospital | No. of Hospitals (%) | Average No. with Day care | Average No. of Beds in the Day care | Average No. of Consultants per hospital | Experience per Consultants years | Average No. of hospital bed spaces |
|---|---|---|---|---|---|---|
| Federal Teaching | 7 (54) | 6 | 4 | 4.5 | 73.6 | 551 |
| State Teaching | 3 (23) | 2 | 3 | 2.7 | 37.3 | 530 |
| Others* | 3 (23) | 0 | 0 | 3 | 30.8 | 393 |

**One each of Federal Medical Centre, State Hospital and Non-Teaching Tertiary Hospital*

*Description of surveyed hospitals (Table 1)*

Majority of the hospitals that responded were Federal Teaching hospitals (54%), and the number of consultant haematologists in the various hospitals varied between two and eleven with a mean of five consultants per hospital. Federal teaching hospitals are more likely to have more haematologists than non-teaching and/or non-federal hospitals (5.4 vs 2.8, p=0.08). All the hospitals surveyed have an emergency medicine department and hold regular weekly haematology outpatients' clinic during which SCD patients are seen. One of the hospitals holds this outpatients' clinic thrice in a week while another holds its clinic twice in a week and the others hold the clinic only once a week. The number of bed spaces in the hospitals range between 250- 800 with a mean of 506±155.6.

*Care provided through the accident and emergency units*

All the hospitals recorded seeing one patient on the average in the emergency room for VOC in a week, only one hospital without a day care unit sees an average of two patients in a week, this hospital also runs outpatients' clinics thrice a week. On the average, blood transfusion is given in the emergency units 1-2 times a week to SCD patients and hospitals without HDCU are more likely to transfuse patients admitted to the ward per week for VOC through the HDCU and at least one patient was transfused with blood per week in the HDCU. One to two patients are admitted through the HDCU every week for other reasons apart from VOC or blood transfusion (Table 2).

**Table 2:** Reasons and average number of patients seen per week by the various day care units.

| Number of Patients | Vaso-occlussive crises | Blood transfusion | Admissions |
|---|---|---|---|
| >3 | 2 | 0 | 0 |
| 1-3 | 4 | 4 | 5 |
| <1 | 2 | 4 | 3 |

**Table 3:** Comparisons of faciities, consultants' experience and admissions between hospitals with and without day care unit

| | Those with day care facilities (Mean±SD) | Those without day care facilities (Mean; SD) | 95%CI | P value |
|---|---|---|---|---|
| Number of hospitals | 8 | 5 | | |
| Average Number of Consultants | 4.9±2.6 | 3.2±1.3 | -1.08-4.48 | 0.2 |
| Average Experience per Consultant years | 65.9±33.2 | 38.4±22.0 | -9.67-64.67 | 0.13 |
| Average number of bed spaces | 580±134.4 | 387.8±112.4 | 33.04-351.36 | 0.02 |
| Average number of total admissions per week | 3.6±0.9 | 3.8±0.8 | -1.29-0.89 | 0.7 |
| Average admissions through ER per week | 1.6±0.8 | 2.4±1.3 | -2.06-0.47 | 0.2 |

*ER: Emergency Room*

*Description of care provided by the Day Care units*

Eight of the thirteen hospitals have an HDCU (62%), of which six are in the Federal teaching hospitals. Four (50%) of the units have been established for over 10yrs while three (37.5%) were established between 6-10yrs ago and one (12.5%) was established less than two years ago, these units have between three to five beds. Patients seen in the various day care units varied between less than one to seven in a week while on the average one patient is in the emergency unit than those with one. Hospitals with an HDCU are three times more likely to transfuse patients only once a week in the emergency unit compared to hospitals without HDCU (OR;95%CI=0.5;0.05-5.5) who are likely to transfuse patients twice a week in the emergency room (OR;95%CI=4.5;0.41-49.6). On the average, admissions per week through the emergency room were 1.75 vs 2.4 (p=0.2) for hospitals with and without HDCU respectively (Table 3)

*Mortality*

The number of sickle cell deaths recorded in the year preceding the survey did not differ between those with and without an HDCU ($X^2$=3.6; p=0.46). Also, recorded death did not differ between teaching hospitals and other hospitals, an aggregate of thirteen deaths were recorded by the ten teaching hospitals in the last one year while the three non-teaching hospitals recorded four deaths ($X^2$=6.1;p=0.19).

*Experience of the Consultant Haematologists*

The experience per consultant years was not significantly different between hospitals with or without HDCU (p=0.13). However, the experience per consultant years differed between Teaching and Non-Teaching hospitals (73.6 vs 34.1; p= 0.02) and between Federal Teaching hospitals and State owned Teaching hospitals (73.6 vs 37.3; p= 0.09). The experience per consultant years was similar between State Teaching hospital and other Non-Teaching hospitals (37.3 vs 30.8; p= 0.65) (Table 1).

*The use of hydroxyurea*

All responses on the use of hydroxyurea by the patients were negative except in one hospital.

**Discussion**

This survey shows that care delivery to SCD patients differed between hospitals with a Day Care unit and those without one. Hospitals without an HDCU are more likely to rely on the emergency room services for the care of the patients, be it for management of painful crises or blood transfusion. Also, the total number of patients admitted unto the wards also differed between hospitals with an HDCU and those without, with hospitals without day care services being more likely to admit patients for care on the wards than those with one. Similarly, experience per consultant years differed between the two groups. Though, these differences were not statistically significant. However, mortality was found to be similar between the two groups, mortality was also unaffected by the level of the hospital i.e. whether it is a teaching hospital or not. The larger a hospital is, the more likely are they to have a day care facility (p=0.02).

Nigeria has 24 teaching hospitals, 14 (58.3%) being Federal institutions and 22 Federal Medical Centres (non-teaching tertiary hospitals). There are about 70 Haematologists in the country, majority of whom work in the Teaching hospitals or the FMCs. The response rate and the distribution of the participating institutions showed a fair spread (Table 1), though there appeared to be a selection bias in favour of the Federal Teaching hospitals. The bias may not be unconnected to the fact that the FMCs are less likely to have a day care facility, which may also be a reason why some of the teaching hospitals did not respond to the questionnaire. The poor response rate from hospitals that are less likely to have a day care unit (FMCs) may therefore account for the non-statistically significant difference of most of the test parameters between both groups.

There are no definite records of how many SCD patients are in the country because of poor record keeping, extrapolations are therefore usually made from prevalence studies, which may also differ based on the population studied. The prevalence of SCD in the country is 3-4% [6,7], and a recent survey of clinics based in some Nigerian hospitals showed that there are between 15-11000 patients in the various hospitals that took part in the survey [8]. Though information about the patient population was not sought for in our survey, it does appear that the patient traffic is light with the busiest hospital seeing an average of one patient a day and an average of four patients admitted for care every week in the various hospitals. This may be because 25% of Nigerian SCD patients rarely have painful crises and only half have up to three painful episodes in a year, also about a quarter have never been transfused [1]. It could also be because many of the patients seek health care in hospitals where there are no Haematologists. This would suggest the need for government to provide specialist care for these patients in all tiers of health care facilities. This could be done by making medical practice in non-teaching hospitals attractive to specialist doctors and also by providing sandwich training in the care of SCD patients for low cadre doctors who can man primary health care centres.

This survey shows that hospitals with day care units are more likely to make use of it than the emergency rooms in the care of SCD patients. Care of SCD patients in the emergency room has been shown to be suboptimal because of the heavy patient load and the varied nature of patients seen there [4,5]. A dedicated centre with staff that with time will become familiar with the medical and psychosocial needs of the patients would be more advantageous. With the high burden of SCD in the country it is recommended that all tertiary institutions should have a 5-10 beds space day care units while other government hospitals should have a 3-5 beds space for day care of SCD patients. The current average beds space of 3 may not be adequate especially since this is also shared by patients with other haematological disorders; care for the patients in the

emergency rooms should therefore be used only when the HDCU is closed [5]. It was also observed that one of the Teaching hospitals without a day care unit runs outpatients' clinics thrice a week which may be a way to compensate for the lack of a day care service. This practice is not recommended since this would unnecessarily increase the work load of the physicians.

The record of one death per hospital per year may not represent the true mortality rate because of underreporting by the participating hospitals. Also, autopsies done on SCD patients in a tertiary hospital in the country showed that 52 autopsies were done over a 17-year period (9) though this is not restricted to adult patients. The authors pointed out that this also may not be representative of the death rate in the hospital because of the high decline rate for autopsies and an equally high rate of unrecorded death. There is need for an accurate data on mortality in SCD patients in the country despite all the challenges, if appropriate interventions are to be used in controlling the disease.

Though the use of hydroxyurea by the patients was not the primary objective of the survey, the low rate of hydroxyurea use by the patient is not surprising. It is estimated that not more than 1% of African SCD patients use this drug possibly because of cost [8, 10]. A comparison of patients with SCD from Nigeria and those from the USA also showed less frequent use of hydroxyurea in the Nigerian patient population [11]. Hydroxyurea appears to be used more frequently in paediatric patients where it is used more often in patients with a high risk of stroke; even in this setting more than half of the population at risk still decline to use it [12]. Reason for decline may be attributable to being unable to afford the drug since those who decline use are also more likely to drop out from school. It is however necessary to ascertain that the lack of frequent use of this drug is because of reason of cost alone, attitudes of both the patients and their primary physicians to the use of the drug should also be explored.

The applicability of the use of day care facility may be limited to populations with high SCD disease burden because of cost effectiveness, though other settings may consider adopting the practice after weighing the benefits against the cost. The applicability of the practice in paediatric patients is also worth considering; this would however need evaluation by paediatricians. This is because of the differences in the physiology and haemodynamics of paediatric patients especially since paediatric patients are more likely to be kept under observation for over 24hrs after treatment for painful crises or following blood transfusion.

This survey has shown the importance and advantages of the use of a day care unit in the care of adult SCD patients especially in countries where the disease burden is high. The mandatory provision of day care service for the care of these patients at the various tiers of health care services in these countries would help the various countries to partly fulfill the recommendation by Diallo et al that African states should fight SCD in their health policies [13]. Hospitals that already have such provision should be assisted by government to upgrade the facilities, not only in the number of bed spaces but also in the provision of social services (through the provision of social workers and psychologists) and laboratory support as done in some centres [5].

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# Molecular detection of *mycoplasma genitalium* among fertile and infertile women in Ibadan: a matched case-controlled study

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**Abstract**

*Background: Mycoplasma genitalium*, an emerging sexually transmitted pathogen of the Mycoplasmatacea family, has been reportedly associated with infertility. It is often asymptomatic and polymerase chain reaction (PCR) is the gold standard for diagnosis. This study is aimed to determine the prevalence of *M. genitalium* infection among fertile and infertile women in Ibadan using the conventional PCR technique.

*Methodology:* A cross–sectional hospital-based, matched case control study of 267 infertile and 135 consenting fertile women conducted between March and November 2015. Information on sociodemographic and behavioural characteristics were obtained by interviewer-administered questionnaire after which endocervical swabs were taken. The presence of *M. genitalium* infection was detected by Conventional PCR. All data were analyzed using SPSS version 20.0.

*Results:* The mean ages of the study and controlled groups were 33.8±5.7 and 31.9±4.5 years respectively (p>0.05). There was no difference in the socio-demographic and behavioural characteristics of the participants. The prevalence of *M. genitalium* was 16.1% among the infertile women and 2.2% among the controls (p < 0.001). This prevalence is similar among the types of infertility- primary or secondary.

*Conclusion:* The prevalence of *Mycoplasma genitalium* is significantly higher among infertile women thereby necessitating a call for appropriate microbiological screening. This will reduce the possibility of patients being under-investigated and misdiagnosed with subsequent inappropriate treatment. Routine screening for *M. genitalium* is therefore recommended in all women presenting with infertility.

**Keywords:** *Endocervical, infertility, Mycoplasma genitalium, PCR*

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**Résumé**

*Contexte: Mycoplasme genitalium*, un émergeant agent pathogène sexuellement transmissible de la famille Mycoplasmatacea a apparemment été associé à la stérilité. Il est souvent asymptomatique et la réaction en chaîne de la polymérase (RCP) est la référence en matière de diagnostic. Cette étude vise à déterminer la prévalence de l'infection à *M. genitalium* chez les femmes fertiles et stériles d'Ibadan à l'aide de la technique conventionnelle RCP.

*Méthodologie:* Une étude transversale comparative cas-témoins basée en hôpital sur 267 femmes stériles et 135 femmes fertiles consentantes a été menée entre Mars et Novembre 2015. Les informations sur les caractéristiques sociodémographiques et comportementales ont été obtenues à l'aide d'un questionnaire administré par intervieweur, après quoi des prélèvements endo-cervicaux ont été effectués. La présence d'une infection à *M. genitalium a* été détectée par RCP conventionnelle. Toutes les données ont été analysées avec SPSS version 20.0.

*Résultats:* Les âges moyens des groupes d'étude et de contrôle étaient respectivement de 33,8 ± 5,7 ans et de 31,9 ± 4,5 ans (p> 0,05). Il n'y a pas de différence dans les caractéristiques sociodémographiques et comportementales des participants. La prévalence de *M. genitalium* était de 16,1% chez les femmes stériles et de 2,2% chez les témoins (p <0,001). Cette prévalence est similaire parmi les types d'infertilité - primaire ou secondaire.

*Conclusion:* La prévalence de *Mycoplasme genitalium* est significativement plus élevée chez les femmes infertiles, ce qui nécessite un appel à un dépistage microbiologique approprié. Cela réduira la possibilité que les patients subissent une sous-enquête et un diagnostic erroné avec un traitement subséquent inapproprié. Le dépistage systématique de *M. genitalium* est donc recommandé chez toutes les femmes présentant une stérilité.

**Mots clés:** *Endo-cervical, infertilité, Mycoplasme genitalium, RCP*

## Introduction

*Mycoplasma genitalium,* an emerging sexually transmitted pathogen of the Mycoplasmatacea family, has been described as a major cause of non–gonococcal urethritis and various inflammatory conditions in men and women respectively [1]. The pathogen has also been reported to be independently and significantly associated with pelvic inflammatory disease (PID) and tubal factor infertility [2-6]. The current global infertility rate has been documented as being between 15% and 20% with associated major economic burden on global healthcare industry [7, 8]. Tubal damage, resulting from tubal occlusion, is the most frequent cause of female infertility in most developing countries. The occlusions were usually caused by pelvic infection particularly from sexually transmitted infections (STIs) which accounted for 25% to 35% of cases [8]. According to Manhart *et al.*, asymptomatic carrier state of *M. genitalium* is a serious epidemiological problem because it enhances unnoticed transmission among sexual partners resulting in various adverse gynaecologic and reproductive events like infertility [9].

In sub-Saharan Africa, most studies on the role of infectious agents in infertility have been concentrated on *Chlamydia trachomatis* and *Neisseria gonorrhoea* among infertile women but these two agents alone had been unable to explain all the infectious causes of infertility [10-13]. It has also been noted that infections caused by *N. gonorrhoea* and *M. genitalium* were present in two-thirds of women with PID and have been associated with infertility [7]. In most instances, *M. genitalium* is asymptomatic, increasing the likelihood for "silent" PID and its infertility sequelae [14].

Some authors in separate studies equally reported that *M. genitalium* was more prevalent than *N. gonorrhoea* but less prevalent than *C. trachomatis* in the USA and that it was strongly associated with sexual activity [9, 15, 16]. Unfortunately, there is dearth of information on association of *M. genitalium* with infertility in Nigeria as specific laboratory investigations for its involvement in cases of unexplained infertility are rarely done [17]. Numerous risk factors have been associated with *M. genitalium* infection which included being uneducated, being unmarried or being a single parent, having migrant background, black ethnicity, smoking and having multiple sexual partners with the prevalence increasing by 10% for each additional sexual partner [18-20].

Isolation of *M. genitalium* had been hampered by difficulties associated with culture as well as its cross reactivity with *M. pneumonia* while the use of ELISA alone has been fraught with several reports of false positive results. However in 2010, two authors, Kenny and Razin, in separate documentations stated that polymerase chain reaction (PCR) is a very sensitive and specific method for its diagnosis [21, 22]. The main objective of our study is to determine the prevalence of *M. genitalium* among women diagnosed with infertility in Ibadan using Nucleic acid Amplification technique (NAAT) and comparing the results with those of women with proven fertility in the same environment. The data from this study may help in the need to establish strategic preventive programme for "at risk" population and this may contribute to reduction in the prevalence of infertility in Nigeria.

## Materials and methods

This was a cross-sectional hospital-based study, conducted between March 1 and November 30 2015, in which a total of 399 consenting women were recruited at the University College Hospital (UCH) and Adeoyo Maternity specialist hospital (AMSH), Ibadan. The UCH is an 880 bedded tertiary health centre located in Ibadan city and serves as referral centre for other hospitals in the country while AMSH is a secondary care centre mostly serving the lower and middle class level patients within the Ibadan metropolis.

From the first two consenting patients that presented on the selected clinic day, one patient was randomly selected using balloting technique. Afterwards every alternate patient was selected until the desired sample, a maximum of 10 for each clinic day, was met. Using interviewer–administered questionnaire, information was obtained on participants' sociodemographic and behavioural characteristics. Endocervical swabs were also taken to test for *M. genitalium.* Non-consenting women and those who recently used antibiotics were excluded from the study.

Written informed consent was obtained after careful and detailed explanation of the concept of the study to each patient before inclusion. Ethical standards were followed in the handling, storage and disposal of specimens. The Ethics committee of the University of Ibadan, University College Hospital Ibadan and Oyo state government approved the study before commencement.

### *Collection of endocervical swab*

Endocervical swabs were collected under aseptic condition for each recruited woman using sterile Copan® flocked eNat cervical swabs with 2mls of nucleic acid preservative (Copan Italia Diagnostics) and stored at "$20^0$C until processing [23].

*Biosafety issues and universal precaution*

*Mycoplasma genitalium* has been described as a Bio safety level–2 organism and was therefore treated as such. Personal protective equipment including laboratory coats, masks, goggles and sterile latex gloves were used. Work surfaces were decontaminated daily, before and after work, with 10% hypochlorite solution.

*DNA extraction from endocervical specimen*

The Jena Bioscience Bacteria DNA preparation kit (Jena Bioscience GmbH, Germany) was used according to the manufacturer's instruction [24]. About 1ml of endocervical specimen in eNat preservation medium was centrifuged at 10000 ×g for 1 min. The supernatant was discarded while 300 µL of lysis buffer and 2 µL of RNase A were added to the pellet. The mixture was vortexed vigorously for 30 to 60 sec, 8 µL of proteinase K was added to it followed by incubation at 60°C for 10 min. After allowing to cool for 5 min, 300µL of binding buffer was added to the mixture and this was vortexed briefly. The solution was placed on ice for 5 min and then centrifuged for another 5 min at 10000×g. A spin column was placed into a 2 mL collection tube and the mixture was discarded into it. Lysate was pipetted directly into the spin column, centrifuged for 1 min at 10000 ×g and the flow-through was discarded. About 500µL of washing buffer was added into the spin column, centrifuged for 30 sec at 10000×g and the flow-through was discarded (this was done twice). The spin column was centrifuged again at 10000×g for 1 min to remove the residual washing buffer. The 2 mL tube was discarded; the spin column was placed in the elution tube and 40 to 50 µL of elution buffer was added into the center of the spin column. It was incubated at room temperature for 1 min and centrifuged at 10000 ×g for 2 min. The extracted DNA was stored at "20°C.

*PCR assay*

Primer sequences used for *M. genitalium Mgpa (major adhesion protein) gene* primer were Mgp-F $5^1$aag tgg agc gat cat cat tac taa c-$3^1$ Mgp-R $5^1$ ccg tgg tta tca tac ctt ctg a- $3^1$ [25].

PCR was set up with reaction mixture comprised of 5µL of DNA extract, 0.40µL of primers (forward and reverse), 10.60µL of PCR water, 4µL of Master Mix (reaction buffer B, MgCl2, dNTPs, blue and yellow dye). Each tube containing the reaction mixture was sealed and briefly centrifuged before amplification in PCR machine. Amplification was done using the following protocol: initial denaturation at 95°C for 5 min, then 30 cycles of denaturation at 95°C for 40 sec, annealing at 56°C for 30sec, extension at 72°C for 40secs and final extension at 72°C for 5min with each amplification run containing distilled water as the negative control. After amplification, electrophoretic separation of PCR products was performed on 1.5% agarose gel stained with ethidium bromide, and visualized by Ultraviolet illumination.(Uvitec, UK).

*Electrophoresis*

About 10ìL of DNA ladder (Solis BioDyne, Estonia) at 100bp gradient was placed at one end of wells of 1.5% agarose gel stained with 2ìl ethidium bromide. Thereafter, 10ìL of the amplified product was added into each well on the agarose gel, placed into the electrophoretic tank and switched on at 100 voltage for 60 minutes. The tray containing the agarose gel and bands were transferred to a bio-imaging system and results were read. Bands corresponding to 495 bp on the DNA ladder were documented as positive for *M. genitalium*.

*Data analysis*

Data analysis was done using the SPSS version 20 software. We determined the means and standard deviation for quantitative variables and proportions for qualitative variables. Chi square test was done for appropriate categorical variables with level of statistical significance set at $P<0.05$.

**Results**

The study aimed to determine the prevalence of *M. genitalium* among fertile and infertile women in Ibadan using PCR for molecular detection. It is a hospital-based study in which 399 consenting women were recruited. The sample size calculated was 390 (260 cases and 130 matched controls in the ratio of 2:1) but the number with inconsistent information is 6 and the total is 399. The mean ages of the study participants were similar in the 2 groups (33.9±5.7 versus 31.9±4.5 years respectively, $p>0.05$). Most of the respondents were married and had tertiary level of education. Across the groups, there was no difference in their marital status, education and religion. These sociodemographic parameters were presented in Table 1. Majority of the respondents, 156 (58.6%) in the study population had secondary infertility while 118 (44.4%) had previous voluntary termination of pregnancies.

*Mycoplasma genitalium* was detected in 43 (16.2%) infertile women and 3 (2.3%) of the control (P<0.001, table 2; Figure 1). The odds of an infertile woman having *M. genitalium* infection was more than eight times more likely than a fertile counterpart (Odds Ratio, OR = 8.36, 95% confidence interval 2.54 – 27.47; p = 0.0005). Of the 156 women with secondary infertility, 27 had positive results for *M. genitalium* giving a prevalence rate of 17.3% while 16 women in the primary infertility group had positive results – a prevalence of 14.5%. However, these findings were not statistically significant (P>0.05; Table 3).

Among the respondents, *M. genitalium* infection was significantly associated with the participants who were single or divorced and were of low socioeconomic status. However, there were no associations between *M. genitalium* and past history of sexually transmitted infections and condom use (Table 4).

## Discussion

Our study aimed to determine the molecular detection of *M. genitalium* among fertile and infertile women using conventional PCR and found a higher prevalence of 16.2% and 2.3% among patients with and without infertility respectively. This underscores the significance of *M. genitalium* as a possible contributory pathogen to female infertility. Earlier studies on *M. genitalium* reported from Nigeria have been that of 4% among asymptomatic males with infertility in South Southern Nigeria and 6% among asymptomatic adolescents in South Eastern Nigeria [26, 27].

Our findings are however higher to that of Grzésko *et al.* who reported 10.6% among infertile women in Poland, a value that is significantly higher than that of their control group [3]. On the contrary, some other authors have reported much higher prevalence rates for *M. genitalium* with values

**Table 1:** Socio-demographic factors of the respondents

| Socio-demographic Factors | Cases Frequency (%) | Control Frequency (%) | P-value |
|---|---|---|---|
| *Age Group ( Years)* | | | |
| 20 – 24 | 9 (3.4) | 5 (3.8) | |
| 25 - 29 | 51 (19.2) | 39 (28.6) | |
| 30 – 34 | 90 (33.8 ) | 50 (36.8) | P>0.05 |
| 35 – 39 | 71 ( 26.7) | 35 (26.3) | |
| ≥ 40 | 45 (16.9) | 6 (4.5) | |
| *Marital Status* | | | |
| Married | 253 (95.1) | 130 (97.7) | |
| Single | 12 (4.5) | 3 (2.3) | P>0.05 |
| Divorced | 1 (0.4) | 0 (0.0) | |
| *Education* | | | |
| Primary | 19 (7.1) | 3 (2.3) | |
| Secondary | 92 (34.6) | 18 (13.5) | P>0.05 |
| Tertiary | 154 (57.9) | 112 (84.2) | |
| Others | 1 (0.4) | 0 (0.0) | |
| *Religion* | | | |
| Christianity | 166 (62.4) | 110 (82.7) | P>0.05 |
| Islam | 100 (37.6) | 24 (17.3) | |

**Table 2:** Relationships between the prevalence of m*ycoplasma genitalium* among the study group and the gontrol group

| Variable | Groups | | Chi–Square | P-value |
|---|---|---|---|---|
| | Study group | Control group | | |
| PCR results: Positive | 43 | 3 | 16.82 | <0.001 |
| Negative | 223 | 130 | | |

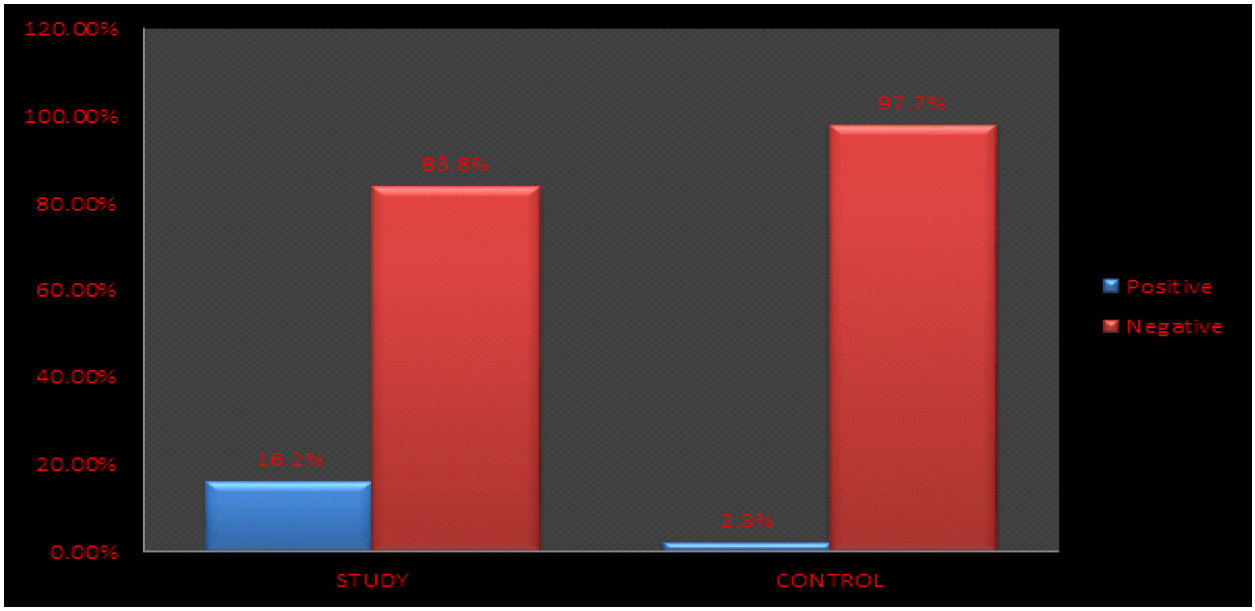


Fig. 1: Prevalence of m*ycoplasma genitalium a*mong the study and control groups

**Table 3**: Prevalence of *mycoplasma genitalium* among women with primary and secondary infertility.

| Variable | | Type of infertility | | RR (95% Confidence Interval) | P – value |
|---|---|---|---|---|---|
| | | Primary | Secondary | | |
| *PCR results*: | Positive | 16 | 27 | 0.88 (0.58 – 1.34) | > 0.05 |
| | Negative | 94 | 129 | | |

**Table 4:** Factors associated with m*ycoplasma genitalium*

| Variable | M. genitalium | | Chi – Square | p-value |
|---|---|---|---|---|
| | Yes (%) | No (%) | | |
| *Grouped Age (in years)* | | | | |
| 20 – 29 | 14 (23.0) | 46 (77.0) | 3.52 | 0.172 |
| 30 – 39 | 21 (13.0) | 140 (87.0) | | |
| ≥ 40 | 8 (17.8) | 37 (82.2) | | |
| *Family type* | | | | |
| Single/Divorced | 10 (76.9) | 3 (23.1) | 38.72 | **<0.001** |
| Monogamous | 31 (14.2) | 188 (85.8) | | |
| Polygamous | 2 (5.9) | 32 (94.1) | | |
| *Monthly Income (in naira)* | | | | |
| < 18,000 | 15 (29.4) | 36 (70.6) | 8.17 | **0.004** |
| ≥ 18,000 | 28 (13.0) | 187 (87.0) | | |
| *Past history of Gonorrhoea / STI* | | | | |
| Yes | 19 (12.8) | 81 (81.0) | | |
| No | 19 (12.8) | 130 (87.2) | 4.08 | 0.130 |
| Don't know | 5 (29.4) | 12 (70.6) | | |
| *Use of condom* | | | | |
| Yes | 9 (24.3) | 28 (75.7) | 2.11 | 0.146 |
| No | 34 (14.8) | 195 (85.2) | | |

ranging from 22% to 31.9% in studies done using serological assay [8, 28, 29]. We however noted that serological assays are limited in sensitivity because of cross reaction between the antibodies of *M. genitalium* and *M. pneumonia*. In view of this limitation, many authors favour PCR, particularly the real time PCR, which has excellent sensitivity and specificity [30-34]. In India, Rajkumar *et al.*, reported an overall prevalence rate of 16% among patients with infertility using real time PCR – a similar value to our findings although on the contrary, they obtained higher values for subjects with primary infertility [35].

The higher prevalence of *M. genitalium* among infertile women illustrates the possibility of a link between the pathogen and female infertility. There are evidences for *M. genitalium* cervicitis and PID thus indicating that this organism has potential to cause ascending infections which can lead to infertility [2, 36-38]. Although some studies have established the sexual transmission mode of *M. genitalium*, there were no documented relationships with previous history of STIs (sexually transmitted infections) which was also corroborated in this study [15, 18, 20, 39]. However, the lack of association between previous history of STI and *Mycoplasma genitalium* in this study may be due to recall bias, deliberate non-disclosure or presence of mild symptom which was ignored.

As corroborated by our findings and previous studies, *M. genitalium* has been shown consistently to have a strong association with female infertility and should be considered as an aetiologic factor. The use of PCR to improve the sensitivity and specificity of the diagnosis furthen strengthen this assertion. We are of the opinion that these findings will lead to a reduction in the possibility of patients being under-investigated and/or misdiagnosed followed by subsequent inappropriate/ inadequate treatment. Routine identification of *M. genitalium* is therefore indicated in all women presenting with infertility.

**Limitation of the study**

Our study was limited by non–use of real time PCR which is known to be more sensitive than Conventional PCR used in this study thereby implying that the prevalence may be higher than we reported. We were also unable to determine the presence of *M. genitalium* among the spouses of our respondents which would have enabled us to assess the possibility of the mode of transmission.

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# Motor function, community reintegration and quality of life in stroke survivors with pre-stroke driving history

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**Abstract**
*Background***:** Driving is an important activity of daily living associated with improved community reintegration and better quality of life. It is however unclear if there is a definite difference in the motor function, community reintegration and quality of life of stroke survivors who returned to driving and those who did not.
*Methods***:** Stroke survivors with pre-stroke driving history participated in this cross sectional survey. Socio-demographics, clinical characteristics and driving history were documented. Motor function, community reintegration and quality of life were assessed using the Modified Motor Assessment Scale (MMAS), Reintegration to Normal Living Index (RNLI) and Health-Related Quality of Life in Stroke Patients (HRQOLISP-40) respectively. Returners and non-returners were compared using Mann Whitney U test at $á_{0.05}$.
*Results***:** Fifteen out of the 44 stroke survivors (34.1%) who participated in this study had returned to driving after their stroke. There was no significant difference in age, time since stroke onset and years of driving experience prior to stroke onset ($p > 0.05$) between returners and non-returners. There was however a significant difference in the motor function, community reintegration and quality of life between the two groups ($p < 0.01$).
*Conclusion***:** Stroke survivors with pre-stroke driving who returned to driving after stroke had better motor function, community reintegration and quality of life compared to their counterparts who had not returned to driving.

**Keywords***: Return-to-driving, motor function, community reintegration, quality of life*,

**Résumé**
*Contexte* **:** La conduite est une activité de la vie quotidienne importante associée à une meilleure réinsertion sociale et à une meilleure qualité de vie. Il n'est toutefois pas clair s'il existe une différence nette entre la fonction motrice, la réinsertion sociale et la qualité de vie des survivants d'AVC qui sont retournés au volant et de ceux qui ne le sont pas.
*Les méthodes* **:** Les survivants d'AVC avec antécédents de conduite avant l'AVC ont participé à cette enquête transversale. Les données sociodémographiques, les caractéristiques cliniques et les antécédents de conduite ont été documentés. La fonction motrice, la réintégration en communauté et la qualité de vie ont été respectivement évaluées à l'aide de l'échelle d'évaluation de la motricité modifiée (EEMM), l'indice de réintégration dans la vie normale (IRVN) et de la qualité de vie liée à la santé chez les patients ayant subi un AVC (HRQOLISP-40). Ceux qui sont revenus à la conduite et ceux qui ne sont pas revenus ont été comparés en utilisant le test U de Mann Whitney à $\alpha_{0,05}$.
*Résultats* **:** Quinze des 44 survivants d'AVC (34,1%) ayant participé à cette étude étaient revenus à la conduite après leur AVC. Il n'y avait pas de différence significative dans l'âge, le temps écoulé depuis le début de l'AVC et les années d'expérience de conduite avant le début de l'AVC ($p > 0.05$) entre ceux qui sont revenus et ceux qui ne sont pas revenus. Il y avait cependant une différence significative dans la fonction motrice, la réintégration dans la communauté et la qualité de vie entre les deux groupes ($p < 0,01$).
*Conclusion* **:** Les victimes d'accident vasculaire cérébral avec conduite avant l'AVC qui sont revenues à la conduite après l'AVC avaient une meilleure fonction motrice, réintégration dans la communauté et une qualité de vie supérieure à celle de leurs homologues qui n'étaient pas revenus à la conduite.

**Mots - clés** *: Retour à la conduite, Fonction motrice, Réintégration dans la communauté, Qualité de vie*,

## Introduction

Stroke is a serious and disabling health problem globally [1]. With improvement in healthcare services, majority of stroke survivors return to live in the community. However, about 70% are left with some degree of physical or cognitive impairments [2,3] that may hinder optimal reintegration. The residual motor impairments make community reintegration an enormous challenge to many stroke survivors by affecting their normal activities of daily living, including ability to return to driving [4,5]. Driving, an important activity of daily living for many people [6], is a complex activity that requires

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full functioning of multiple systems that might have been compromised in stroke survivors [7]. Hence, return to driving post stroke signifies progress in the recovery trajectory for those who had pre-stroke driving history.

Driving cessation often seen among stroke survivors interferes with many activities of daily living needed for maintaining independent living status, such as working and shopping [8]. It can result in adverse changes in mood, reduced life satisfaction, loss of identity and social isolation [9-12]. Return to driving therefore decreases depression and reduces the sense of immobility associated with stroke [13,14]. It has also been submitted that ability to drive after a stroke is an indicator of independence, and demonstrates strong association with good social reintegration [15]. Yet, only a small proportion of survivors who were driving before the stroke return to driving. Allen *et al* [16] and Aufman *et al* [17] reported the rate of return to driving six months after admission to inpatient rehabilitation for stroke as 19% and 30% respectively. Fisk *et al* [18] had earlier reported a return rate of about 50% five-year post rehabilitation.

Driving an automobile requires a high degree of competence on many levels, including physical abilities and cognitive skills, to integrate and respond appropriately to multiple rapid and transient signals [8]. Safe driving requires intact visual, behavioural, and cognitive ability [19,20]. These abilities generally fall under three domains: motor (e.g. turning the wheel, using the foot pedals, turning on windshield wipers), visual-perceptual (e.g. recognizing traffic signs, noticing events in the periphery, parking between lines), and cognitive (e.g. being aware of speed limit, knowing the directions to the destination, planning and assessing safety in merging and switching lanes [21]. Thus, pathology that affects attention, perception, executive and motor function, and awareness of cognition and behavioural performance may lead to driving errors and result in crash [22]. These functions are often impaired post-stroke and consequently, people who have suffered a stroke have greater deûciency when driving than stroke-free individuals [19].

Considering that returning to driving post-stroke is an index of reduction in the burden of care associated with stroke and improved quality of life, it is important to investigate the potential for return to driving in stroke population. Evidence has shown that younger age at stroke onset, lower level of disability and fewer cognitive deûcits are associated with return to driving after stroke [4,17, 23-24]. Most studies on return to driving after stroke focused on driving assessment protocols and influence of cognitive and visual impairment on driving ability [8,25]. There is paucity of information on the possible differences in motor function, community reintegration and quality of life between stroke survivors who had returned to driving and those who had not. We compared the motor function, community reintegration and quality of life between stroke survivors who had returned to driving (returners) and those who had not (non-returners). Association between return to driving and socio-demographic variables (age, sex, occupation, educational status, marital status) and clinical variables (time since stroke onset, years of driving pre-stroke, (side of affectation and limb dominance) among returners were also studied.

## Method

Community-dwelling stroke survivors with first incident stroke and pre-stroke driving history of $\geq$2 years attending the physiotherapy clinics the University College Hospital, Ibadan and National Hospital, Abuja were purposively recruited into this cross sectional survey. Recruitment of participants spanned four (4) months. Participants were eligible to participate if they had mild to moderate disability ($\leq$3 on Modified Rankin Scale); no cognitive ($\geq$ 24/30 on Mini Mental State Examination) and/or no visual field or visual acuity impairments. Ethical approval was obtained from the appropriate institutional health research ethics committee. All participants gave informed consents.

A content-validated, structured questionnaire was used to obtain socio-demographic and clinical information of the participants. Relevant information on driving history and current driving status was also elicited using the same questionnaire. Motor function of participants was assessed using the Modified Motor Assessment Scale (MMAS). The MMAS [26] is an-item scale for assessing motor recovery after stroke. It is a performance-based scale scored on a 7-point Likert scale from 0-6. The quality and/or speed of performance of tasks were assessed based on the criteria for scoring each task. Obtainable scores ranged from zero to a maximum of 48. Community reintegration was assessed using the Return to Normal Living Index (RNLI). The RNLI [27] comprises 11 declarative statements graded on a visual scale from zero (does not describe my situation) to 10 (fully describes my situation). Obtained scores were subsequently transformed into percent scores. Higher scores denote better reintegration into the community. The Health Related Quality of Life in Stroke Patients (HRQOLISP-40)

was used to assess the Quality of Life (QoL). The HRQLISP-40 [28] is a 40-item disease-specific measure of quality of life after a stroke. It assesses QoL in 5 domains. Higher scores indicate better QoL. All outcomes were administered by one of the researchers (NKO).

**Data analysis**

Data were summarised using descriptive statistics. Mann Whitney U test was used to examine the differences in motor function, community reintegration and QoL among stroke survivors who had returned to driving (returners) and those who had not (non-returners). Chi-square test was used to investigate the association between selected socio-demographic (sex, occupation, educational status, marital status), clinical variables (side of affectation and limb dominance), and each of motor function, community reintegration and quality of life among the returners. Level of significance was set at $p<0.05$.

**Results**

Forty-four stroke survivors (37 males, 7 females) participated in this survey. The mean age of the participants was 56.3±8.9 years (range = 39-75 years). The time since stroke onset was 23.55±35.80 weeks (12-228weeks) while years of driving experience before stroke onset was 20.05±14.24 years (2-50 years). The socio-demographic and clinical characteristics of the participants are as presented in table 1.

About a third of the stroke survivors (34.1%) had returned to driving after stroke. There was no significant difference in the age of returners and non-returners (p=0.19). However, returners were younger (53.80±7.30 years) than non-returners (57.52±9.52 years). Returners were mostly males (93.3%), had tertiary education (86.7%) and all were married (n=15). There was no significant difference in years of driving experience prior to stroke onset (p=0.90) and time since stroke onset (p=0.97) between returners and non-returners. Returners had significantly higher motor function score, community reintegration score and health-related quality of life score ($p<0.01$) than the non-returners (Table 2).

**Table 1:** Demographic and Clinical Characteristics of the Participants (N=44)

| Characteristics | Frequency (n) | (%) |
|---|---|---|
| *Gender* | | |
| Male | 37 | 84.1 |
| Female | 7 | 15.5 |
| *Occupation* | | |
| Highly skilled | 22 | 50 |
| Artisan/ Self employed | 7 | 15.9 |
| Business/ Semi skilled | 6 | 13.6 |
| Unemployed | 2 | 4.5 |
| Retired | 7 | 15.9 |
| *Marital status* | | |
| Single | 2 | 4.5 |
| Married | 37 | 84.1 |
| Divorced | 3 | 6.8 |
| Widowed | 2 | 4.5 |
| *Level of Education* | | |
| None | 1 | 2.3 |
| Primary | 3 | 6.8 |
| Secondary | 9 | 20.5 |
| Tertiary | 31 | 70.5 |
| *Limb Dominance* | | |
| Right | 39 | 88.6 |
| Left | 5 | 11.4 |
| *Side of Affectation* | | |
| Right | 26 | 59.1 |
| Left | 18 | 40.9 |
| *Return to Driving* | | |
| Yes | 15 | 34.1 |
| No | 29 | 65.9 |
| *Mean Age (years)* | 56.3±8.9 | |

**Table 2**: Comparison of age, motor function, community reintegration and HRQOL between returners and non-returners

| | Returners (n=15) Mean rank | Non-Returners (n= 29) Mean rank | U- value | P-value |
|---|---|---|---|---|
| Age (years) | 19.17 | 24.22 | 167.50 | 0.22 |
| Motor Function | 31.90 | 17.64 | 76.50 | 0.01* |
| Community Reintegration | 34.83 | 16.12 | 32.50 | 0.01* |
| HRQOL | 32.53 | 17.31 | 67.00 | 0.01* |

**significant at p<0.05*

Keys

HRQOL= Health related quality of life

There was no significant association between return to driving and each of sex and level of education among returners (p>0.05). Return to driving was not associated with side of brain lesion, although majority of returners (60.0%) had right hemispheric stroke

Perrier *et al* [30]; Tan *et al* [31] and Yu *et al* [32]. These authors reported an association between younger age and return to driving among stroke survivors with pre-stroke driving history. All the participants who returned to driving in this study were males. This is in line with the report of McNamara *et al* [33] that male stroke survivors tend to return to driving more than their female

**Table 3:** Association between return to driving and socio-demographics and selected clinical variables of participants

| | Returned to driving Frequency | % | $\chi^2$ | P-value |
|---|---|---|---|---|
| *Sex* | | | | |
| Male | 14 | 93.33 | 1.453 | 0.23 |
| Female | 1 | 6.67 | | |
| *Occupation* | | | | |
| Highly Skilled | 10 | 66.67 | | |
| Artisan/ self employed | 2 | 13.33 | | |
| Business/ Semi skilled | 3 | 20.00 | 6.69 | 0.15 |
| Unemployed | 0 | 0.00 | | |
| Retired | 0 | 0.00 | | |
| *Marital status* | | | | |
| Single | 0 | 0.00 | | |
| Married | 15 | 100.00 | 4.306 | 0.23 |
| Divorced | 0 | 0.00 | | |
| Widowed | 0 | 0.00 | | |
| *Level of Education* | | | | |
| None | 0 | 0.00 | | |
| Primary | 2 | 13.33 | 7.438 | 0.06 |
| Secondary | 0 | 0.00 | | |
| Tertiary | 13 | 86.67 | | |
| *Limb Dominance* | | | | |
| Right | 13 | 13.33 | 0.88 | 0.77 |
| Left | 2 | 86.67 | | |
| *Side of Affectation* | | | | |
| Right | 6 | 40.00 | 3.431 | 0.06 |
| Left | 9 | 60.00 | | |

## Discussion

Of the forty-four participants in this survey, only about a-third (34.1%) had returned to driving after their stroke events. This is consistent with findings from earlier studies that reported the rates of return to driving after a stroke as ranging between 30% and 66% [13,17,29-30]. Participants who returned to driving were comparable to those who did not return to driving in age, sex and marital status. Previous studies had similarly reported no difference in sex and marital status between stroke survivors who returned and those who did not return to driving after a stroke [8,15,29]. Nonetheless, participants who returned to driving were younger than those who did not. This finding is comparable to the reports of

counterparts. This could be because of the social role expected of males. In this community, male gender is associated with provision for family needs and activities such as driving. Expectations from family members could compel male stroke survivors to return to driving earlier than their female counterparts in order to satisfy the societal role expectations. It could also be that males might have better initial post stroke clinical status than their female counterparts, which made it easier for them to recover motor function and return to driving after a stroke event. Their initial post stroke clinical functions were however not assessed in this study.

Side of brain lesion was not significantly associated with return to driving. However, more

individuals with right hemispheric stroke returned to driving than those with left hemispheric stroke in a ratio of 3:2. This could be because the Nigeria rule of road permits right-hand traffic with a resultant left-hand drive. This may have given an advantage to individuals with left hemiparesis and right limb dominance. These individuals probably found it easier returning to driving given the location of the gear system and pedals, which are on the right side of the driver's sitting position. However, the long term effect may be detrimental considering that patients with right hemispheric strokes are more prone to hemispatial neglect than their counterparts with left hemispheric stroke [34].

Participants who had returned to driving (returners) had better motor function than those who had not. This affirms the importance of motor function as a major contributor to return to driving after stroke. It could be that only participants with minimal impairments at stroke onset or those who recorded improvement in motor function over time were able to return to driving. Driving is a functional task which requires a certain level of motor function to execute. Motor function has been adjudged a key component and predictor of driving after stroke [17,19,23,30]. Evidence suggests that stroke survivors with cognitive impairments coupled with low motor function of the lower extremity are less likely to be able to return to driving after stroke [17]. It is also possible that driving in itself as a task has led to improvement in motor function in returners.

Stroke survivors who had returned to driving (returners), recorded better community reintegration than those who had not returned to driving. This is in congruence with the findings of Finestone *et al* [15]. Finestone et al [15] reported a significant difference in community reintegration between stroke survivors who had returned to driving and those who had not. Their study showed community reintegration score of those who had returned to driving to be almost twice that of those who had not returned, which is comparable with the finding from this study. Driving status has significant influence on community reintegration after stroke [35]. The improvement in community reintegration of the participants could also be due to their improved motor function which had been reported to enhance community reintegration after stroke by Olaleye *et al* [36].

Our findings showed that community-dwelling stroke survivors who had returned to driving had better quality of life compared to those who had not. Factors that independently affect quality of life among stroke survivors have been reportedly shown to be improved by driving. For instance, depression and dependence in ADL have been widely associated with poor quality of life post stroke [37-39]. Driving decreases depression and reduces the sense of immobility associated with stroke [13,14]. Driving a car implies mobility, independence and freedom for a stroke patient [22,23] and therefore would be an important contributor to quality of life after stroke [35]. In addition, a significant association has been found between driving and community reintegration in stroke patients [15]. The stroke survivors in this study who had returned to driving had better motor function and community reintegration and this could have positively impacted their quality of life.

This study is the first to compare motor function, community reintegration and quality of life in stroke survivors with pre-stroke driving history in our community. However, non-probing of the immediate post-stroke clinical parameters such as extent of the lesion is an important limitation to the findings of this study. The outcome of the study should also be interpreted with caution because of the small sample size.

## Conclusion

Stroke survivors with pre-stroke driving who returned to driving (returners) after stroke had better motor function, community reintegration and quality of life compared to their counterparts who had not returned to driving (non-returners). The better motor function observed in stroke survivors who returned to driving suggests that motor function either plays a role in return to driving or is possibly improved by it. The findings of this study further affirm return to driving as an indicator or part of attributes of community reintegration and improve quality of life after stroke.

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# Acute abdomen in a Nigerian secondary to gastric broomstick injury - a case report

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**Abstract**
Foreign body ingestion is seen most commonly in children aged 6 months to 6 years in about 80% of cases. In adults, intentional foreign object ingestion occurs mostly among patients with altered sensorium, psychiatric disorders and patients seeking secondary gain. The most commonly ingested foreign bodies in adults are bones, fish bones, dentures and food bolus. Majority of the foreign objects will pass spontaneously. However, large and sharp/pointed foreign bodies may get impacted, leading to various complications. Therefore, large and sharp/pointed objects are recommended for removal either by endoscopy or surgery. We present a case of a Nigerian who presented with acute abdomen secondary to ingested broomstick which was removed at endoscopy.

**Keywords:** *Acute abdomen; gastric injury; broomstick*

**Résumé**
L'ingestion de corps étranger est observée le plus souvent chez les enfants âgés de 6 mois à 6 ans dans environ 80% des cas. Chez l'adulte, l'ingestion intentionnelle d'objets étrangers se produit principalement chez les patients présentant un sensoriel altéré, des troubles psychiatriques et les patients recherchant un gain secondaire. Les corps étrangers les plus couramment ingérés chez les adultes sont les os, les os de poisson, les prothèses dentaires et le bol alimentaire. La majorité des objets étrangers passera spontanément. Cependant, des corps étrangers larges et pointus peuvent être impactés, entraînant de diverses complications. De ce fait, les objets larges et pointus sont recommandés pour le retrait, soit par endoscopie ou par chirurgie. Nous présentons le cas d'un Nigérian présentant un abdomen aigu secondaire à l'ingestion d'une manche de balai qui a été retiré par endoscopie.

**Mots clés:** *Abdomen aigu; Lésion gastrique; Manche de balai*

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## Introduction

Foreign body ingestion is seen most commonly in children aged 6 months to 6 years in about 80% of cases [1,2]. In adults, intentional foreign object ingestion occurs mostly among patients with altered sensorium, psychiatric disorders and patients seeking secondary gain [3].

Accidental foreign body ingestion occurs in the elderly, in patients with mental retardation and the intoxicated [4]. Also, because of compromised tactile sensation during swallowing, presence of dentures and dental bridgework can predispose to accidental foreign body ingestion [3].

The most commonly ingested foreign bodies in adults are bones (8-40%), fish bones (9-45%) and dentures (4-18%) [5-7]. However, food bolus impaction is the most common foreign body, especially in adults older than 40 or 50 years of age [3].

Most times, the clinical presentation of gastrointestinal (GI) foreign bodies is not dramatic, especially in the absence of GI obstruction or complications. Patients may present with sensation of an object, dysphagia, abdominal or chest pain or vomiting [7]. Also, complications may arise and these include GI obstruction, perforation and bleeding [6].

Foreign bodies in the GI tract are expected to pass naturally. However, surgical or endoscopic intervention may be required in about 1% or 20% respectively [2,4,7,8]. Although, most cases of foreign body ingestion run a benign course, about 1500 deaths are reported annually in the USA [9].

In Nigeria, common foreign bodies that have been reported to be ingested include toothbrush, metallic objects, fish bone and coin [10-14].
We hereby report a case of a Nigerian who accidentally ingested a broken broomstick in soup, and subsequently presented with acute abdomen.

## Case report

A 55 year-old woman who presented with a 5-day history of sudden progressively worsening upper abdominal pain, non-radiating, colicky in nature. There were no known precipitating or aggravating factors. She took oral rabeprazole, suspension gascol

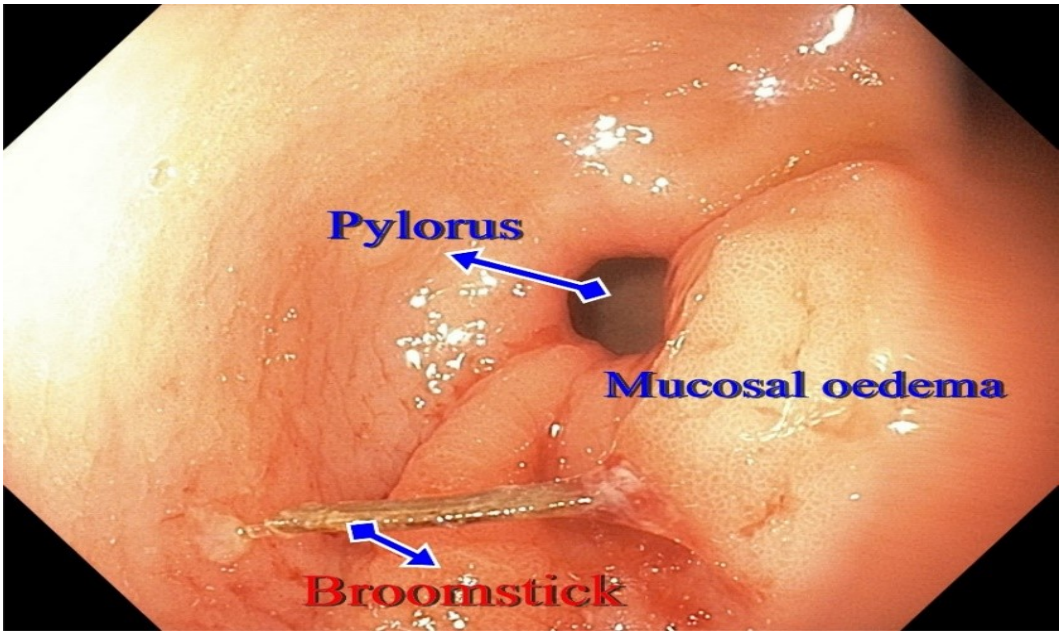


**Fig.1:** Broomstick embedded in the gastric mucosa

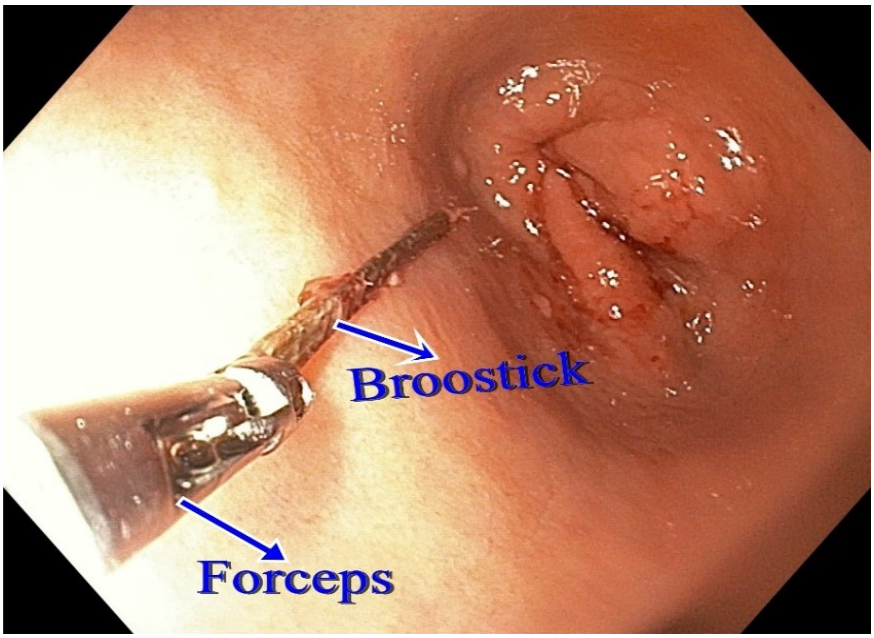


**Fig.2:** Broomstick with forceps being removed enbloc

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and hyocine without relief. There was associated postprandial vomiting but no haematemesis, melaena, haematochezia nor weight loss.

She was a known patient with dyspepsia who had had upper and lower gastrointestinal (GI) endoscopy in the past which showed antral gastritis and colonic polyp respectively. She had *Helicobacter pylori* eradication therapy for 2 weeks and rabeprazole for 4 weeks then, and had remained asymptomatic until this present episode.

General physical examination was normal, except that she was groaning in pain. Abdominal examination showed marked epigastric tenderness and guarding. No palpable organomegaly. Bowel sounds were absent. Vital signs were within normal range. The clinical diagnosis was acute exacerbation of acid peptic disease.

She was admitted and administered intravenous rabeprazole and hyocine, and intramuscular pentazocine. There was very little relief of the abdominal pain, but vomiting persisted. She had a repeat upper GI endoscopy which showed a broomstick in the antrum with one end embedded in the posterior wall with surrounding mucosal

oedema and hyperaemia, while the other end was free in the lumen pointing towards the anterior wall. (Figure 1) It was detached with a biopsy forceps and then removed enbloc with the endoscope (Figures 2 and 3)

Apart from medical history, radiography of the GI tract has been recommended as an initial screening method to diagnose foreign body ingestion [15]. But, this would not have been sufficient to reach a diagnosis in this case because, broomstick is not

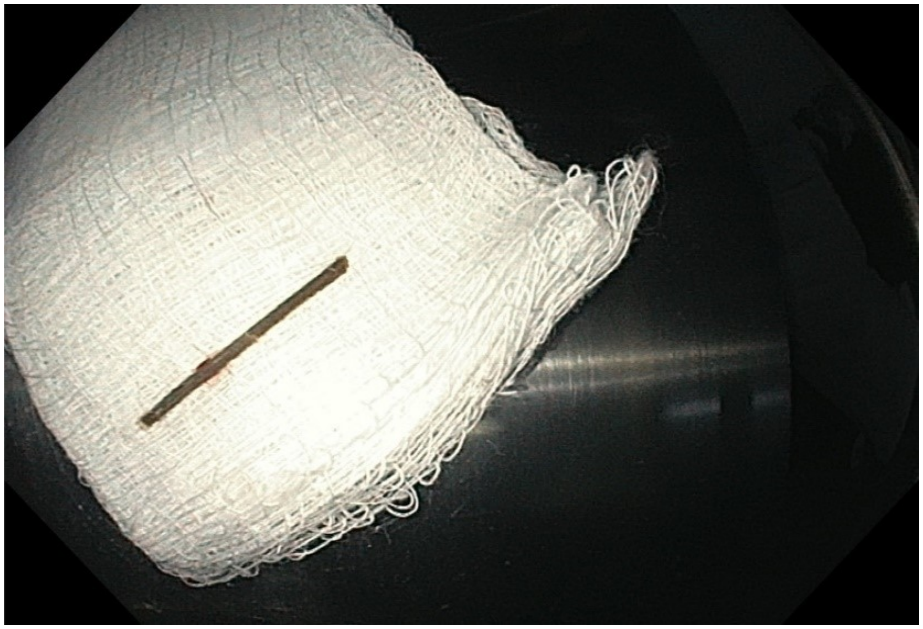

**Fig.3:** The broomstick after removal

With further history, the patient recalled that she took a local vegetable soup called 'ewedu'(mallow leaves, scientific name is '*corchorus*') a few days before the onset of her symptoms. In the preparation of this soup a small bunch of broomsticks (known as *'ijabe'*) is usually used to mash it, in order to soften and blend it.

Post removal of the broomstick, all the symptoms subsided. She started tolerating orally and was discharged the following day. She has remained symptom-free since then.

## Discussion

This case described the accidental ingestion of a broken broomstick contained in a local soup called 'ewedu'. A small bunch of broomsticks is usually used to mash it, so as to soften and blend the vegetable during preparation. So, in this case, one of the broomsticks must have broken into the soup and was accidentally swallowed together with the soup by our patient. In this case, history of ingestion of foreign body and the type of foreign body were not known until the foreign body was retrieved at endoscopy. In most cases, patients usually provide information about the ingested foreign body. But, this was not the case with our patient.

radiopaque. Even in cases where the ingested object is radiopaque, it might be concealed by soft tissue and fluid in the stomach, thereby making diagnosis difficult [16,17].

Upper GI endoscopy in our patient not only made the diagnosis of the foreign body possible, but also enhanced its removal. Endoscopy in this case was timely because, the object was already stuck in the mucosa and there was a risk of perforation. Emergency endoscopy is said to be indicated in cases of ingested sharp or pointed objects and batteries. This is because, these objects could cause perforation, pressure necrosis, fistulas or mercury poisoning [15,18].

It is believed that about 90% of all ingested objects will pass spontaneously through the digestive tract within 7-10 days, especially if they had reached the stomach [3]. This was unlikely to have happened in the case presented because, the object was already impacted in the mucosa of the stomach. The nature of the object (long and sharp) could have contributed to its impaction in the mucosa. It is also possible that, the integrity of the gastric mucosa had been compromised secondary to long standing acid peptic disease in the patient. However, this could not be easily substantiated.

It has been reported that objects longer than 5cm cannot pass through the pylorus and duodenum

[4,19]. Although, the broomstick in our patient was about 4 cm long, the fact that it had pointed ends could have prevented its easy passage and at the same time aided its mucosal impaction.

The most common significant complications associated with GI foreign bodies are bowel obstruction, perforation, bleeding, fistula and abscess formation [3]. Sharp/pointed and long objects as is the case in our patient have been described as the most dangerous of all foreign bodies in the GI tract. It has been reported that about 30% of all GI perforations as a result of foreign bodies are due to sharp/pointed objects, and about 15-35% of ingested sharp/pointed objects will cause GI perforation if not removed [20]. It was therefore possible that, the broomstick could have caused gastric perforation in our patient if not timely removed.

## Conclusion

This case has revealed the danger that may be associated with using broomsticks in the preparation of this local soup (ewedu). Therefore, alternative means of preparation, like using the electronic blender should be employed. Also, it was important that an early endoscopy was performed in order to unravel the aetiology of patient's protracted symptoms.

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# Sexual practices and willingness to use female condoms among female undergraduate students of the University of Port Harcourt, Rivers State, Nigeria

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**Abstract**
*Background:* The female condom is useful in empowering women to protect themselves from adverse consequences of sexual intercourse but there is a dearth of information about willingness to use this device by young women in Nigeria. This study assessed sexual practices and willingness to use female condoms among female undergraduate students of the University of Port Harcourt, Rivers State, Nigeria.
*Methods***:** This cross-sectional study conducted among 600 female undergraduate students utilized a cluster sampling technique. Thirty out of 78 off campus hostels were selected by simple random sampling. A pre-tested, semi-structured, self-administered questionnaire was used. Data were analysed using descriptive and inferential statistics with significance set at p=0.05.
*Results:* Mean age of respondents was 21.5±2.5years. Majority of the sexually active respondents (285, 81.7%) had multiple sexual partners 92 (26.4%) while 266 (76.2%) had ever used contraceptives. Only 17 (6.3%) of the 270 respondents who had ever seen the female condom had used it. Main reasons for non-use of female condom were unavailability (32.7%), insertion difficulty (20.1%) and discomfort (17.1%). About a quarter, 154 (27.1%) indicated willingness to use a female condom. Predictors of willingness to use the female condom were being in a relationship (OR= 0.49; CI=0.26-0.93) and level of study (OR=1.86; CI=1.2-2.9).
*Conclusion***:** Most respondents were sexually active with evidence of contraceptive use but poor use and a moderate level of willingness to use the female condom. Interventions aimed at improving access and demonstrations of how to use female condoms by health workers can improve use of this method.

**Keywords:** *Sexual practices, female condom, female undergraduates*

**Résumé**
*Contexte:* Le préservatif féminin est utile pour permettre aux femmes de se protéger contre les conséquences néfastes des rapports sexuels, mais il y a un manque d'informations concernant la volonté d'utiliser ce dispositif chez les jeunes femmes au. Cette étude a évalué les pratiques sexuelles et la volonté d'utiliser des préservatifs féminins parmi les étudiantes en licence de l'Université de Port Harcourt, dans l'État de Rivers, Nigéria.
*Méthodes* **:** Cette étude transversale menée auprès de 600 étudiantes en licence a utilisé une technique d'échantillonnage en groupement. Trente des 78 auberges hors campus ont été sélectionnées par simple échantillonnage aléatoire. Un questionnaire pré testé, semi-structuré et auto-administré a été utilisé. Les données ont été analysées à l'aide de statistiques descriptives et d'inférence, avec la signifiance fixée à p = 0,05.
*Résultats:* L'âge moyen des répondantes était de 21,5 ± 2,5 ans. La majorité des répondantes sexuellement actives (285 ; 81,7%) avaient plusieurs partenaires sexuels 92 (26,4%), tandis que 266 (76,2%) avaient déjà utilisé un moyen de contraception. Seulement 17 (6,3%) des 270 répondants qui avaient déjà vu le préservatif féminin l'avaient utilisé. Les raisons principales de non utilisation du préservatif féminin étaient l'indisponibilité (32,7%), la difficulté d'insertion (20,1%) et le malaise (17,1%). Environ un quart, 154 (27,1%) ont indiqué leur volonté d'utiliser le préservatif féminin. Les prédicteurs de la volonté d'utiliser le préservatif féminin étaient d'être dans une relation (OR = 0,49; IC = 0,26-0,93) et le niveau d'étude (OR = 1,86; IC = 1,2-2,9).
*Conclusion* **:** La plupart des répondantes étaient sexuellement actives et présentaient des preuves d'utilisation de contraceptifs, mais faible utilisation et une volonté modérée d'utiliser le préservatif féminin. Les interventions visant à améliorer l'accès et les démonstrations sur l'utilisation des préservatifs féminins par les agents de santé peuvent améliorer l'utilisation de cette méthode.

**Mots clés:** *Pratiques sexuelles, Préservatif féminin, Étudiantes en licence*

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## Introduction

Sexual activity has become increasingly prevalent among university undergraduates and has been associated with risky sexual practices among them. [1,2]. This may result in the adverse consequences of unprotected sex such as sexually transmitted infections, unwanted pregnancies and abortions with women bearing a disproportionate burden of these consequences [1,2].

Universities provide the highest level of education in the country and their role in national development through the generation of knowledge and provision of skilled labour for both the public and private sector is vital. Upon entry into university, undergraduates acquire independence from parental and secondary school restrictions. When young people move out of their parents' homes, direct parental control ceases and identification with the peer group increases. This increase in autonomy manifests in very permissive attitudes and increased sexual experimentation, associated with risky sexual practices [3]. Young people who make up the majority of any undergraduate population and who are aged 15-24 account for an estimated 45% of new HIV infections worldwide [4]. Reports for Sub-Saharan Africa indicates that the percentage of young women aged 15-24 living with HIV are twice that of young men of the same age [5, 6]. National data in Nigeria indicate that Rivers State has the highest HIV prevalence rate at 15.2% [7].

An essential step in controlling the pandemic of HIV and STIs is through helping young people to reduce or avoid unsafe sexual behaviour. Condoms can be used to achieve this goal. The condom is a type of barrier contraceptive which could be of the male and female kind which has the advantage that it can be used during sexual intercourse to reduce the probability of pregnancy and spread of sexually transmitted diseases including HIV/AIDS [8]. Condoms are most often made from latex, but some are made from other materials such as polyurethane, polyisoprene, or lamb intestine [9]. The need for a female condom has been driven by the recognition that the nature of women's intimate relationships often render it difficult for them to request, much less insist on, male condom use [10].

The female condom is of particular interest because it is seen as a product that can give women the ability to initiate their own protection from unwanted pregnancy, HIV and other sexually transmitted diseases which are all extremely urgent health concerns for women of reproductive age. However, available information on contraceptive use in Nigeria, indicates that male condom use is 67.0% while female condom was found to be 29.0% as documented in a nationally representative survey [11]. Few studies have looked at the prevalence of female condom use. A study among undergraduates in Enugu revealed that male condom use was 62.0% while female condom use was found to be 15.9% [12, 13]. Another study in the Eastern part of Nigeria also documented the prevalence of female condom use as 15.7% [14]

There is little information about reasons for non-use of female condoms and willingness to use among young women. The objective of this study was to determine the sexual practices of female undergraduates at the University of Port Harcourt, as well as their awareness and willingness to use female condoms.

## Materials and method

A cross-sectional study design was utilized. The study population consisted of female undergraduate students of the University of Port Harcourt. The University of Port Harcourt was established in 1975 and has a student population of about 38,000 with a total of ten faculties. There are on-campus hostels for students which are specifically for 100 level students while other students are required to live off-campus in privately owned housing units near the University.

A cluster sampling technique was utilized. Seventy-eight housing units in 3 main neighbourhoods near the campus were identified and thirty were selected by simple random sampling. Ten housing units comprising of five small (10-30 rooms) and five large (40-60 rooms) housing units were selected in each of the three neighbourhoods. All female students in the selected housing units were recruited following informed consent. All research participants expressed willingness to participate in the study.

The research tool was a self -administered questionnaire with sections for obtaining information on socio-demographic characteristics, sexual practices, knowledge of the female condom, its use as well as willingness to use. Questionnaires were administered by four trained female research assistants of graduate and undergraduate educational status.

The data obtained were edited and manually cleaned and recoded where necessary. Data were entered into the computer and analyzed using the Statistical Package for Social Sciences (SPSS 16.0 Microsoft Inc., 2007). Data analysis was done using both descriptive and inferential statistics. The dependent variable was willingness to use the female

**Table 1**: Socio-demographic characteristics of the respondents (N=600)

| Variables | n | % |
|---|---|---|
| *Faculty* | | |
| Arts | 123 | 20.5 |
| Sciences | 268 | 44.7 |
| Social sciences | 69 | 11.5 |
| Education | 140 | 23.3 |
| *Study Level* | | |
| 200 | 390 | 65 |
| 300 | 115 | 19.2 |
| 400 | 76 | 12.7 |
| 500 | 10 | 1.7 |
| 600 | 9 | 1.5 |
| *Age range* 16-30 years | | |
| *Age group (in years)* | | |
| ≤18 | 71 | 11.8 |
| 19-21 | 245 | 40.8 |
| 22-24 | 208 | 34.7 |
| ≥ 25 | 76 | 12.7 |
| *Marital status* | | |
| Single | 59 | 98.8 |
| Married | 37 | 1.2 |
| *Religion* | | |
| Christianity | 590 | 98.3 |
| Islam | 5 | 0.8 |
| Others (free thinkers) | 2 | 0.3 |

condom while sociodemographic characteristics served as the independent variables. Chi-square test was used to test the statistical associations between categorical variables at 5% level of significance. Multivariate analysis using binary logistic regression was used to identify predictors of willingness to use the female condom. The independent variables entered into the logistic regression model were those that were significant at 10% ($p<0.01$) on bivariate analysis.

Ethical clearance was obtained from the University of Port Harcourt Ethics Review Board. Each participant was provided with information on the study objectives. Written informed consent was obtained from respondents. Participation in the study was voluntary and participants were at liberty to decline at any stage of the study without consequence. Respondents' privacy and confidentiality was guaranteed by ensuring the anonymity of respondents and limited access to the data collected. Research assistants were required to sign a declaration of non-disclosure of all information provided by participants in the course of data collection.

## Results

The mean age of the respondents was 21.5 ± 2.5 years with a response rate of 100%. Majority of the respondents were single 593 (98.8%), Christian 590 (98.3%) and were in 200 and 300 levels of study 505 (84.2%). About a quarter 140 (23%) of the respondents were from the Faculty of Education, 123 (20.5%) from Faculty of Humanities, 96 (16.0%) from Management Sciences while Faculty of Dentistry had the least number of respondents 3 (0.5%). The socio-demographic characteristics of the respondents are highlighted in Table 1.

**Table 2:** Sexual practices of respondents

| Variables | | (N=600)n | % |
|---|---|---|---|
| Ever had sex | | | |
| Yes | | 356 | 59.3 |
| No | | 244 | 40.7 |
| Age at first sex | | (N=356) | |
| ≤ 16 | | 38 | 10.7 |
| 17-20 | | 248 | 69.7 |
| ≥21 | | 67 | 18.8 |
| Mean age at first sex married | 21.1± 2.1 | | |
| Mean age at first sex single | 18.5± 3.5 | | |
| Sex in the last 12 months preceding the survey among single respondents | | (N=349) | |
| Yes | | 285 | 81.7 |
| No | | 64 | 18.3 |
| Multiple sexual partners in the last 12 months | | | |
| Yes | | 92 | 26.4 |
| No | | 192 | 26.4 |
| No response | | 65 | 18.6 |

**Table 3:** Contraceptive Use among singles that had ever had sex N=349

| Variable | (N=349) n | % |
|---|---|---|
| *Ever used contraceptives* | | |
| Yes | 266 | 76.2 |
| No | 83 | 23.8 |
| *Contraceptive method used** | | |
| Male condom | 153 | 41.9 |
| Pills | 129 | 35.3 |
| Withdrawal | 58 | 15.9 |
| Periodic abstinence | 20 | 5.5 |
| Female sterilization | 2 | 0.5 |
| Injectable | 2 | 0.5 |
| Implants | 1 | 0.3 |
| *Current use of contraceptives* | | |
| Yes | 202 | 57.9 |
| No | 64 | 18.3 |
| *Contraceptive method used** | | |
| Male condom | 104 | 43.8 |
| Pills | 70 | 29.4 |
| Withdrawal | 40 | 16.8 |
| Periodic abstinence | 22 | 9.2 |
| Female sterilization | 2 | 0.8 |

*Multiple responses

Table 2 highlights the sexual practices of the respondents. More than half had ever had sex 356 (59.3%) with mean age of sexual debut for single respondents being 18.5 ± 3.5 years and mean age for married respondents being 21.1 ± 2.1 years. Majority of the respondents who had ever had sex were sexually active 285 (81.7%) having had sexual intercourse within the preceding 12 months. About a quarter of sexually active respondents 92 (26.4%) were involved in multiple sexual partnering. With respect to contraceptive use, of the single respondents that had ever had sex, 266 (76.2%) had ever used contraceptives and 202 (57.9%) were currently using contraceptives with male condoms being the contraceptive that was used by most of the respondents 153 (43.8%).

Majority of the respondents 569 (94.8%) had ever heard of the female condom with friends being the main source of information, 228 (38.0%). Almost half of the respondents who had heard of the female condom 270 (47.5%) had ever seen one with only 17 (3.0%) respondents reporting ever having used a female condom. Only three respondents (17.6%) out of those that had ever used a female condom were currently using it (Table 4). Intent to use the female condom in the future was reported by 27.1% of the

**Table 4:** Awareness, sources of information and use of the female condom N=600

| Variables | **(N=600)** n | % |
|---|---|---|
| *Ever heard of female condom* | | |
| Yes | 569 | 94.8 |
| No | 31 | 5.2 |
| *Source of information for female condom (N=569)* | | |
| Internet | 26 | 4.3 |
| Friends | 228 | 38.0 |
| Media | 109 | 18.2 |
| Parents | 7 | 1.2 |
| School | 90 | 15.8 |
| Health workers | 109 | 19.2 |
| Non response | 31 | 5.2 |
| *Source from which to obtain female condom* | | |
| Government hospitals/health Centers | 90 | 15.0 |
| Chemist | 19 | 3.2 |
| Pharmacy | 201 | 33.5 |
| Others (friends, NGOs) | 5 | 0.8 |
| Don't know | 285 | 47.5 |
| *Ever seen a female condom* | | |
| Yes | 270 | 47.5 |
| No | 299 | 52.5 |
| *Ever used female condom* | | |
| Yes | 17 | 3.0 |
| No | 552 | 97.0 |
| *Current use of female condom* (N=17) | | |
| Yes | 3 | 17.6 |
| No | 14 | 82.4 |

**Table 5:** Willingness to use female condom and reasons for non-use

| Variable | (N=569)n | % |
|---|---|---|
| *Willingness to use female condom* | | |
| Yes | 154 | 27.1 |
| No | 415 | 72.9 |
| *Reasons for not using the female condom* | | |
| Not sexually active | 23 | 6.8 |
| Partners disapproval | 38 | 11.2 |
| Discomfort | 58 | 17.1 |
| Insertion difficulty | 68 | 20.1 |
| Unavailability | 111 | 32.7 |
| Cost | 7 | 2.1 |
| Religious reasons | 21 | 6.2 |
| No response | 89 | 21.4 |
| *Reasons for using the female condom* | | |
| Prevention of pregnancy and sexually transmitted diseases | 23 | 6.8 |

**Table 6:** Association between respondents' background characteristics and willingness to use the female condom among those who had heard of the female condom

| Background characteristics | Willingness to use the female condom N= 559 | | Chi square | P value |
|---|---|---|---|---|
| | Yes n(%) | No n(%) | | |
| *Age group (in years)* | | | | |
| ≤ 18 | 15 (21.1) | 56 (78.9) | | |
| 19-21 | 68 (28.1) | 174 (71.9) | 6.053 | 0.109 |
| 22-24 | 67 (32.8) | 137 (67.2) | | |
| ≥ 25 | 15 (20.5) | 58 (79.5) | | |
| *Level* | | | | |
| 200-300 | 127 (25.7) | 368 (74.3) | 8.140 | 0.004 |
| > 400 | 38(400) | | | |
| 57 (60.0) | | | | |
| *In a relationship* | | | | |
| Yes | 151 (30.3) | 348 (69.7) | | |
| No | 14 (15.4) | 77 (84.6) | 8.454 | 0.002 |
| *Ever had sex* | | | | |
| Yes | 111 (31.6) | 240 (68.4) | 5.755 | 0.010 |
| No | 54 (22.6) | 185 (77.4) | | |

**Table 7:** Predictors of willingness to use the female condom

| Variables | Odd's ratio | 95% Confidence interval | P-value |
|---|---|---|---|
| Being in a relationship with the opposite sex | | | |
| Yes | 0.496 | 0.26 – 0.93 | 0.030 |
| No | Ref. | | |
| Ever had Sex | | | |
| Yes | 0.75 | 0.5 – 1.11 | 0.153 |
| No | Ref. | | |
| Level of study | | | |
| 200-300 | 1.86 | 1.2 - 2.9 | 0.009 |
| ≥400 | Ref | | |

respondents with unavailability (32.7%), insertion difficulty (20.1%), discomfort (17.1%) and partners disapproval (11.2%) being the main reasons why respondents were not willing to use the female condom (Table 5). However, a total of 154 (27.1 %) indicated a willingness to use the female condom. Level of study, relationship status and ever having sex were significantly associated with the willingness to use female condoms on bivariate analysis. Those who were in 200-300 level, respondents that were in a relationship and those who had never had sex were less likely to be willing to use a female condom (Table 6). Being in a relationship and level of study also predicted the willingness to use the female condom as they remained significant in the logistic model (Table 7).

## Discussion

Almost all the respondents were single. More than half of the single respondents had ever had sex with mean age at sexual debut being 18.5 ± 3.5. This is similar to what was observed in a study by Cadmus and Owoaje at the University of Ibadan where mean age of sexual debut was 19 years [15]. However, the mean age in a study carried out among young female undergraduates in Nnamdi Azikiwe University, Anambra by Adinma and Okeke revealed a higher mean age at sexual debut of 21.8 years [16].

Majority of the single respondents were sexually active, reporting sexual activity within the 12 months preceding the survey (81.7%). This is comparable to findings from a study by Duru et al where almost three quarters of respondents who had

ever had sex reported being currently sexually active [17]. About a third of single respondents who were currently sexually active had multiple sexual partners. This is similar to the findings of Ibe [18] who reported that 42% of students of tertiary institutions in Rivers State had multiple sexual partners and the findings of 40.3% reported by Tobin et al among undergraduate students of University of Port Harcourt [19].

**Contraceptive use**

About three quarters of the respondents in this study who had ever had sex (76.2%) had ever used contraception which is similar to what was reported by Cadmus and Owoaje who found contraceptive use to be 63.9% among female undergraduates in Ibadan [15]. However this finding is in contrast to a study by Duru et al which reported 54.4% [17]. This finding is also higher than 54.0% that was reported among female undergraduates in Lagos State [20] and 32.4% reported by Ejembi and colleagues from the Ahmadu Bello University [3].

Current use of contraceptives among the respondents in this study was 57.9%. The main type of contraceptives used was the male condom (ever used 41.9%, current use 43.8%) followed by oral contraceptive pills (ever used 35.3%, current use 29.4%). Use of contraceptives among sexually active young people is critical in the prevention of unwanted pregnancy as well as other negative consequences of unprotected sexual intercourse [21]. The prevalence of unwanted pregnancy among young people in Nigeria has been found to vary with reports of 33.6 % in Calabar [22], 27.4% in Ekiti [23], 21% in Lagos [24] and 5.7% in Ilorin [25]. In this study, unwanted pregnancy was reported to be 15.6% with (79) 84.0% of these being aborted. The reasons for these variations in the prevalence of unwanted pregnancy are unclear, however, cultural perceptions towards premarital sexual intercourse and subsequent pregnancy out of wedlock may play a role. Reports from other studies show that undergoing an abortion is the way majority of young girls handle unwanted pregnancy with abortion rates ranging from 51.2% to 100% [22, 23, 25]. This is similar to what was observed in this study where 84.0% of unwanted pregnancies ended up in an abortion.

Majority of the respondents in this study had heard about the female condom. This was also reported by Oladeinde et al in Ilorin where awareness of female condom among female undergraduates was very high [26]. Many of the respondents heard about the female condom from friends, which was similar to what was found by Oladeinde [26]. Almost half of the respondents in this study had ever seen the female condom (47.5%). Similar observations have been made by other researchers within Nigeria with Nwaokoro reporting 35.7% and Tobin-West reporting 50.3% [14, 19] However, a study by Mbarushimana and colleagues in Rwanda reported that up to 79% of the respondents had seen the female condom [27]. Differences in contraceptive method mixes that are readily available in various countries and by extension, greater awareness with respect to methods that are available might be a contributory factor to the differences observed. Female condom use was very low in this study which was also seen in other parts of Nigeria [14, 19]. Low utilization was also observed by a study conducted by Dayan et al in Ethiopia as well as that by Mbarushimana *et al* [27, 28]. Among the sexually active respondents in this study, the major reason for not using the female condom was as a result of its non-availability. This was also a major reason highlighted by other researchers within Nigeria [14, 19, 25].

Insertion difficulties and discomfort were other reasons for non-use. Reasons given for the low use as reported by Mbarushimana and colleagues in Rwanda were non-availability, problems with access and difficulties in use while Dayan et al in Ethiopia reported non-availability and a negative attitude. Non- availability of female condoms appears to be a recurring theme as it has been highlighted by other researchers in Nigeria [14, 19, 25] as well as in other parts of Africa [26, 28]. In this study, about 27.1% were willing to use the female condom in the future while the study by Dayan and colleagues, carried out among female college students in Ethiopia reported that 40.9% were willing to use female condoms [28]. Reasons for this disparity in the willingness to use female condoms might possibly be due to cultural differences. Predictors of female condom use have been reported to include multiple sexual partnering, knowledge of female condom use, education and age as seen in the U.S.A [29]. In this study, respondents in a relationship were less likely to be willing to use a female condom in the future compared to those who were not in a relationship. This may not be particularly surprising as young people have been found to be inconsistent in their use of contraception [23]

Respondents who were in 200 and 300 hundred levels (the second and third year of study) were more likely to be willing to use a female condom in the future compared to those who were in 400 level and above. Sexually active female undergraduates in higher levels of study are usually

more experienced and have possibly decided on what methods work for them and this might have contributed to this finding.

**Conclusion and recommendation**

This study is limited by its cross sectional design which does not allow for causal associations. The possibility of recall bias on the part of the respondents is also acknowledged. Despite this, our findings show that these young females engage in risky sexual behaviour and only a small proportion of them expressed a willingness to use female condoms. Non-availability, insertion difficulty and discomfort represent barriers to use.

Contraceptive programmes should ensure availability of the female condom as well as explore options for its redesign. Health care providers should provide health education and demonstration of the use of female condoms as is done with the male condom. These measures would be useful in addressing insertion difficulties and discomfort reported by this and other studies. Such improvements have the potential to increase uptake of this method.

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# Knowledge of implications of obesity on reproductive health among women of reproductive age in Ibadan South-west Local Government Area, Oyo State, Nigeria

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**Abstract**

*Background:* Obesity is one of the risk factors to non-communicable diseases and it is characterized by an excess of adipose tissue in the body. It has also been implicated in reproductive health challenges confronting women including infertility. However, knowledge and attitude of Women of Reproductive Age (WRA) on the implications of obesity on their reproductive health status have not been fully explored among Nigerian WRA. This study was conducted to investigate knowledge of implications of obesity on reproductive health among WRA in Ibadan South-West Local Government Area in Oyo State.

*Methods***:** This was a descriptive cross-sectional study. A three-stage sampling technique was used to select 500 WRA from six communities. Semi-structured, interviewer-administered questionnaire was used to elicit information on socio-demographic characteristics, knowledge and attitude towards obesity. Obesity was assessed using Body Mass Index (BMI) and Waist-to-Hip Ratio (WHR). Data were analysed using descriptive and inferential statistics.

*Results***:** Age was 29.9±8.7 years with 56.0% having tertiary education and 60.0% had biological children. Prevalence of obesity was 18.6% and 52.4% had abdominal obesity. Few respondents mentioned reproductive health problems influenced by obesity to include infertility (34.4%), obstructed labour (33.0%), delivery by caesarean section (26.0%), fibroid (4.0%) and menstrual disorders (3.0%). Majority (86.8%) had poor knowledge of the implications of obesity on reproductive health. Respondents (90.4%) had favourable disposition towards obesity and knowledge was found not significant in different with age ($p>0.05$).

*Conclusion***:** Poor knowledge was observed among the respondents. This implies the need for sensitization on the negative implications of obesity on reproductive health.

**Keywords:** *Obesity, reproductive health challenges, women of reproductive age*

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**Résumé**

*Contexte:* L'obésité est l'un des facteurs de risque des maladies non transmissibles et se caractérise par un excès de tissu adipeux dans le corps. Il a également été impliqué dans les problèmes de santé reproductrice auxquels sont confrontées les femmes, notamment l'infertilité. Cependant, les connaissances et l'attitude des femmes en âge de procréer (FAP) sur les implications de l'obésité sur leur statut en matière de santé de la reproduction n'ont pas été complètement explorées chez les FAP nigérianes. Cette étude a été menée pour étudier les connaissances sur les implications de l'obésité sur la santé reproductrice chez les FAP dans la commune du Sud-Ouest d'Ibadan dans l'État d'Oyo.

*Méthodes* **:** Il s'agissait d'une étude descriptive transversale. Une technique d'échantillonnage en trois étapes a été utilisée pour sélectionner 500 FAP dans six communautés. Un questionnaire semi-structuré, administré par un intervieweur, a été utilisé pour obtenir des informations sur les caractéristiques sociodémographiques, les connaissances et l'attitude à l'égard de l'obésité. L'obésité a été évaluée à l'aide de l'indice de masse corporelle (IMC) et du ratio taille- hanches (RTH). Les données ont été analysées à l'aide de statistiques descriptives et inférences.

*Résultats* **:** L'âge était de 29,9 ± 8,7 ans, dont 56,0% avaient suivi des études supérieures et 60,0% avaient des enfants biologiques. La prévalence de l'obésité était de 18,6% et 52,4% avait l'obésité abdominale. Peu des répondantes ont mentionnés des problèmes de santé reproductrice liés à l'obésité à inclure l'infertilité (34,4%), l'accouchement avec obstruction (33,0%), l'accouchement par césarienne (26,0%), les fibromes (4,0%) et les troubles menstruels (3,0%). La majorité (86,8%) avait une connaissance insuffisante des conséquences de l'obésité sur la santé reproductrice. Les répondantes (90,4%) avaient une prédisposition favorable à l'obésité et les connaissances acquises n'étaient pas significatives avec l'âge ($p> 0,05$).

*Conclusion* **:** Une faible connaissance a été observée parmi les répondantes. Cela implique un besoin de sensibilisation sur les implications négatives de l'obésité sur la santé reproductrice.

**Mots-clés:** *Obésité, problèmes de santé reproductrice, femmes en âge de procréer*

## Introduction

In many developing countries, research and investment in health have been mainly devoted to infectious diseases, despite the growing need to address non-communicable diseases (NCDs) with more efforts and resources [1]. Deaths from infectious diseases, maternal and perinatal conditions, and nutritional deficiencies combined are projected to decline by 3.0% over the next 10 years, while at the same time deaths due NCDs are projected to increase by 17.0% [2]. As a result, it is estimated that of the projected 64 million deaths worldwide in 2015, 41 million (64.0%) will result from chronic diseases; unless urgent action is taken [1]. Obesity is a risk factor to some NCDs and it's characterized by an excess of adipose tissue. It should be considered a serious medical condition that can lead to significant morbidity and mortality rather than a character flaw or personal weakness [3].

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. Overweight and obesity are the fifth leading risk for global deaths. At least 2.8 million adults die each year as a result of being overweight or obese. In addition, 44.0% of the diabetes burden, 23.0% of the ischaemic heart disease burden and between 7.0% and 41.0% of certain cancer burdens are attributable to overweight and obesity [4]. Approximately 2.5 million deaths globally are attributable to obesity, of which one third occurs in developing countries [5]. In Nigeria, nearly one in four women is either overweight or obese (16.0% overweight and 6.0% obese). Overweight and obesity increase by age from 7.0% among women age 15-19 years to 34.0% among women age 40-49 years. More urban women (31.0%) than rural women (17.0%) are overweight or obese [6]. Obesity, which was previously thought to have low prevalence rate in Nigeria because of its association with wealth and affluence has risen in prevalence over the last decade to levels that now constitute epidemic threat [7, 8].

Obesity and overweight are common conditions that have consequences not only on NCDs but also to a great extent on reproductive health [9]. The impact of obesity on reproduction starts at a young age. Obese girls frequently experience the onset of puberty at a younger age than their normal-weight peers [10]. Obesity contributes to anovulation and menstrual irregularities, reduced conception rate and a reduced response to fertility treatment; it is frequently associated with disturbances in the menstrual cycle [11]. Maternal obesity is related to a significantly higher risk for complications during pregnancy, including a higher rate of delivery and surgical difficulties, hypertension, thromboembolism, and gestational diabetes, which also contribute to foetal complications including congenital malformations, macrosomia, and antepartum stillbirth [12, 13]. Obesity is associated with an increased risk of maternal mortality, gestational diabetes mellitus, thromboembolism, pre-eclampsia and postpartum haemorrhage. Obesity also complicates operative delivery; it makes operative delivery more difficult, increases complications and paradoxically increases the need for operative delivery [9]. Obese women are also less likely to breastfeed for mechanical as well as physiological reasons, removing a fundamental safeguard against long-term weight gain for themselves and their children [14]. There is also evidence that excess body fat may impair mammary gland development before conception and during pregnancy by hormonal and metabolic effects [15].

Women are at higher risk because they are already faced with a number of health challenges that concerns their reproductive roles and these will definitely be compounded when they are obese. Obesity has been implicated in some cases of infertility among women [8]. Women of reproductive age have a vital role to play in the family; therefore any harm to them will have a spiral effect not only on the family but also on the society at large. In view of the cultural acceptance of obesity by some women, it is relevant to investigate knowledge of reproductive health implications and attitude of women of reproductive age in relation to obesity.

## Materials and methods

This study was a descriptive cross sectional survey among women of reproductive age in Ibadan South West Local Government Area, Ibadan. The study population was women of reproductive age between 15-49 years who consented to be part of the study. A three-stage sampling technique was used to select 500 respondents for this study. A pretested semi-structured and interviewer-administered questionnaire was used for data collection and it elicited information on socio-demographic characteristics of respondents, attitude of women towards obesity and knowledge of respondents on implications of obesity on reproductive health. Attitude of women towards obesity was assessed with an 11-item attitudinal scale. Respondents' attitude towards obesity was analyzed on a 22-point scale with scores of 50$^{th}$ centile and below classified as 'Positive' and greater than this centile was classified as 'Negative' attitude. Knowledge of implications of

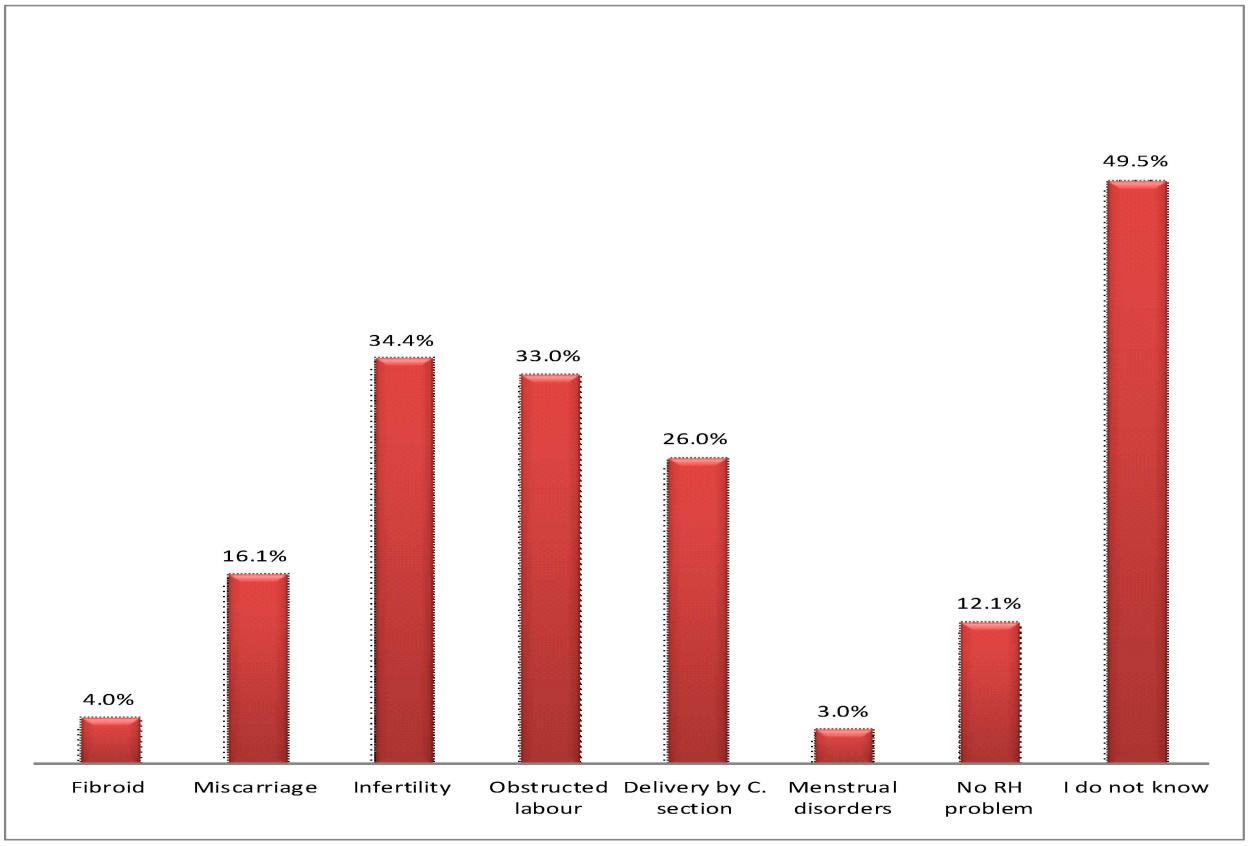


**Fig. 1:** Reproductive health problems mentioned to be associated with obesity

obesity on reproductive health was assessed on a 7-item scale of 14 points. Knowledge score were classified as poor (0-8) and good (>8).

Anthropometric measurements conducted were weight, height, waist and hip circumference. Body weight was measured in kilogram using a validated Harson scales (Model H89 black). Height was measured in metres using portable locally manufactured but validated stadiometers. Body mass index (BMI) was calculated as weight in kilograms divided by the square of the height in meters. It is the most commonly used measure for monitoring the prevalence of obesity at population level. BMI ($kg/m^2$) was categorized using the World Health Organization [16] definitions. Waist circumference was taken at approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest [17] while the hip circumference was taken at the widest portion of the buttocks and measured to the nearest centimetre using a flexible tape. Waist-to-hip ratio was calculated by dividing the waist circumference by the hip circumference in centimetre. Data collected were analysed using descriptive and bivariate statistics.

## Results

About half (50.6%) of the respondents were married while 41.4% were single. Majority of the respondents were Christians (79.0%) and Yoruba (84.0%). Only 60.0% of respondents reported having biological children. Few (22.2%) of the respondents was aged 25-29 years while respondents aged 40-44 years and 45-49 years were 6.6% and 9.2%, respectively. Fifty six percent of respondents had tertiary education while 35.4% and 6.4% had secondary and primary school education, respectively.

The reproductive health problems implicated in obese persons as stated by the respondents included menstrual disorder (3.0%); fibroid (4.0%) and miscarriage (16.1%). Other reproductive health-related problems mentioned were child delivery requiring caesarian operation (26.0%); obstructed labour (33.0%) and infertility (34.4%). A few (12.1%) of the respondents stated that there were no reproductive health problems associated with obesity while 49.5% did not know the reproductive health problems associated with obesity (Figure 1). The set of data presented in Figure 1 was from a general response to the question on reproductive health problems that are associated with obesity as understood by the respondents.

**Table 1:** Knowledge of respondents on implications of obesity on reproductive health N=500

| Variables | N | % |
|---|---|---|
| *Implication of obesity on menstrual cycle* | | |
| Excessive flow* | 66 | 13.2 |
| Cessation of menses* | 29 | 5.8 |
| Scanty flow* | 15 | 3.0 |
| Pain | 21 | 4.2 |
| Offensive odour | 15 | 3.0 |
| Irregular menses* | 79 | 15.8 |
| No effect on menses | 218 | 43.6 |
| I don't know | 234 | 46.8 |
| *Implication of obesity on child delivery* | | |
| Obstructed labour* | 251 | 50.2 |
| Delivery by caesarean section* | 229 | 45.8 |
| Macrosomic baby* | 14 | 2.8 |
| Stillbirth | 37 | 7.4 |
| Neonatal abnormalities* | 9 | 1.8 |
| Microsomic baby | 24 | 4.8 |
| No effect on child delivery | 82 | 16.4 |
| I don't know | 237 | 47.4 |
| *Implication of obesity on forms of cancer* | | |
| Breast* | 153 | 30.6 |
| Endometrial* | 16 | 3.2 |
| Cervix* | 34 | 6.8 |
| Intestinal/colon* | 12 | 2.4 |
| Kidney* | 27 | 5.2 |
| Lung† | 13 | 2.6 |
| Stomach† | 12 | 2.4 |
| I don't know | 95 | 19.0 |

*Note: Multiple responses recorded*

*Correct responses
†Evidence not too strong

However, in Table 1, three domains of knowledge were used to assess respondents' knowledge of implications of obesity on reproductive health. These domains included implications of obesity on: menstrual cycle, child delivery and types of cancer. Each of these domains has variables that were used to measure the knowledge as presented in Table 1.

Some of the implications of obesity on menstrual cycle as mentioned by the respondents (500) included excessive flow of menstrual blood (13.2%), cessation of menses (5.8%) and offensive odour (3.0%) (Multiple responses recorded). Respondents who indicated that they did not know the effects of obesity on menstrual cycle were 46.8% while 43.6% stated that obesity does not have effects on menstrual cycle.

Knowledge of effects of obesity on child delivery as determined by the set variables and mentioned by the respondents ranged from neonatal abnormalities (1.8%) to obstructed labour (50.2%); details are presented in Table 1.

Data on the knowledge of implication of obesity on types of cancer showed that 30.6% of respondents mentioned breast cancer while 6.8% and 3.2% stated cervical and endometrial cancers, respectively. Other correct types of cancer mentioned included renal (5.4%) and intestinal/colon (2.4%). However, 19.0% of respondents did not know that obesity can be a risk factor to some types of cancer.

Respondents (36.4%) stated that obesity is associated with increased risk of cancers. Many (52.8%) did not agree that obesity can contribute to failure to initiate and sustain exclusive breastfeeding while 29.0% and 18.2% agreed and did not know, respectively. Effects of obesity on mother's health during pregnancy as stated by the respondents were fatigue (45.8%), eclampsia (42.2%), fever (9.8%) and gestational diabetes (8.2%). Few (16.3%) and 46.4% mentioned that there was no implication and

**Table 2:** Association between Age Group of Respondents and Knowledge of Implications of Obesity on Reproductive Health N=500

| Variable | Knowledge category on implications of obesity | | |
|---|---|---|---|
| | Poor (n) | Good (n) | Total |
| Age group (in years) | | | |
| 15-19 | 48 | 6 | 54 |
| 20-24 | 89 | 6 | 95 |
| 25-29 | 90 | 21 | 111 |
| 30-34 | 84 | 13 | 97 |
| 35-39 | 53 | 11 | 64 |
| 40+ | 70 | 9 | 79 |

*$X^2$=8.421; df=5; p-value=0.13*

did not know of any implication of obesity on women's health in pregnancy, respectively.

Respondents' score on implications of obesity on reproductive health was 4.8 ± 3.0. Majority of the respondents (86.8%) had poor knowledge of the implications of obesity on reproductive health. With the level of significance set at <0.05, there was no significant association between age group of respondents and level of knowledge of implications of obesity on reproductive health (See Table 2).

The respondents who strongly agreed that obesity is not a symbol of well-being and good living were 46.6%. Respondents (48.8%) agreed that obese people are lazier than normal weight people while 41.2% agreed that obese people are very untidy. Few (22.0%) of the respondents strongly disagreed that they liked obese people than slim ones while 54.4% agreed that they were comfortable associating with obese people. Respondents (25.6%) disagreed that obese persons are as healthy as non-obese (See Table 3). Also, 30.4% of the respondents detested becoming obese. The mean score of attitude towards

**Table 3:** Attitude of Respondents towards Obesity (N=500)

| Variable | SA<br>n (%) | A<br>n (%) | U<br>n (%) | D<br>n (%) | D<br>n (%) |
|---|---|---|---|---|---|
| I do not consider obesity as a symbol of richness and good living | 233(46.6) | 237(47.4) | 12(2.4) | 14(2.8) | 4(0.8) |
| I expect obese people to live normal lives | 20(4.0) | 216(43.2) | 60(12.0) | 179(35.8) | 25(5.0) |
| I picture obese people as being lazier than normal weight people | 93(18.6) | 244(48.8) | 72(14.4) | 83(16.6) | 8(1.6) |
| I see obese people as very untidy | 71(14.2) | 206(41.2) | 111(22.2) | 97(19.4) | 15(3.0) |
| I like obese people than slim ones | 10(2.0) | 38(7.6) | 86(17.2) | 256(51.2) | 110(22.0) |
| I see obesity as the worst thing that can happen to anybody | 42(8.4) | 152(30.4) | 54(10.8) | 218(43.6) | 34(6.8) |
| I consider obese persons as confident as other people | 13(2.6) | 168(33.6) | 106(21.2) | 196(39.2) | 17(3.4) |
| I consider obese people as not being healthy as non obese people | 42(8.4) | 271(54.2) | 50(10.0) | 128(25.6) | 9(1.8) |
| I support that obese workers can be as successful as other workers | 28(5.6) | 235(47.0) | 116(23.2) | 112(22.4) | 9(1.8) |
| I am comfortable associating with obese people | 20(4.0) | 272(54.4) | 45(9.0) | 142(28.4) | 21 (4.2) |
| I am sure that obese people are as happy as non obese people | 18(3.6) | 148(29.6) | 140(28.0) | 172(34.4) | 22 (4.4) |

*SA: Strongly Agree; A: Agree; U: Undecided; D: Disagree; SD: Strongly Disagree*

obesity was 7.1±3.4. Majority (90.4%) of the respondents had positive attitude i.e. was favourably disposed towards obesity.

Weight and height were 63.7 ± 13.0kg and 1.6 ± 0.1m, respectively while the BMI was 25.0 ± 5.0kg/$m^2$. Respondents (49.6%) were of normal weight, 4.4% were underweight while 27.4% and 18.6% were overweight and obese, respectively. The respondents' waist circumference was 83.9 ± 42.5cm while the hip circumference was 95.3 ± 10.2cm. The WHR was 0.9 ± 0.1. Respondents who had low Waist-to-hip ratio (WHR) were 47.6% while 52.4% had high WHR.

**Discussion**

The implications of obesity on reproductive health as reported by the respondents included obstructed labour, miscarriages, menstrual problem, and neonatal abnormalities among others. This was similar to findings by Ogbuji [18], which highlighted the outcome of obesity on pregnancy and labour to include increased prevalence of pregnancy-induced hypertension, gestational diabetes, thromboembolism, urinary tract infections, induction of labour, instrumental delivery, caesarean section, anesthetic and postoperative complications including uterine infections. Nitert et al., [19] reported that 57.0% of the women in their study knew that being very obese prior to pregnancy increased the overall risk of pregnancy and birth complications. Over 75.0% of the respondents in the study identified that obese women had increased risk of overall complications, including gestational diabetes and hypertensive disorders of pregnancy compared to women of normal weight. The result from this study also showed that few respondents (19.6%) indicated that obesity is not associated with increased risk of cancer, 36.4% stated that obesity is associated with increased risk of cancer while 44.0% did not know if there is an association between the two medical conditions. This is supported by the findings of Soriano *et al*., [20], which revealed that there was a gap in knowledge regarding the risk obesity poses for the development of breast and colon cancer. Age of the respondents was found to have no effect on knowledge of obesity as a risk factor to reproductive health.

Respondents tended to view obese persons as being healthy as non-obese persons. This finding is at variance with [21] study that showed that school teachers tended to view obese persons as less healthy than non-obese persons. This study also showed that few of the respondents regarded obesity as the worst thing that can happen to anybody; which is similar to the findings of [21] and [22]. Neumark-Sztainer *et al*., [21] also submitted that 57.0% of their respondents agreed with the statement that "most obese people feel that they are not as good as other people", which is similar to what this study revealed that 39.2% of respondents disagreeing with the statement that views obese persons as confident as other people". Few (29.6%) of the respondents in this study agreed that obese people are as happy as non obese people which differs from the findings of [23] study where 63.3% of their respondents agreed that obese people feel unhappier than others. This study revealed that majority had positive attitude towards being obese. This implies that majority of women of reproductive age are favourably disposed to obesity. Positive disposition to overweight and obesity can hinder the effectiveness of weight control health education and promotion intervention programs.

When the prevalence of obesity among the respondents in this study was compared to the findings from other African countries, it is similar to the 18.0% that was reported in a study among urban dwellers in the Republic of Benin [24] but higher than the 13.6% reported in Ghana [25]. An earlier cross-sectional study in the southwestern part of Nigeria also found obesity to be present in 21.2% of the subjects [26]. The WHR assessment of participants in this study revealed that more than half (52.4%) had truncal obesity.

**Conclusion and recommendation**

The prevalence of obesity is gradually on the increase and the implications on reproductive health among WRA have not been fully understood by many of the respondents. Ironically, majority of the respondents in this study were favourably disposed towards obesity. This calls for relevant health promotion and education interventions to tackle the increasing prevalence of overweight and obesity. This implies that there is a need to create awareness that will assist in change in knowledge through appropriate health education program. Subsequently, availability of programs serving as reinforcement will assist in changing perception and attitude towards obesity. Nutrition education has a very strong role to play as part of the interventions to foster healthy eating as well as engagement in some controlled physical exercises among this group of women. The infertility clinics in Obstetrics and Gynaecology Departments should include weight management and control as parts of the screening and management of infertile couples. A similar study on men's knowledge of the relationship between obesity and fertility is very necessary

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# Attitudes and perceptions of orthodontists and residents -in- training to the need for orthognathic surgery in Nigeria

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**Abstract**

*Background***:** The use of orthognathic surgery (OS) protocol in the correction of severe skeletal malocclusions is still not widely practiced especially in the developing world despite its obvious benefits. In order to assess its acceptance and utilization in our environment, it is necessary to understand orthodontic practitioners' current attitudes and perceptions toward this emerging treatment option. This survey was therefore aimed to provide an insight into orthodontists' attitudes and perceptions to this treatment modalilty in Nigeria

*Methodology:* Thirty- six practicing Nigerian Orthodontists were included in this cross-sectional study. An 18-item self administered open ended questionnaire was used to collect data on their attitudes and perceptions of orthognathic surgery. Descriptive statistics were computed and analyzed as appropriate.

*Results***:** The mean age of the respondents was 41.3 years (range 29-68 years) with a female to male ratio of 2:1. Fifteen respondents (41.7%) were fellows of postgraduate Colleges (National postgraduate College of Nigeria/West African Postgraduate Medical College) while the remaining 21(58.3%) were resident doctors. Most of the respondents (88.9%) indicated that there was a need for OS in managing patients with dentofacial deformity while only 9(47.2%) of the respondents treat all cases of malocclusion with orthodontic methods alone irrespective of the aetiology. Majority believed that orthognathic surgical procedure is not easily accessible in Nigeria and they identified cost, fear and safety of surgery, lack of facilities and expertise as possible obstacles.

*Conclusion:* Nigerian orthodontists and trainees seem to view OS as a useful treatment protocol that is capable of improving efficiency and quality of patient care.

**Keywords:** *Orthognathic surgery, malocclusions, cross-sectional, respondent, dentofacial*.

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**Résumé**

*Contexte* **:** L'utilisation du protocole de chirurgie orthognathique (CO) pour la correction des malocclusions squelettiques sévères n'est pas encore largement pratiquée, en particulier dans les pays en voie de développement, en dépit de ses avantages évidents. Afin d'évaluer son acceptation et son utilisation dans notre environnement, il est nécessaire de comprendre les attitudes et perceptions actuelles des praticiens orthodontiques à l'égard de cette nouvelle option de traitement.

Cette enquête visait donc à fournir un aperçu des attitudes et des perceptions des orthodontistes à l'égard de cette modalité de traitement au Nigéria.

*Méthodologie:* Trente - six orthodontistes pratiquants nigérians ont été inclus dans cette étude transversale. Un questionnaire ouvert de 18 questions auto-administré a été utilisé pour collecter des données sur leurs attitudes et leurs perceptions de la chirurgie orthognathique. Des statistiques descriptives ont été calculées et analysées le cas échéant.

*Résultats* **:** L'âge moyen des répondants était de 41,3 ans (intervalle de 29 à 68 ans) avec un ratio femmes / hommes de 2:1. Quinze répondants (41,7%) étaient membres des collèges de troisième cycle (Collège national de troisième cycle du Nigeria / Collège de médecine de troisième cycle de l'Afrique de l'Ouest), les 21 autres (58,3%) étaient des médecins résidents. La plupart des répondants (88,9%) ont indiqué qu'il y a un besoin de CO pour la prise en charge des patients présentant une déformation dento-faciale, tandis que seulement 9 (47,2%) des répondants traitent tous les cas de malocclusion avec des méthodes orthodontiques seules, indépendamment de l'étiologie. La majorité a estimé que la procédure chirurgicale orthognathique n'était pas facilement accessible au Nigéria et ils ont identifié le coût, la peur et la sécurité de la chirurgie, le manque d'installations et de compétences spécialisées comme obstacles possibles.

*Conclusion:* Les orthodontistes et stagiaires nigérians semblent considérer la CO comme un protocole de traitement utile, capable d'améliorer l'efficacité et la qualité des soins prodigués aux patients.

**Mots clés:** *Chirurgie orthognathique, malocclusions, transversale, répondant, dento - faciale*

## Introduction

Historically, orthognathic surgery (OS) or corrective jaw surgery is designed to correct dentofacial conditions related to structure, facial growth, temporomandibular joint (TMJ) disorders, sleep apnoea and other skeletal malocclusions that cannot easily be treated with simple orthodontic mechanics [1]. This procedure dates back to 1945s and now accounts for about 5% of all treated cases of dentofacial deformity in the general population [1-3]. Though the procedure involves a team approach, orthodontists are often the patients' primary providers of information concerning the goals, benefits, and risks of OS treatment[4]. Patients' decision to seek OS treatment therefore is often initiated and influenced by orthodontist referral [4].

Possible differences in training and exposure may affect orthodontists' perception of OS treatment need and this variation can impact directly or indirectly on the utilization and success of treatment of dento-facial deformities with resultant effect on patients' satisfaction [5].

Unlike in advanced countries of Europe and America where OS procedures are common place and routine due to advances in three-dimensional imaging and computer-assisted surgery have significantly improved surgical outcomes and reduced surgical morbidity [6], current utilization of OS in Nigeria is very low [7-9]. It is conceivable that orthodontist' perception of OS treatment need may play a role in its under-utilization.

The purpose of this study was to assess Nigerian orthodontists and trainees' attitudes towards OS as a veritable surgical protocol in the management of skeletal anomalies.

## Methods

This survey was carried out through structured questionnaire distributed to orthodontists who attended the 10th Annual International Conference of the Nigerian Association of Orthodontists in Lagos in 2016. After the congress, the same questionnaires were sent electronically to orthodontists who did not attend the congress and are registered members of Nigerian Association of Orthodontists as at October 2016. A reminder mail was sent after 3 weeks to those who did not respond. An 18- item self -administered questionnaire was used to used to assess their attitudes and perceptions of orthognathic surgery in treating patients with dentofacial deformity.The questions were subdivided into 2 main topics; socio-demographics and attitude/perception.

Data were obtained through the electronic mail and from questionnaires returned at the meeting and they were entered into a personal computer and descriptive statistical analysis of variables which were presented as frequencies and percentages with level of significance set at 5% was done.

## Results

Thirty-six out of the total 61 questionnaires issued were returned giving a response rate of 59.0 %.

*Demographic data*

The mean age of the respondents was 41.3 years (range 29-68 years) with the majority in the 35-44 age category. There was significant female predilection (overall female to male ratio of 2: 1) in all the age categories except 25-34 (figure 1). Fifteen respondents (41.7%) were Fellows while the remaining 21(58.3%) were senior residents.

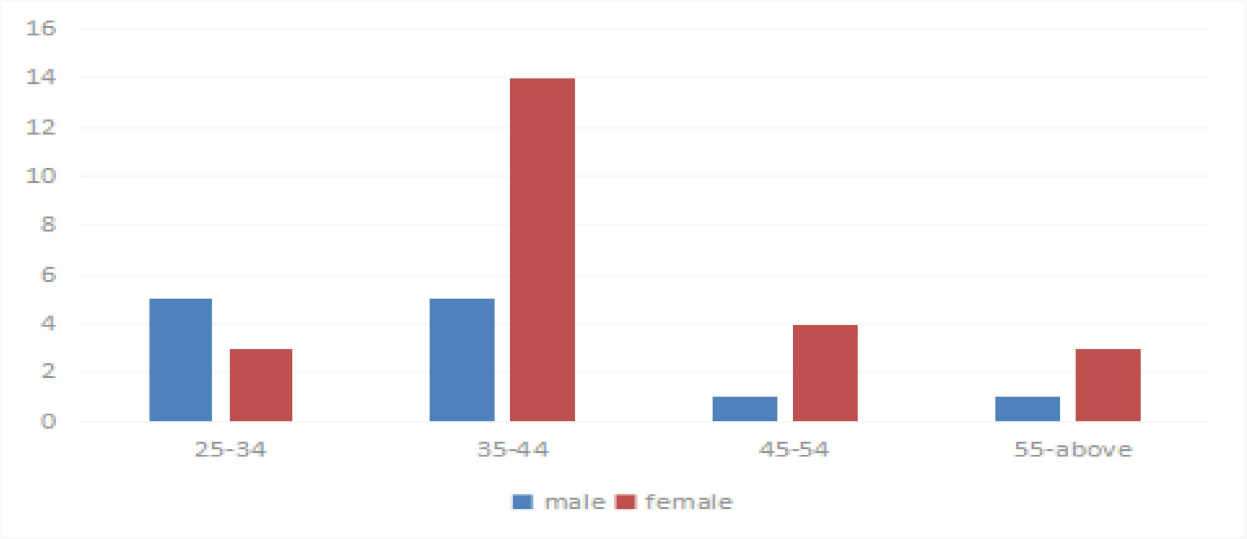


**Fig. 1**: Age and gender distribution of the respondents

**Table 1:** Demographic characteristics of the respondents.

| Variable | Frequency | Percentage |
|---|---|---|
| *Age* | | |
| 25-34 | 8 | 22.2 |
| 35-44 | 19 | 52.8 |
| 45-54 | 5 | 13.9 |
| 55-above | 4 | 11.1 |
| Total | 36 | 100 |
| *Gender* | | |
| male | 12 | 33.3 |
| female | 24 | 66.7 |
| total | 36 | 100 |
| **Status** | | |
| registrar | 21 | 58.3 |
| consultant | 15 | 41.7 |
| total | 36 | 100 |
| *Location of practice* | | |
| Lagos | 22 | 61.1 |
| Ibadan | 4 | 11.1 |
| Ile-Ife | 4 | 11.1 |
| OthersTotal | 636 | 16.7100 |

Most respondents (61.1 %) practiced in the Lagos area (Table 1). When asked if there is a need for surgery in managing patients with dentofacial deformity, most orthodontists (88.9%) responded in the affirmative despite the fact that up to one half (41.7%) claimed that their center was involved in orthognathic surgery. About one half (52.8%) of the respondents had attended a seminar on the relevance of orthognathic surgery in orthodontic practice but only a quarter 9(25.0%) of the respondents indicated that they will offer only orthodontic treatment to their patients irrespective of the aetiology of malocclusion.

Overwhelming majority (91.7%) believed that orthognathic surgical procedure was not easily accessible in Nigeria and cited patient factors (69.4%), institutional factors (61.1%), surgeon related factors (47.2%) and orthodontist related factors (41.7%) as possible obstacles. Out of the institutional factors mentioned, lack of infrastructural support was identified by most respondents while cost and fear of surgery was cited often as the patient factors while lack of expertise was indicated as the surgeon or orthodontist related factor.

## Discussion

This study gathered information about the attitudes of Nigerian orthodontists and trainees toward orthognathic surgery.

The response rate of 59% was lower than that of the previous national survey carried out by Sanu *et al*, 2014 [10] 2 years previously and this was most likely affected by the fact that junior residents were not included in the study because we felt that they may not have had adequate exposure to orthognathic surgery. It is also possible that some orthodontists could not find time out of their busy schedule to respond electronically. Furthermore, an earlier study had suggested that the response rate among health care professionals is decreasing [11]. Data in this study consisted of respondents mainly located in Lagos area and previous report [10] had indicated that majority of Nigerian orthodontists are based in Lagos hence reasons of proximity may have contributed further to the larger number of respondents from Lagos since the conference was held in Lagos. This calls for caution when extrapolating the opinions expressed on a national basis.

Slightly more females and residents responded in the present survey when compared with an earlier study in 2014 among Nigerian orthodontists by Sanu *et al* [10] and exclusion of junior residents from the present sample may again account for these differences because this study [10] had documented significant female preponderance in orthodontic practice.

Orthodontists' traits such as age, gender, status and location of practice did not appear to affect attitudes and opinions [11]. This survey suggests that Nigerian orthodontists believe in the need for orthognathic surgery in the treatment of patients with dentofacial deformity even though they believe it is not easily accessible. Lack of infrastructural facilities, expertise, cost and fear of surgery are mainly responsible. Similarly, Yao et al [12] reported high cost and lack of expertise/equipment as major barrier to accessing reconstructive surgery in Vietnam and other low- and middle-income countries leading to over reliance on charitable care.

Added cost of virtual surgical planning, model surgery and 3D printing of surgical splints makes OS to be relatively more expensive compared to other reconstructive surgeries [13] however, strategies for reducing cost such as regionalization of patients to high volume centers in out-patient setting [14-15] have been suggested.

On the other hand, certain patients' traits were the major determinants of orthognathic surgery referral in a Canadian [16-17] and UK [18] surveys with less frequent recommendations for patients with mild or moderate compromise. Patients' motives and fears [19] of surgery were also identified as the most prevalent reasons for declining surgery in a Norwegian population [20].

## Recommendations

If this perceived need for OS will be translated to more referrals, there is a need to make OS more

accessible in Nigeria. Concerted efforts must be made by policy makers to make OS more affordable. This can be accomplished in several ways. First, both the orthodontist and oral/ maxillofacial surgery specialists must reinforce the importance and value of orthognathic surgery to patients, referring clinicians and government. Efficient, safe, and effective outpatient orthognathic surgery in facilities that can substantially reduce cost will help patients benefit from this valuable service.

## Conclusion

The study highlights uniformity in treatment philosophies/need for orthognathic surgery among Nigerian orthodontists, despite variations in background. Nigerian orthodontists seem to view OS as useful and capable of improving efficiency and quality of patient care.

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# Life threatening consensual coital laceration in the seventh decade; a case report

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**Abstract**
*Background***:** Non-obstetric injuries to the female genital tract are becoming a frequent cause of gynaecological emergencies. These injuries appear to be more common in young, inexperienced patients. However occurrence in the seventh decade seems uncommon and probably under reported. Sexual arousal is known to decline with age and in the presence of certain medical illnesses such as diabetes mellitus. The posterior fornix is the most frequent site of injury and may be consequent upon postmenopausal changes in the elderly.
*Case presentation and management*: A 70 year old $P5^{+0}$ (4 Alive) postmenopausal patient who presented with bleeding per vaginaam of 6 hours duration following vigorous sexual intercourse with spouse. Evaluation at presentation revealed a hypotensive patient (B/P 80/40mmhg) with moderate anaemia (PCV 23%) and copious blood clots at the perineum. She subsequently had an examination under anaesthesia (EUA) and repair of a posterior fornix laceration measuring about 4cm. She was transfused with 2 units of whole blood and discharged home after 24 hours of observation. The couple was counselled on the need for adequate foreplay even in old age and early resort to the use of lubricants to prevent future occurrence.
*Conclusion*: Sexual and reproductive health rights of the elderly seem to take backstage in the society with very little attention from relevant stake holders. Late presentation as demonstrated in this case, culminating in haemorrhagic shock maybe a reflection of the societal stigma attached to sexuality in the elderly. There is therefore a need to focus on geriatric sexual needs of low income countries with the goal of providing information and supportive care.

**Keywords:** *Life threatening, Coital laceration, Seventh decade***.**

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**Résumé**
*Contexte* **:** Les lésions non-obstétriques du tractus génital féminin sont en train de devenir une cause fréquente d'urgence gynécologique. Ces blessures semblent être plus courantes chez les patientes jeunes et inexpérimentées. Cependant, l'occurrence durant la septième décennie semble peu commune et probablement sous-estimée. On sait que l'excitation sexuelle diminue avec l'âge et en présence de certaines maladies telles que le diabète sucré. Le fornix postérieur est le site de lésion le plus fréquent et peut en résulter des changements post-ménopausiques chez les personnes âgées.
*Présentation de cas et de gestion:* Une patiente post-ménopausée $P5^{+0}$ (4 Vivant) âgée de 70 ans qui a présenté avec des saignements vaginaux d'une durée de 6 heures suivant des rapports sexuels vigoureuses avec son époux. L'évaluation lors de la présentation a révélé une patiente hypotensive (B / P 80 / 40mmhg) avec anémie modérée (23% PCV) et des caillots sanguins abondants au niveau du périnée. Elle a ensuite subi un examen sous anesthésie (ESA) et la réparation d'une lacération fornix postérieure mesurant environ 4 cm. Elle a reçu une transfusion de 2 unités de sang total et déchargée après 24 heures d'observation. Le couple a été informé de la nécessité de faire des préliminaires adéquats, même à un âge avancé et de recourir de manière précoce à l'utilisation de lubrifiants pour éviter que cela ne se reproduise.
*Conclusion* : Les droits des personnes âgées en matière de santé reproductrice et sexuelle semblent revenir en arrière-plan dans la société avec très peu d'attention de la part des parties prenantes concernées. La présentation tardive, telle que démontrée dans ce cas, aboutissant à un choc hémorragique peut être le reflet de la stigmatisation sociétale liée à la sexualité chez les personnes âgées. Il est donc nécessaire de se concentrer sur les besoins sexuels gériatriques des pays à faible revenu dans le but de fournir des informations et des soins de soutien.

**Mots - clés:** *Menaçant la vie, lacération coïtale, septième décennie.*

## Introduction

Consensual coital injuries are frequently encountered in developing countries, however they are often

underreported [1, 2]. Coital injuries may result in minimal vaginal bleeding requiring little or no attention to life threatening bleeding which invariably may result in haemorrhagic shock or death if medical attention is not promptly provided [3]. Occurrence in the seventh decade is a rarity and may be dismissed by the couple especially if injuries are minor.

Risk factors for coital injuries include male to female disproportion, harmful position during coitus such as dorsal decubitus, long period of sexual abstinence, chronic vaginal infection, rough coitus, first sexual intercourse, postmenopausal vaginal atrophy, congenital and acquired shortness of the vagina and use of aphrodisiacs [4, 5].

Consensual coital injury in the seventh decade as presented may result from poor sex negotiation by the female partner resulting in rape by the male partner in a consensual relationship. This often goes unreported except in life threatening circumstances. The need for geriatric sexual health is not only imperative but expedient as this group is often neglected.

**Case**

Mrs O.O a 70 year old $P5^{+0}$ (4 Alive) postmenopausal patient who presented with bleeding per vaginaam of 6 hours duration following vigorous sexual intercourse with her spouse. There was associated passage of copious blood clots with an estimated blood loss of approximately 800mls. She felt dizzy and unstable; however there was no loss of consciousness. She had a vaginal hysterectomy and pelvic floor repair 3 months prior to presentation. Her spouse was a 72 year old retired military officer. She was the only wife of her spouse and she had no background medical illness.

Evaluation at presentation revealed a hypotensive patient (B/P 80/40mmhg) with moderate anaemia (PCV 23%) and copious blood clots at the perineum. She was resuscitated with intravenous fluids and subsequently had an examination under anaesthesia (EUA) and repair of a posterior fornix laceration measuring about 4cm. A digital rectal examination was performed to exclude rectal mucosa involvement.

She had two units of whole blood transfused and was placed on broad spectrum antibiotics. She was discharged home after 24 hours of observation on the gynaecological ward. The couple was counselled on the need for adequate foreplay even in old age and early resort to the use of lubricants to prevent future occurrence.

**Discussion**

Obstetric injuries are the most common cause of trauma to the female genital tract especially in developing countries with poor health indices. However the contribution of coitus to non-obstetric trauma of the female genital tract has been estimated to be approximately 32% [6]. Most coital injuries are often minor and follow normal sexual intercourse. However when coitus results in

**Fig 1**: The repaired laceration at the posterior fornix

extensive laceration of the female genital tract, it may result in massive life threatening blood loss necessitating immediate intervention [7].

Consensual coital injuries often go unreported as a result of the shame and secrecy attached to the injury ultimately resulting in delay or outright silence [8] except in few cases of rape which are reported solely for medical assistance. The true incidence of consensual coital injury is difficult to estimate due to underreporting, however a study estimating an incidence of 1/1000 gynaecologic emergencies has been reported in Calabar, Nigeria [9]. It was suggested that young unmarried women of low parity were the most susceptible to coital injuries [9].

Trauma to the posterior fornix, a vulnerable anatomic site is quite common [10]. This is attributable to the weaker endopelvic fascia found at this site. During coitus, the lower third of the vaginal wall contracts while the upper portions expand. This puts the endopelvic fascia of the posterior fornix under tension thus predisposing to lacerations during forceful peno-vaginal intercourse. Other locations in which female genital injuries may occur include the fourchette, clitoris and labia minora. Fistulas especially the recto-vaginal variety have been described in literature [11].

Risk factors for coital injuries include male to female disproportion, harmful position during coitus such as dorsal decubitus, long period of sexual abstinence, chronic vaginal infection, rough coitus, first sexual intercourse, postmenopausal vaginal atrophy, congenital and acquired shortness of the vagina and use of aphrodisiacs. Mrs O.O was postmenopausal and had not been sexually active for 4 months prior to presentation. This could partly explain the aetiology of the genital trauma sustained following prolonged deprivation.

The most frequent complaint following coital injury is haemorrhage which may be life threatening as exemplified by this case complicated by hypovolaemic shock. Haemoperitoneum, peritonitis, fistulae, urethral injury, ecchymosis and abrasions may also complicate coital lacerations [11]. Dyspareunia and possible recurrence of injury are recognized morbidities.

Coital injury resulting in extensive vaginal laceration is not uncommon during the first coitus. However haemorrhagic shock following consensual coitus especially in the elderly is a rarity. As women age, the vagina gets narrower and shorter, the walls becoming less elastic and thin with accompanying reduced vaginal gland secretions. These menopausal changes may result in increased risk of injury in postmenopausal women following vigorous sexual intercourse. Also, intercurrent medical illnesses such as diabetes mellitus, hypertension and its treatment, antidepressants and antipsychotics may result in sexual dysfunction and poor arousal [12].

Prompt management of the condition is imperative with the view to minimize complications. Management involves an initial resuscitation and stabilization followed by the definitive management. In this case the patient had an examination under anaesthesia and repair of 4cm posterior fornix laceration using O vicryl suture in an interrupted fashion. A digital rectal examination was performed to rule out rectal mucosa involvement. Supportive care was provided and the patient was transfused with two units of whole blood and placed on oral antibiotics (amoxicillin + clavulanic acid) and analgesics (Ibuprofen). She was observed in the hospital for 24 hours before discharge home. This was to ensure adequate recuperation especially in the elderly patients who may require further attention.

## Conclusion

Consensual coital injuries are quite common but often underreported. Occurrence in the seventh decade is a rarity but may be consequent upon the menopausal changes present at this stage of life. The posterior fornix is the most frequently traumatized site due to the weak endopelvic fascia found at this site. Sexual assaults, rough unsynchronized coitus even in consensual relationships are recognized factors contributing to life threatening coital injuries [12]. Geriatric sexual health may be a panacea for this condition as misconception that postmenopausal patients are not sexually desirable should be dispelled. It is therefore recommended that sex education, use of lubricants and hormone replacement therapy (HRT) where necessary should be provided for the sexually active geriatric patient.

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# Role of optimism bias, knowledge, and demographic profile on perceived infectability to Lassa virus infection

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**Abstract**
*Background:* Lassa fever is a highly infectious haemorrhagic fever with potentially severe morbidity and mortality. Little is known about the role of socio-psychological factors fuelling its spread The role of optimism bias, knowledge about Lassa fever symptoms, and demographic profile (gender and educational status) on perceived infectability to Lassa virus infection was investigated.
*Method:* Three hundred and ninety-one residents of Irrua, a Nigerian community with endemic Lassa fever were selected using multi-stage sampling. The cross sectional survey utilized 54-item questionnaire measuring optimum bias (r=.84); perceived infectability (r=.62); and knowledge of Lassa fever symptoms (r=.84) was used.
*Result:* Descriptive and inferential statistics were employed in analysis, with three hypotheses tested at p<0.05. Gender ($\bar{x}$ = 2.63; P<.05) and educational status ( $\bar{x}$ 2.53; P<.05) differences also affected perceived Lassa fever infectability; with females reporting significantly higher means ($\bar{x}$ 26.68± 6.94) than males ( $\bar{x}$ 24.91±6.36). Participants with tertiary education reported higher perceived infectability ( $\bar{x}$ 27.63±6.77) than participants with below tertiary education ( $\bar{x}$ 25.10±6.24).
*Conclusion*: These factors are pertinent in understanding perceived infectability/vulnerability to Lassa virus. Attention to these variables and their inclusion in preventive health education are critical in the present multi-disciplinary primary prevention of Lassa infection outbreak in the population.

**Keywords:** *Optimism bias, Knowledge about Lassa fever symptoms, perceived Lassa virus infectability, Nigeria*.

**Résumé**
*Contexte:* La fièvre de Lassa est une fièvre hémorragique très infectieuse pouvant entraîner une morbidité et une mortalité potentiellement graves. On sait peu de choses sur le rôle des facteurs socio-psychologiques qui alimentent sa propagation. Le rôle du biais d'optimisme, de la connaissance des symptômes de la fièvre de Lassa et du profil démographique (sexe et statut scolaire) sur la transmissibilité perçue de l'infection par le virus de Lassa a été étudié.
*Méthode:* Trois cent quatre-vingt-onze résidents d'Irrua, une communauté nigériane endémique à la fièvre de Lassa, ont été sélectionnés à l'aide d'un échantillonnage à étape multiple. L'enquête transversale a utilisé un questionnaire de 54 questions mesurant le biais optimal (r = 0,84); transmissibilité perçue (r = 0,62); et la connaissance des symptômes de la fièvre de Lassa (r = 0,84) a été utilisée.
*Résultat: Des* statistiques descriptives et d'inférences ont été utilisées dans l'analyse, avec trois hypothèses testées à p <0,05. Les différences liées au sexe ($\bar{x}$= 2,63; P <0,05) et au statut éducatif ($\bar{x}$= 2,53; P <0,05) ont également affecté la transmissibilité perçue de la fièvre de Lassa ; avec les femmes déclarant des moyennes significativement plus élevées ($\bar{x}$= 26,68 ± 6,94) que les hommes ($\bar{x}$= 24,91 $\bar{x}$± 6,36). Les participants ayant suivi des études supérieures ont signalé une transmissibilité perçue plus élevée ($\bar{x}$= 27,63 ± 6,77) que les participants qui n'avaient pas des études supérieures ($\bar{x}$= 25,10 ± 6,24).
*Conclusion* : Ces facteurs sont pertinents pour comprendre la transmissibilité / vulnérabilité perçue au virus de Lassa. L'attention portée à ces variables et leur inclusion dans l'éducation préventive à la santé sont essentielles dans le cadre de la prévention primaire multidisciplinaire actuelle d'un déclenchement épidémique de l'infection de Lassa dans la population.

**Mots clés:** *Biais d'optimisme, connaissances sur les symptômes de la fièvre de Lassa, perception de transmissibilité du virus de Lassa, Nigéria*.

## Introduction

Lassa fever is an acute viral illness caused by Lassa virus. The virus, first isolated in a north-eastern Nigerian village, Lassa, in 1969 is a zoonotic, rodent-borne, single-stranded ribonucleic acid [1}. The natural reservoir of the Lassa virus is a 'multimammate rat', Mastomys natalensis [1]. The rats produce large numbers of offspring, and are abundant in the savannah and forests of West, Central, and East Africa. They readily colonize human homes, thus increasing the risk of Lassa virus

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spread from infected rats to humans [2]. Lassa fever presents with no specific symptoms [3]. Definitive diagnosis could therefore be difficult without differential laboratory testing [4].

The risk for contacting Lassa virus infection is both local and global. About 59 million people in Sierra Leone, Guinea, and Nigeria are potentially vulnerable, with an annual incidence of 3 million, and mortality rate as high as 67,000 [5]. Lassa fever cases have been "exported" into the United States of America and Europe by viremic travelers from endemic areas [6], and the possibility of a global spread is high as a result of increased frequency of international travel [2, 6]. The prevalence of Lassa virus antibodies in Nigerian population (21%) is highest compared with other countries in West Africa [7]. A report released by the Nigeria Centre for Disease Control said that as of February 11, 2018, there were 615 reported cases. Of these, 193 cases were confirmed, with 57 deaths [8]. Lassa fever has been spreading at an unprecedented rate in southern Nigeria [9, 10], but little is known about the level of perceived infectability to Lassa virus infection by members of affected communities.

Most of the extant literature on Lassa fever outbreak over the past thirty years [11, 12, 13] focus on clinical and pathological issues, to the neglect of its attitudinal and behavioural components; without which the present efforts at prevention and control of Lassa fever would be inadequate and inchoate. There is no vaccine to prevent Lassa fever [14]. Similarly, current efforts at curtailing the virus is still largely in its trial stages, while there are very few standard Lassa virus laboratories serving about 180 million potentially vulnerable Nigerians [2]. The need for primary prevention is therefore imperative. To address this gap, the present study investigates the role of optimism bias, knowledge and demographic profile on perceived infectability to Lassa virus.

An individual's perceived infectability to Lassa virus infection is his/her subjective observation and recognition of the likelihood of contracting, and subsequently manifesting signs and symptoms of Lassa virus infection or fever. The term perceived vulnerability is used interchangeably in this study. Perceived vulnerability means feeling of being affected as a result of perceived inadequate protection [15]. According to Do and Meekers [16], perception of disease vulnerability forms the basis of risk avoidance behavior.

Perceived infectability to Lassa virus could be explained in the light of existing theories. The Health Belief Model (HBM) stresses that an individual's perceived vulnerability to a disease, perceived severity of the condition, possible benefits of specific preventive behaviour and barriers to carrying out such preventive behaviours influence the individual's health related behavior [17, 18]. This implies that perception of infectability is a major step in becoming conscious of personal infectability and avoidance of primary sources of transmitting a disease. However, adopting these behaviours is rather systematic than spontaneous, involving different cognitive stages.

Many phenomena in the realm of social cognition are influenced by the temporary salience of disease and by individual differences in chronic concerns about disease transmission [19]. These individual differences predict ethnocentric attitudes, disposition to risk avoidance, and other health related behaviours. The emerging implication is that different psychological phenomena (many of which may not be overtly disease-relevant) may predict individual differences in perceived infectability to a potentially pathological micro-organism [20].

Several factors have been linked to perceived infectability to a virus or a disease [21]. Demographic variables such as age and gender [22], as well as psycho-social factors which include knowledge [23] and attitude to a disease [24], have also been related to perceived infectability in an epidemic. According to Welling, Conway, DeBruine, and Jones [24], individuals with high perceived infectability to a micro-organism demonstrated stronger preferences for health than did individuals with relatively low perceived infectability. Although little is known about gender differences in perceived infectability, the gender difference hypothesis holds that males and females are different on most, but not all, psychological variables. The tendency for females to have a greater basal capacity to exercise inhibitory or opposing influence over modulatory environmental contextual factors has been reported in extant literature *[25]*.

Optimism bias is a cognitive bias that causes an individual to mistakenly believe that he/she is at a lesser risk of experiencing a negative event compared to others. Sharot [26] sums it up by saying that we overestimate the likelihood of positive events, and underestimate the likelihood of negative events. For instance, some might underrate their chances of suffering from cancer despite high heritability [27], or underrate their chances of coming down with Lassa fever, despite exposure to Lassa virus. This is "unrealistic optimism," or "illusion of invulnerability." The optimism bias has been found in every race, region, culture, and socioeconomic

category [28]. In contrast to the studies cited, most research regarding optimism bias and physical health suggest that optimism bias affects people negatively [29]. For example, if people are optimistically biased towards their fitness level, the bias could become a factor underlying less likelihood to exercise [30]. In this context, if an individual is optimistically biased towards his perceived infectability to Lassa virus, he/she is less likely to embrace Lassa fever preventive behaviours.

Lassa fever knowledge is one of the variables investigated in this study. It is about the level of awareness or explicit information that an individual has about Lassa virus infection symptoms. The National Bureau of Economic Research, [31] established that the higher the level of an individual's education, the better the health seeking behaviour and healthier outcomes. Also, knowledge of Ebola Virus Disease (EVD) influenced the desire to seek hospital treatment for EVD in a sample of students in Owo, Nigeria [32]. *Aigbiremolen,* Ejiyere, Abejegah, *et al* [33] investigated knowledge and practice of Lassa fever control among health workers. All the respondents were aware of Lassa fever and 77.9% of them had good knowledge of the control of the disease, but less than 17% of them comply with standard preventive practices. In a similar study, 73.9% of the participants had high level of awareness of Lassa fever, but only 54.2% of these believed in its person to person infectability [33], Omotowo [34] reported similar findings in a study among health workers. This may explain why despite their good knowledge, 83% of the sample in Reuben and Gyar's [35] Lassa fever study did not perceive any risk of infectability.

Adefisan [36] asserts that while the search for a potent vaccine continues, it is instructive and worthwhile, as a baseline measure to investigate other attributes of the Lassa fever outbreak. The goal of this research is to examine the role of optimism bias, knowledge and demographic profile on perceived infectability to Lassa virus infection. The objectives of the study of the study are to:

1. Test whether optimism bias (i.e. Negative optimism bias and positive optimism bias) and knowledge of Lassa virus infection symptoms will have significant main and interactive effect on perceived infectability to Lassa virus.
2. Examine whether female respondents will report significantly higher level of perceived infectability to Lassa virus than their male counterparts.
3. Investigate whether respondents with high educational status (i.e. tertiary degree holders) will report significantly higher level of perceived infectability to Lassa virus than those with lower educational status (i.e. no formal educational background, primary school leaving certificate or Senior school leaving certificate).

The study was designed to test the following hypotheses:

1. Optimism bias (i.e. Negative optimism bias and positive optimism bias) and knowledge of Lassa virus infection symptoms will have significant main and interactive effect on perceived infectability to Lassa virus.
2. Female respondents will report significantly higher level of perceived infectability to Lassa virus than their male counterparts.
3. Respondents with high educational status (i.e. tertiary degree holders) will report significantly higher level of perceived infectability to Lassa virus than those with lower educational status (i.e. no formal educational background, primary school leaving certificate or Senior school leaving certificate).

## Method

*Design*: This study adopted a cross-sectional survey method. The dependent variable is perceived susceptibility to Lassa virus infection, while the independent variables are optimism bias (i.e. Negative optimism bias and positive optimism bias), knowledge about Lassa virus infection symptoms, and demographic factors (gender, and educational status) of members of a community with Lassa virus outbreak.

*Setting*

It was conducted in Irrua, a semi-urban community located in Edo Central Senatorial District, along the Benin- Abuja highway, about 87 kilometers north of Benin City, Nigeria. It is bounded by Latitudes 6º 42'N - 6 º 45'N and Longitudes 6º 2'E - 6 º 16'E [37]. Irrua has a population of 39,042 as documented in a 2010 field survey [38]. The people, called Esans are traditionally agriculturalists and hunters [39]. Lassa fever is endemic with yearly outbreaks in Irrua. A Specialist Teaching Hospital, hosting a Lassa fever research institute is located in the city.

*Sampling and participant selection*

Multi-stage sampling was adopted to seek research participants made up of individuals and household members in Irrua. Cluster sampling was adopted to identify the political wards in the town, followed by systematic sampling of households in each ward. The

interval was arrived at by dividing the Irrua population size of 39,042 [38] by a desired sample size of 400 participants (in line with the technique applied in a similar study conducted by Momodu, [39], so that the households were picked at intervals until 98 households were selected. In each household, the leader, usually a male (in other instances, it was a female that was available) was approached. The purpose, risks and potential benefits of the study were discussed with the leader, and the consent for research participation of any eligible member of the household was sought, and consenting individual(s) purposively included in the study. Details about participants' demographic profile are found in Table 1.

*Selection criteria*

Only household members aged 18 years and above, who had lived in the community / ward for at least one year, able to understand and speak English Language, who has also heard about Lassa fever were included.

*Ethical consideration*

The research proposal, including the research instrument was sent to the Ethics Committee of Irrua Specialist Teaching Hospital for review, followed by ethical approval.

*Instruments*

A 54-item self-report questionnaire divided into four sections was used for data collection. The 6-item Section A was designed to obtain participants' demographic profile. Section B contained the 22-item Optimum Bias Scale developed by Lapsley and Hill [40]. Sample items include "I can get a sexually transmitted disease if I have unprotected sex," "I can get caught if I cheat in a test." Responses are in a Likert format. Response options were arranged in a 7-point Likert format ranging between "Much below average" =1 and "Much above average"=7. It has negative (19 items with r=.89) and positive (3 items with r=.56) subscales. The instrument was also used by Marx [30] in a similar study. Negative items were reversed in scoring. Scores in the positive and negative optimism bias subscales, as well as the composite score in optimism bias were considered in analysis and interpretation. The scale was revalidated during the study, yielding a Chronbach's alpha of .84, with mean at ($\bar{x}$ =115.25±19.86). High score indicates high level of optimism bias, vice versa.

Section C contained the 7-item perceived infectability sub-scale of the 15-item Perceived Vulnerability scale developed by Duncan, Schaller, and Park [20]. Sample items include "If an illness is 'going around', I will get it", and "It does not make me anxious to be around sick people". Response patterns are scaled between "Strongly disagree=1, and Strongly Agree=7". Negative items were reversed in scoring. Possible scores range between 7 and 49. A revalidation of the scale during the study yielded Cronbach's alpha of .62 and mean is ($\bar{x}$ =25.77± 6.69). Higher scores indicate high level of perceived infectability to Lassa virus, and vice-versa.

Section D contained the 11-item Knowledge of Lassa fever symptoms sub-scale of the 18-item Lassa fever knowledge scale developed by Tobin *et al*. [13]. The 7-item subscale testing method of prevention of Lassa fever in health facility was excluded, because it was designed for use among health professionals involved in Lassa fever management; hence did not meet the goal of this study. Items in the Knowledge of Lassa fever symptoms subscale include: "Bleeding from orifice is a symptom of Lassa virus infection", and Safe food storage can reduce the spread of Lassa virus infection". Responses are in "True" or "False" format. Only True responses are correct. Correct responses attract one point, while wrong responses attract zero. Possible scores range between 0 and 11. A revalidation of the scale yielded .84 reliability; and mean =($\bar{x}$ =7.15±2.15). High score indicates good knowledge of Lassa fever symptoms, vice versa.

*Procedure*

There was community engagement of the traditional leader and community stakeholders, during which they expressed community willingness to participate in the study. The purpose, risks, and potential benefits of the study were explained. They were assured of their privacy and confidentiality. Each consenting participant was given a copy of the research questionnaire, with instructions on how to respond to the items. Although 400 copies of the questionnaire were given out to consenting participants, only 391 were correctly completed and returned, representing 97.8% response rate.

*Data analysis*

The independent variables i.e. positive optimism bias, negative optimism bias, (i.e. optimism bias) and Knowledge about Lassa virus infection were categorized into 2 levels each. Analysis of the data included descriptive statistics such as frequency, percentages, and mean, as well as inferential statistics such as 2 X 2 X 2 ANOVA, and t-test at $p<0.05$.

**Results**

The findings from the data analysis are hereby presented. To answer the question whether an

Table 1: Descriptive statistics showing the demographic characteristics of participants against perceived infectability

| Variables | Infectability ($\bar{x}$ &S.D ) | | Bias ($\bar{x}$ &S.D) | | Optimism bias ($\bar{x}$ &S.D) | | Optimism bias ($\bar{x}$ &S.D) | | Know. ($\bar{x}$ &S.D) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Age | | | | | | | | | | |
| <20 years | 125(31.9) | 25.87(6.55) | >.05 | 28.72(17.85) | >.05 | 22.84(16.23) | <.05 | 5.85(2.85) | >.05 | 14.59(2.18) | <.01 |
| 20-29 years | 166(42.4) | 25.56(6.40) | | 31.49(17.97) | | 25.39(16.70) | | 6.09(2.93) | | 14.81(2.32) | |
| 30-39 years | 55(14.3) | 26.51(7.58) | | 28.64(15.02) | | 21.18(15.02) | | 6.95(2.26) | | 14.41(1.76) | |
| 40-49 years | 33(8.4) | 25.33(6.88) | | 23.30(19.42) | | 17.12(17.39) | | 6.33(2.93) | | 14.12(3.15) | |
| 50-59 years | 6(1.5) | 20.33(3.78) | | 16.17(12.73) | | 10.83(10.48) | | 4.33(2.94) | | 11.17(5.56) | |
| 60 years > | 6(1.5) | 30.67(8.80) | | 28.17(12.72) | | 24.00(9.42) | | 4.83(3.71) | | 15.00(2.61) | |
| Sex | | | | | | | | | | | |
| Male | 200(51.2) | 24.91(6.36) | <.05 | 29.43(18.01) | >.05 | 23.46(16.88) | >.05 | 5.95(2.81) | >.05 | 14.77(2.45) | >.05 |
| Female | 191(48.8) | 26.68(6.94) | | 28.95(17.35) | | 22.55(15.86) | | 6.28(2.88) | | 14.37(2.33) | |
| Marital Status | | | | | | | | | | | |
| Single | 275(70.4) | 26.20(6.84) | <.01 | 31.03(17.88) | <.01 | 25.08(16.33) | <.01 | 5.99(2.90) | <.01 | 14.70(2.22) | >.05 |
| Married | 104(26.6) | 24.89(5.98) | | 26.03(15.65) | | 18.97(15.18) | | 6.66(2.48) | | 14.38(2.46) | |
| Divorced | 10(2.6) | 21.20(5.09) | | 7.40(8.81) | | 4.60(7.31) | | 3.40(3.50) | | 13.40(5.15) | |
| Widowed | 1(0.2) | 46.00(0) | | 66.00(0) | | 54.00(0) | | 9.00(0) | | 11.00(0) | |
| Separated | 1(0.2) | 23.00(0) | | 39.00(0) | | 32.00(0) | | 5.00(0) | | 16.00(0) | |
| Religion | | | | | | | | | | | |
| Christianity | 296(75.7) | 26.46(6.54) | <.01 | 30.44(17.47) | <.05 | 24.28(16.18) | <.05 | 6.23(2.82) | >.05 | 14.65(2.35) | >.05 |
| Islam | 24(6.1) | 21.79(4.96) | | 24.70(17.66) | | 18.70(16.07) | | 5.46(2.93) | | 14.67(3.55) | |
| Traditional | 28(7.2) | 23.00(8.02) | | 21.59(18.54) | | 14.63(16.86) | | 6.29(2.98) | | 13.79(2.03) | |
| Others | 43(11) | 25.02(6.59) | | 27.75(17.36) | | 21.75(16.15) | | 5.51(2.91) | | 14.51(2.15) | |
| Occupation | | | | | | | | | | | |
| Student | 126(32.2) | 26.54(5.99) | >.05 | 30.02(18.60) | >.05 | 24.06(16.92) | >.05 | 6.19(2.86) | >.05 | 14.63(2.54) | >.05 |
| Artisan | 59(15.1) | 25.24(6.85) | | 26.76(18.71) | | 20.56(16.39) | | 5.80(3.35) | | 14.58(2.11) | |
| Housewife | 63(16.1) | 24.62(6.87) | | 31.84(18.46) | | 25.89(17.56) | | 5.95(2.32) | | 14.56(1.82) | |
| Civil servant | 79(20.2) | 25.72(7.26) | | 27.60(16.99) | | 21.67(15.96) | | 5.87(2.95) | | 14.53(1.97) | |
| Farming | 45(11.5) | 27.13(7.26) | | 29.29(13.99) | | 22.16(13.26) | | 6.64(2.73) | | 14.27(3.65) | |
| Retired | 19(4.9) | 23.77(6.70) | | 28.47(16.62) | | 21.16(17.06) | | 6.74(2.54) | | 15.16(1.95) | |
| Edu. Qual. | | | | | | | | | | | |
| No formal | 87(22.2) | 24.55(6.58) | <.01 | 26.65(18.91) | <.05 | 21.30(17.55) | <.05 | 5.47(2.95) | <.05 | 14.48(2.22) | >.05 |
| Primary | 64(16.4) | 23.43(5.38) | | 29.88(17.83) | | 22.83(17.66) | | 6.52(2.49) | | 14.77(2.24) | |
| WASSCE | 132(33.7) | 27.33(6.77) | | 27.61(15.41) | | 21.34(14.05) | | 6.39(2.83) | | 14.60(2.58) | |
| Tertiary | 108(27.6) | 27.63(6.82) | | 35.10(16.89) | | 28.24(15.22) | | 6.56(2.78) | | 14.56(2.60) | |
| TOTAL | 391 | 25.77(6.70) | | 29.20(17.66) | | 23.02(16.38) | | 6.11(2.85) | | 58.72(11.54) | |

**Table 2:** 2x2x2 ANOVA showing the effect of Lassa fever knowledge, negative and positive optimism bias on perceived Lassa virus infectability

| Dependent Variable: Perceived_infectability<br>Source | SS | df | MS | F | P |
|---|---|---|---|---|---|
| Lassa fever knowledge (A) | 68.185 | 1 | 68.185 | 1.671 | >.05 |
| Negative optimism bias (B | 1285.269 | 1 | 1285.269 | 31.492 | <.01 |
| Positive optimism bias (C) | .829 | 1 | .829 | .020 | >.05 |
| A * B | 10.935 | 1 | 10.935 | .268 | >.05 |
| A * C | 129.632 | 1 | 129.632 | 3.176 | >.05 |
| B * C | 232.035 | 1 | 232.035 | 5.685 | <.05 |
| A * B * C | .100 | 1 | .100 | .002 | >.05 |
| Error | 15672.168 | 384 | 40.813 | | |
| Total | 277878.000 | 392 | | | |
| Corrected Total | 17545.337 | 391 | | | |

*a. R Squared = .107 (Adjusted R Squared = .090)*

individual's demographic profile affects his/her perceived vulnerability to Lassa virus infection, descriptive statistics was conducted, with the results in table 1

Table 1 shows that a greater proportion of the respondents i.e. 125 (31.9%) were less than 20 years old; 166 (42.4%) were between 20 and 29 years; 55 (14.3%) were between 30 and 39 years old; 33 (8.4%) were between 40 and 49 years old; 6 (1.5%) were between 50 and 59 years old; while the other 6 (1.5%) were 60 years old and above. The mean age was found to be ($\bar{x}$ =28.32±11.03). There was significant age difference in negative optimism bias and Lassa fever knowledge, with no significant age difference in perceived infectability. As regards sex, a greater number of the respondents i.e. 200 (51.2%) were males, while the other 191 (48.8%) were females. A significant mean difference of sex in perceived infectability to Lassa fever was reported.

The profile of the participants' educational qualification shows that more of the respondents, i.e. 132 (33.7%) had secondary school leaving certificate; 108 (27.6%) completed one form of tertiary education or the other (i.e. National Diploma / National Certificate of Education / Higher National Diploma / University degree / PhD); 87 (22.2%) had no formal education; while the remaining 64 (16.3%) had primary school leaving certificate. A significant mean difference of educational qualification in perceived infectability was reported.

**Hypothesis one**

Hypothesis One was designed to test whether positive bias, negative bias (i.e. optimism bias) and Lassa fever knowledge will have significant main and interactive effect on perceived Lassa virus infectability. This was tested using 2x2x2 Analysis of Variance. The result is presented in Table 2.

Table 2 shows that negative optimism bias had significant main effect on perceived Lassa virus infectability [F (1, 384) = 31.49; P<.01], while Lassa fever knowledge [F (1, 384) = 1.67; P>.05] and

**Table 3:** Main effect of negative optimism bias, and interactive effect of negative and positive optimism bias on perceived Lassa virus infectability

| Dependent Variable: Perceived infectability | | | |
|---|---|---|---|
| Negative Optimism Bias | | | Std. Error |
| Low | | 23.75 | .48 |
| High | | 27.43 | .45 |
| Negative optimism bias | Positive optimism Bias | | Std. Error |
| | Low | 24.58 | .71 |
| Low | High | 22.92 | .64 |
| | Low | 26.69 | .69 |
| High | High | 28.16 | .58 |

positive optimism bias [F (1, 384) = .02; P>.05] did not. Negative and positive optimism bias had significant interactive effect on perceived Lassa virus infectability [F (1, 384) = 5.69; P<.05]. Negative optimism bias, positive optimism bias, and knowledge of Lassa fever symptoms did not have significant joint influence [F (1, 384) = .002; P>.05]. The hypothesis is therefore not supported.

Table 3 presents further analysis on the main effect of negative optimism bias and interactive effect of negative and positive optimism bias (to test which group is different) on perceived Lassa virus infectability.

Table 3 shows that individuals with high level of negative optimism bias reported higher perceived infectability ($\bar{x}$ = 27.43) than those with low level of negative optimism bias who reported mean score of ($\bar{x}$ = 23.75). Further, individuals with high level of negative optimism bias and high level of positive optimism bias reported highest perceived infectability ($\bar{x}$ = 28.16), while those with low level of negative optimism bias and high level of positive optimism bias reported lowest perceived infectability ($\bar{x}$ = 22.92)

Hypothesis 2 states that female respondents will report significantly higher level of perceived infectability to Lassa virus infection than their male counterparts. This was tested using t-test for independent samples and the result is presented on table 4.

**Table 4:** T-test Summary showing Sex Mean differences on Perceived infectability

| Dependent | Sex | N | | SD | T | Df | P |
|---|---|---|---|---|---|---|---|
| Perceived infectability | Male | 200 | 24.91 | 6.36 | 2.63 | 390 | <.05 |
| | Female | 191 | 26.68 | 6.94 | | | |

There was significant mean difference of Sex on perceived infectability [t (390) = 2.63; P<.05]. with females reporting significantly higher means ($\bar{x}$ = 26.68± 6.94) than males ($\bar{x}$ = 24.91±6.36). Hypothesis 2 is therefore supported.

Hypothesis 3 was designed to test whether educational status has effect on perceived infectability to Lassa virus infection.

Table 5 shows that educational qualification had significant influence on perceived infectablity

**Table 5:** One-Way ANOVA Showing the effect of Educational qualification of perceived infectability

| Perceived_infectability<br>Source | SS | Df | MS | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 1084.384 | 3 | 361.461 | 8.520 | .000 |
| Within Groups | 16460.953 | 388 | 42.425 | | |
| Total | 17545.337 | 391 | | | |

**Table 6:** Multiple Comparison Showing the Effect of Educational Qualification on Perceived Infectability

| Educational Qualification | 1 | 2 | $\bar{x}$ | $\overline{SD}$ |
|---|---|---|---|---|
| Below Tertiary Education | 2.42* | 3.08* | 25.10 | 6.24 |
| Tertiary Education | | - | 27.63 | 6.77 |

**** Significant at 0.05***

[F (3, 388) = 8.52; P<.01]. Further post-hoc analysis is presented on Table 6.

Table 6 shows that participants with tertiary education reported highest perceived vulnerability ( $\bar{x}$ = 27.63±6.77), while participants with below tertiary education reported significantly lower perceived infectability ($\bar{x}$ = 25.10±6.24), meaning that there exists significant mean difference between those with below tertiary level education and above tertiary level education with a mean difference of (= 2.53; P<.05). Hypothesis 3 is therefore supported.

**Discussion**

This study examined the role of optimism bias and Lassa fever knowledge, as well as the effect of gender and educational status on perceived Lassa virus infectability in a community affected by Lassa fever outbreak. It became clearer that optimism bias and Lassa fever knowledge jointly influenced perceived Lassa virus infectability, with participants with high level of negative optimism bias reporting higher level of perceived infectability than those with low level of negative optimism bias. Gender and educational status differences also affected perceived Lassa fever infectability, with females reporting higher levels of perceived infectability to Lassa virus infection than their male counterparts. Participants with tertiary education reported higher level of perceived vulnerability to Lassa virus infection compared to those with below tertiary educational attainment.

The revelation that negative optimism bias had significant effect on perceived Lassa virus infectability suggests that the participants had the mistaken belief that their chances of experiencing a negative event (in this case, possibility of being infected with Lassa virus as a result of their exposure Lassa fever outbreak) are lower than that of other members in the same community.

Although, there is a dearth of literature on the influence of negative optimism bias on perceived Lassa virus susceptibility, this result contradicts the finding of Katapodi, Dodd, Lee, and Facione [27] in a study on the influence of optimism bias on perceived vulnerability among cancer patients, but it confirms Sharot's revelation that optimism bias is found in every race, culture, and socioeconomic category [28]. Because a majority of Irrua residents cannot be above the mean rating on perceived infectability unless the distribution is highly skewed, these findings suggests that the sample is optimistically biased in respect of their perceived Lassa virus infectability. It is also possible that participants that are negatively optimistically biased are typically overconfident about their chances of avoiding infection with Lassa virus, i.e. a negative event, irrespective of how their chances compare with those of their peers.

This "illusion of unique invulnerability" may be attributed to cognitive factors. When comparing their risk to that of others, people are egocentric in that they focus more on their own risk factors than on those of the peers to whom they are comparing [41]. The participants' potential tendency to underestimate the likelihood of negative events influenced their perceived low probability of contracting Lassa virus. This suggests the possibility that members of Irrua community, despite persistent Lassa fever outbreaks overvalue their potentials and perceived strengths regarding insusceptibility to the disease, with corresponding underestimation of possible threat of Lassa virus infectability. It could also be due to denial of the morbidity and mortality risks associated with Lassa fever outbreak. This perceived insusceptibility may reduce attention towards adopting Lassa virus infection avoidance behaviours by members of this community, and therefore the possibility of escalating the outbreak of Lassa virus infection in the area.

The present research serves as an evidence based tool required in translational Lassa fever control efforts. It is an eye opener, unmasking potentially significant underlying socio-cognitive factors that might be remotely driving further spread of Lassa fever in the research community. The neglect of negative optimism bias and perceived infectability in past Lassa fever control programmes may possibly reduce the overall effectiveness of such efforts. In practice, this finding has therefore contributed to the literature, by increasing knowledge in the area of counseling needs of communities affected by Lassa fever outbreak. In reducing the possibility of thought biases characteristic of optimism bias, this finding presents an empirical basis for infusion of appropriate psychological interventions into the content of preventive health education of communities at the risk for Lassa virus outbreak, as part of multi-disciplinary approach to curtail the spread of Lassa virus.

The discovery that Lassa fever knowledge did not have significant effect on perceived infectability corroborates findings from previous research [33, 35, 34]. It however contradicts the results of other investigations [32, 31]. However, knowledge about Lassa virus symptoms and optimism bias jointly influenced perceived Lassa virus infectability. This means that knowledge about Lassa virus is not sufficiently influential to affect the participants' perceived Lassa virus infectability, unless combined

with optimism bias. Rationally, general awareness or possession of information, facts, or principles about Lassa fever transmission should spur an individual's tendency to perceive Lassa virus infectability; and this should logically spur individual attitude and behaviours deliberately targeted at Lassa virus risk aversion. By way of illustration, when the driver of a huge truck sees a road sign indicating narrow bridge ahead, he is expected to slow down as he drives towards the bridge to prevent an accident. But thought, perception, attitude and behavior sequences do not follow this sequence in some instances. Not everyone, and not in all instances do people believe important health warnings. There is also the possibility that the research participants have perceived infallibility. This might explain why knowledge about Lassa virus transmission did not influence perceived Lassa virus infectability.

Female participants reported significantly higher levels of perceived infectability to Lassa virus infection than their male counterparts. This means that female participants appreciate their likelihood of getting infected with Lassa virus more than males. It suggests that females and males differ in their perception of the possibility of contracting Lassa virus. This finding supports the gender difference hypothesis concerning inhibitory influence of thought processes on issues related to environmental contextual factors, with females exercising greater control compared to males [25]. It however contradicts the finding that there is insignificant gender difference in negative or positive optimism bias in perceived susceptibility reported by Lapsley and Hill [40]. Participants' social roles and biological differences might have accounted for these. It is possible that inhibition of irrelevant responses (i.e. thoughtful consideration, and deliberate efforts to reduce inclinations to over-estimate individual competence to avoid Lassa virus infection) is an important aspect of cognitive control of a goal-directed behavior towards aversion of Lassa virus infectability, which females in this study seem to possess more than males. Women living in rural and semi-urban communities like Irrua in Nigeria are at risk of Lassa fever because of proximity to animal reservoir, the practice of drying grains by road sides or outside homes and unprotected grain storage within homes [42]. All these factors are known to facilitate increased rodent-man contact or contamination of food sources by infected rodent secretions. Hence, women may have a higher level of perceived susceptibility.

Participants with tertiary education reported higher level of perceived vulnerability to Lassa virus infection compared to those with below-tertiary educational status. This suggests that higher level of exposure to formal education at Masters and PhD levels led to other forms of experiences that made participants with tertiary education perceive higher level of likely Lassa virus infectability. At postgraduate level of education, enrollees are exposed to multi-faceted exposures, greater value for good health and quality of life. Such individuals would likely be extra mindful of potential threats to life, especially risk for contracting Lassa fever in a community with endemic Lassa virus outbreak.

This study has a few limitations. It may be necessary to include other Lassa fever endemic areas in Nigeria to increase the generalizability. Measuring perceived infectability or vulnerability to an endemic infection is not as simple as drawing inferences from responses to survey questionnaires suggests. More reliable and robust data gathering techniques that combine laboratory, epidemiological and qualitative approaches would improve both the validity as well as knowledge about the content and context of research data and findings.

## Conclusion

Lassa fever is a highly infectious haemorrhagic fever with potentially severe morbidity and mortality. Little is known about the role of socio-psychological factors fuelling its spread. This study is unique in the sense that it established that optimism bias and knowledge of Lassa virus infection symptoms have significant interactive effect on perceived Lassa virus infectability, with negative optimism bias having significant independent effect. Female respondents have higher level of perceived infectability to Lassa virus than their male counterparts. Respondents with high educational status have higher level of perceived infectability to Lassa virus than those with lower educational status. Hypotheses 2 and 3 are therefore supported.

Having established the level of optimism bias and its influence on perceived Lassa virus infectability in this study, we recommended community-sensitization on personal and environmental hygiene. It is also suggested that community residents be taken through some forms of cognitive restructuring to correct the bias to address the socio-psychological factors fuelling Lassa fever transmission.

Lassa fever remains an important cause of morbidity and mortality in Nigeria and many parts of West Africa. The probability of using Lassa fever outbreak as an instrument of global bio-terrorism exists. Greater attention to perceived infectability among residents of affected communities is

fundamental to the primary prevention of this endemic and lethal disease.

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# Simultaneous versus sequential surgery for bilateral congenital cataracts in a resource-limited setting

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**Abstract**
*Background:* To compare simultaneous surgery with sequential surgery for the treatment of bilateral congenital cataracts in children younger than three years at a tertiary hospital in a resource-limited setting in order to facilitate informed decision-making by parents and healthcare providers.
*Methods:* A retrospective review of medical records of children below three years who had bilateral surgery for congenital cataracts between 2010 and 2016 at the paediatric ophthalmology unit of a university teaching hospital in Nigeria. Data on demographic characteristics, type of surgery, delays in care, time interval between surgery and optical rehabilitation, direct cost of care, systemic associations and surgical complications were retrieved, descriptively summarized and compared for both groups.
*Results***:** There were 40 eligible patients, 25 (62.5%) of which were males. Age at presentation ranged from 4-128 weeks with a median of 28 weeks. Twenty-four (60%) patients had simultaneous bilateral cataract surgery. Patients who underwent sequential cataract surgery had higher direct costs and accumulated hospital stay, and were more likely to experience delays in accessing second procedures as well as post-operative optical rehabilitation. No anesthetic or other serious ocular complications such as endophthalmitis were noted in either group.
*Conclusion:* Although there were similarly low complication rates in both groups, we observed higher direct costs of care, longer duration of hospital stay, as well as longer intervals before second surgeries and visual rehabilitation in the sequential group. Therefore, simultaneous cataract surgeries may be the preferable option in resource-limited settings like ours, where health care financing is mainly through out-of-pocket expenses.

**Keywords:** *Congenital cataract, simultaneous surgery, sequential surgery*

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**Résumé**
*Contexte:* Pour comparer la chirurgie simultanée avec la chirurgie séquentielle pour le traitement des cataractes congénitales bilatérales chez les enfants de moins de trois ans dans un hôpital tertiaire d'un environnement à ressources limitées afin de faciliter la prise de décision informée par les parents et les fournisseurs de soins de santé.
*Méthodes:* Examen rétrospectif des dossiers médicaux d'enfants âgés de moins de trois ans ayant subi une chirurgie bilatérale pour une cataracte congénitale entre 2010 et 2016 à l'unité d'ophtalmologie pédiatrique d'un hôpital universitaire au Nigéria. Les données sur les caractéristiques démographiques, type de chirurgie, délais des soins, intervalle de temps entre la chirurgie et la réadaptation optique, le coût direct des soins, les associations systémiques et les complications chirurgicales ont été récupérées, résumées de manière descriptive et comparées pour les deux groupes.
*Résultats* **:** Il y avait 40 patients éligibles, dont 25 (62,5%) étaient des garçons. L'âge à la présentation variait de 4 à 128 semaines avec une médiane de 28 semaines. Vingt-quatre (60%) patients ont subi une chirurgie bilatérale simultanée de la cataracte. Les patients subissant une chirurgie séquentielle de la cataracte entraînaient des coûts directs plus élevés et une hospitalisation cumulée, et étaient plus susceptibles d'avoir des retards dans l'accès à une seconde procédure ainsi que dans la rééducation optique postopératoire. Aucune complication anesthétique ou autre complication oculaire grave telle que l'endophtalmie n'a été notée dans les deux groupes.
*Conclusion:* Bien que les taux de complications soient tout aussi faibles dans les deux groupes, nous avons observé des coûts directs plus élevés des soins, une durée d'hospitalisation plus longue, ainsi que des intervalles plus longs avant la deuxième intervention chirurgicale et la réadaptation visuelle dans le groupe séquentiel. Par conséquent, les chirurgies de la cataracte simultanées peuvent être l'option préférable dans des environnements aux ressources limitées comme le nôtre, où le financement des soins de santé repose principalement sur les dépenses personnelles.

**Mots clés:** *Cataracte congénitale, chirurgie simultanée, chirurgie séquentielle*

## Introduction

Globally, approximately 1.4 million children are blind [1]. Childhood blindness requires special attention because of its significant contribution to "blind person years"[2]. Congenital cataract currently constitutes the leading cause of childhood blindness in Africa [3]. It occurs in 1 in 30,000 live births and is bilateral in two-thirds of cases [4].

The definitive management for congenital cataract is surgery. The management of cataracts in the paediatric age group is multidisciplinary, challenging and requires long term follow-up. It also has certain peculiarities as regards timing and type of surgery, because of the risk of stimulus deprivation amblyobia [5].

There is a global controversy on whether bilateral cataract surgeries should be carried out sequentially (each eye on a different day) or simultaneously (both eyes during the same theatre session) [6-9]. For instance, simultaneous surgeries may be associated with higher risk of endophthalmitis or Toxic Anterior Segment Syndrome (TASS) [6,10,11]. These risks may be circumvented by adhering strictly to aseptic procedures and treating each eye as a separate entity [12]. Despite these limitations, the advantages of simultaneous surgery in children include less exposure to general anaesthesia, faster visual rehabilitation, avoidance of loss to follow-up for second surgery and/or rehabilitation, and lower overall costs to the patient [12-15].

There are no studies from sub-Saharan Africa addressing this controversy. Therefore, this study compared simultaneous and sequential bilateral congenital cataract surgery at a tertiary hospital in Nigeria in order to assist paediatric ophthalmologists and parents/care-givers in informed decision-making.

## Patients and methods

The study was a retrospective comparison of simultaneous and sequential bilateral cataract surgeries for bilateral congenital cataracts in children younger than three years at the paediatric ophthalmology unit of our hospital between January 2010 and April 2016. Outcome measures included length of hospital stay, direct costs, occurrence of complications (anaesthetic complications, endolphthalmitis, TASS) and delays in care. The direct cost for each group comprised three main parameters- cost of surgery, cost of accommodation and cost of drugs.

All patients were referred for paediatric cardiology review to ascertain fitness for general anesthesia before being scheduled for surgery. Careful and detailed ocular examination was carried out to rule out the presence of risk factors for endophthalmitis such as conjunctivitis, blepharitis, nasolacrimal duct obstruction, etc. Caregivers were appropriately counseled on both surgical modalities, and allowed to make an informed decision. There was strict adherence to aseptic technique during surgery. Each eye was treated as a separate entity for the simultaneous group, with surgeons and assistants re-gowning and re-scrubbing before operating on the second eye, and the use of a separate set of instruments. Surgeries were performed under general anaesthesia by three different surgeons, all of whom are trained paediatric ophthalmologists.

Most patients had Extracapsular Cataract Extraction (ECCE) with Primary Posterior Capsulotomy (PPC) and Anterior Vitrectomy (AV) through the limbal approach. Two patients had Small Incision Cataract Surgery (SICS) and lens aspiration respectively. There was no intraocular lens implantation for any of the patients. Incisions were closed with 10/0 monofilament nylon sutures. All patients received subconjunctival methylprednisolone, dexamethasone and gentamicin at the end of surgery before padding the eye. This was followed by frequent instillations of topical antibiotic and steroid eye drops post operatively. Optical correction was by use of spectacles or contact lenses depending on availability and affordability.

Surgery for the second eye in the sequential group was routinely scheduled for one week after surgery in the first eye. All patients were scheduled to have refraction a few days after surgery, while still on admission. This was the definitive refraction used as a basis for optical rehabilitation for the simultaneous group. The patients in the sequential group were scheduled to have a second refraction (definitive) few days after surgery in the second eye. Patients were closely monitored for complications, adherence to medications and commencement of optical rehabilitation as much as possible.

Data was analysed using IBM Statistical Package for Social Sciences (SPSS) version 20.0 (IBM Corps., New York, USA). Means and standard deviations were calculated for quantitative variables while frequencies and percentages were calculated for qualitative variables. The difference in mean hospital stay, direct costs and delays in management for the two groups were compared using the Independent t-test, and a *P*-value of $<0.05$ was considered statistically significant.

The study abided by the tenets of the Declaration of Helsinki for studies involving human

subjects. Ethical approval was obtained from the Ethics Review Committee of the hospital.

## Results

Prior to 2012, mostly sequential surgeries were performed, while the rate of simultaneous surgeries increased thereafter (Figure 1). Forty of 42 eligible patients had complete data and were included in the study. Median age at presentation was 28 weeks (range 4-128 weeks) and 25 (62%) of them were males. Twenty-five (62.5%) patients had associated cardiac abnormalities and 24 (60%) patients had simultaneous surgery.

There was no significant difference in gender distribution between both simultaneous and sequential surgery groups [p= 0.505]. The median ages in both groups were also not significantly different, p=0.29. However, more patients in the simultaneous group had systemic associations (83.3%) compared with patients in the sequential group (31.2%); [p= 0.001].

Patients who had sequential surgeries had significantly longer hospital stay and higher direct costs than patients who had simultaneous surgeries (Table 1). Twelve (75%) of patients in the sequential group had surgery in the second eye within seven days of surgery in the first eye. Three patients in this group, however, experienced delays accessing surgery in the second eye ranging from four to twelve months, while one patient was lost to follow-up before second surgery. Specific reasons for the delay in these patients were not available in their records. Definitive optical correction for all patients was achieved after cataract surgery had been carried out in both eyes. As a result, the three patients who had delay in accessing surgery for the second eye invariably had delays in visual rehabilitation. No serious anaesthetic or ocular complication (endophthalmitis or TASS) was noted in the two groups.

## Discussion

The main finding of this study was that while the sequential group had higher direct costs, longer duration of hospital stay, longer intervals to second surgery and visual rehabilitation, there were no anaesthetic or serious ocular complications (endophthalmitis or TASS) in either group.

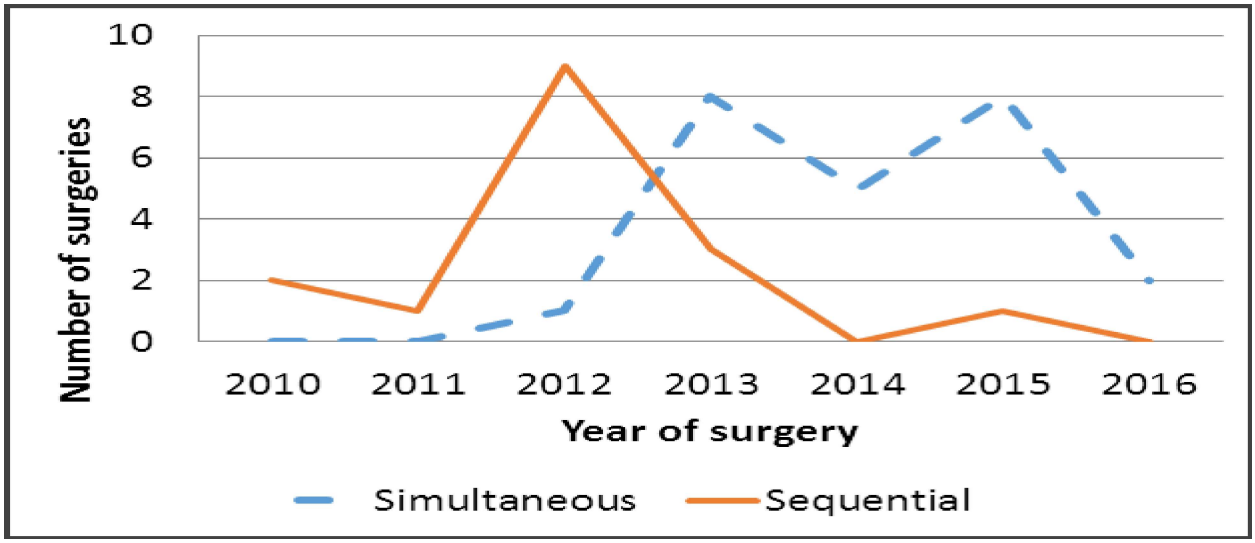


**Fig. 1**: Trend of bilateral cataract surgeries in the hospital between January 2010 and April 2016

**Table 1:** Comparisons between simultaneous and sequential surgery for bilateral congenital cataract

| | Simultaneous surgery | Sequential surgery | P-value (difference in mean/median) |
|---|---|---|---|
| Length of hospital stay | Mean = 6.3 days (4-10 days) | 12.1 days (11-18 days) >> 92% longer | P<0.001 |
| Direct costs | Mean = ₦47,000 (₦45,200 – N52,200) | Mean = ₦70,000 (₦69,000 – N73,000) >> 48.9% higher | P<0.001 |
| Time interval-surgery to optical correction | Median = 2.25 days (1-5 days) | Median = 9 days (8-365 days) | P=0.076 |

Previous studies showed similar safety and efficacy profiles for both types of surgery [7,14,15]. The main arguments against simultaneous surgery are the rare but devastating risks of bilateral endophthalmitis and TASS. However, there are only four documented cases of bilateral endophthalmitis following simultaneous bilateral cataract surgery in literature, all occurring following a breach of standard protocol, and there is no documented case of bilateral TASS [7]. The incidence of acute-onset endophthalmitis following cataract surgery has been reported to be 0.04% [16] and the incidence following paediatric intraocular surgery is 0.071% [17]. Although the fact that there were no cases of endophthalmitis or TASS in this study may be due to the small sample size, it is important to note that the rates of endophthalmitis and TASS in the Paediatric Ophthalmology unit of our hospital have been 0% respectively in the last 10 years. Nevertheless, careful patient selection and maintenance of strict aseptic technique (re-gowning and re-gloving, using different set of instruments, different batch of balanced salt solution and viscoelastic agents) are the bedrocks of safe and effective simultaneous surgery.

The risk of repeated exposure to general anaesthesia is one of the arguments against sequential surgeries. Specifically, the associated cardiac and systemic comorbidities in some of the children with congenital cataracts make them poor candidates for repeated exposure to general anaesthesia. In this study, more than half of the patients had associated cardiac morbidities. Though recent evidence has shown no significant association between a single, short duration exposure to general anaesthesia and future neurocognitive and behavioural outcomes [18], there is no evidence yet with regards to the effect of multiple exposures in vulnerable subjects such as these.

Patients who had sequential surgery had total direct costs that were 48.9% higher than patients who had simultaneous surgery. Other studies in the United States and Finland have also reported higher costs for sequential surgeries [13,15,19,20]. Simultaneous surgeries may be more cost effective in our setting in view of the challenges of health care financing which is mostly through out-of-pocket spending on the part of caregivers.

In addition, patients who had simultaneous surgeries in this study spent fewer days in the hospital and were less likely to experience management delays than patients in the sequential group. This is also similar to findings in other studies [13,15], and is an incentive for choosing simultaneous over sequential surgery.

The main limitation of this study is its retrospective nature and the possibility of bias due to lack of randomisation into the two surgery groups. A randomised controlled trial would have been ideal to affirm the evidence from this study regarding the advantages of simultaneous over sequential surgery. Another limitation is that the study did not compare visual outcomes, long term complications as well as compliance with follow up.

In conclusion, the choice of simultaneous over sequential surgery for bilateral congenital cataracts is dependent on various important factors such as available resources, expertise and patient factors. Based on the results of this study and evidence from literature, simultaneous surgery may be considered as the preferable option for bilateral congenital cataracts especially in resource-limited settings where access to health care is inadequate and the burden of health care financing is borne mostly by the patient/caregiver.

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# Socio-demographic characteristics of Ibadan preschool teachers: policy implication for improved child oral health education

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**Abstract**

*Background:* Teachers/Caregivers in preschool centres are well recognized for their role in the care and education of growing children. The sociodemographic and other work related characteristics of these caregiver staffs have been shown in many literatures to exert influence on the quality of educational delivery and care they provide in the care centers. Such information which is useful to advise policy directions in other systems is however scarce in our local environment. This study was therefore set out to assess the sociodemographic and work related variables of preschool caregivers in Ibadan.

*Methods:* A descriptive cross sectional survey using mixed methods was used. Self-administered questionnaire was used to obtain information from 362 teachers and 44 headmistresses (key-informants) also volunteered information. Three-stage sampling technique was used to enroll participants into the study. Interview questions included sociodemographic characteristics and other work-related profile of the caregiver staffs. Qualitative data were analyzed manually while the quantitative data were analyzed using SPSS version 22.

*Result:* Caregivers' male: female ratio was 1: 9 and were aged between 18 and 60 years with a mean age of 35.2 ±8.9 years. About 56.0% were of the entry level career stage and most (68.0%) were married. The majority (96.7%) of the respondents had at least, a secondary school education, 36.0% of which had Early Child Care Education (ECCE) training. Caregiver: pupil ratio was 1: 10. Mean daily work hours was 8.2±1.2 hours/day and a total of 41hours/ week. Monthly salary ranged between 15 and 35 thousand naira ($42 - $97) and increased with better education, job experience and specialized ECCE training ($p<0.001$). Twenty-one (47.7%) informants admitted to observing a regular health promotion programme in their facilities out of which 14(66.7%) of them claimed that the programmes had no oral health content.

*Conclusion:* The preschool teachers' sociodemographic and work-related profile revealed less emphasis on the required specialized training and poor remuneration. Many centres did not observe a regular health promotion programme and a significant number of the few that observed it did not have oral health content.

**Keywords:** *Preschool caregiver, Preschools, Socio-demographic characteristics, Oral health education*

**Résumé**

*Contexte: Les* enseignants / personnes responsables de soin des centres préscolaires sont reconnus pour leur rôle dans les soins et l'éducation des enfants en croissance. Il a été démontré dans de nombreuses littératures que les caractéristiques socio-démographiques et autres caractéristiques liées au travail de ces personnels soignants ont une influence sur la qualité de l'enseignement dispensé et des soins qu'ils dispensent dans les centres de soins. De telles informations, utiles pour conseiller les orientations des politiques d'autres systèmes, sont toutefois rares dans notre environnement local. Cette étude visait donc à évaluer les variables sociodémographiques et liées au travail des personnes responsables des soins préscolaires à Ibadan.

*Méthodes:* Une enquête transversale descriptive utilisant des méthodes mixtes a été utilisée. Un questionnaire auto-administré a été utilisé pour obtenir des informations auprès de 362 enseignants et aussi 44 directrices (informatrices clés) donnaient l'information volontairement. Une technique d'échantillonnage en trois étapes a été utilisée pour inscrire les participants à l'étude. Les questions de l'entrevue comprenaient les caractéristiques sociodémographiques et autre profil professionnel des personnes responsables de soin. Les données qualitatives ont été analysées manuellement, tandis que les données quantitatives ont été analysées à l'aide de SPSS version 22.

*Résultat :* Le ratio hommes / femmes des responsables de soin était de 1: 9 et était âgé entre 18 et 60 ans avec un âge moyen de 35,2 ± 8,9 ans. Environ 56,0% étaient au stade de début de carrière et la plupart (68,0%) étaient mariés. La majorité (96,7%) des répondants avaient au moins une formation de niveau secondaire, dont 36,0% avaient suivi une formation en éducation

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de soin de la petite enfance (ESPE). Le ratio responsable de soin: élève était de 1: 10. La moyenne des heures de travail quotidiennes était de 8,2 ± 1,2 heures / jour et un total de 41 heures / semaine. Le salaire mensuel variait entre 15 000 et 35 000 Naira (42 à 97 dollars) et augmentait avec une meilleure éducation, une expérience de travail et une formation spécialisée en ESPE (p <0,001). Vingt-et-un (47,7%) informatrices admettaient à observer un programme régulier de promotion de santé dans leurs établissements, dont 14 (66,7%) ont déclaré que ces programmes n'avaient aucun contenu en matière de santé bucco-dentaire.

*Conclusion:* Le profil sociodémographique et relatif au travail des enseignants préscolaires a révélé une moindre importance accordée à la formation spécialisée requise et à une rémunération médiocre. De nombreux centres n'observaient pas de programme régulier de promotion de la santé et un nombre significatif des peu qui l'observaient n'avait aucun contenu relatif à la santé bucco-dentaire.

**Mots clés:** *Responsable de soin préscolaire, Préscolaire, Caractéristiques sociodémographiques, Éducation en santé bucco-dentaire*

## Introduction

As realization of the need for women to earn income grows, it brings to the fore the importance of non-parental care settings such as the preschools for the care of preschool aged children. At preschool establishments, children spend between 59% and 75% of their preschool period with professional caregivers [1]. This is why preschool care facilities are projected as home extensions, and the child care workers seen as second mothers. At preschool age, the children are quite tender and impressionable, hence the years between birth and age five are well recognized as the formative years for which the foundation of adult oral health is laid. Within the same period a child's dental disease risks and pattern are also established [1, 2].

The role of a preschool teacher/caregiver regarding children's oral health education in the classroom includes helping children to imbibe the right knowledge and develop positive habits and skills. Topics such as personal health and wellness, oral health promotion and disease-prevention including concepts such as teeth brushing and healthy nutrition are expected to be well elaborated within this period. In addition, preschool caregivers demonstrate behaviours that enhance health and reduce risks, show how poor oral health can affect self-esteem, and prevent injuries, identify and develop safety strategies to prevent oral/dental injuries among others[3,4] Successfully impacting these lessons into the lifestyle and habits of children in order to instill best practice in them require skill and capacity for painstaking supervision and individualized instructions from a competent and qualified caregiver staff [5,6]. Unfortunately, the effective delivery of these educational measures had remained a challenge for oral health promotion[7].

The quality of work life, an important domain of human lives has been shown to exert significant influence on a worker's overall well-being which in turn greatly impacts on his productivity and output [8]. Therefore, some factors related to a pre-school workplace such as reasonable workload and hours, pay and benefits sufficient to maintain a socially acceptable standard of living and growth opportunities, have the capacity to influence work output among paid caregivers.

Similarly, research reports have identified caregiver qualities such as a better overall education, additional training, being older in age, being dedicated, working with a good caregiver-pupil ratio and work hours, wages and welfare packages as fundamental and important factors which could influence the quality of educational delivery and care obtained in care settings [9-16] and thus were often referred to as structural quality indicators in service delivery in child care establishments [11, 12]. As such, these qualities were encouraged as desirable virtues in preschool caregiver staffs so as to appropriately position them into their roles [10].

The goal of any center-based child care establishment and their regulatory bodies is to achieve a high-quality child care and educational delivery[13]. The preschool caregiver having been recognized as key in the realization of this goal needs to be appropriately positioned in order to effectively deliver on its mandates [10] more so, on the oral health education needs of the children.

The profile of sociodemographic and other work related conditions in preschool caregivers and how well these may influence the quality in educational delivery and care among them when compared with standards required for quality of care has been thoroughly debated in literatures[9,11,14-17]. But such information is however scarce in our local environment, hence this study.

## Methods

The study was conducted in Ibadan, the capital city of Oyo State, southwest Nigeria. Preschools in the state exist in both public and private settings co-existing with the parent school structures. It may also exist alone in the form of a preparatory or beginners setting, without any affiliation with a bigger school. The preschool establishments are populated with

children between the ages 2 and 5 years and are cared for in structures referred to as pre-nursery, nursery, pre-Kindergarten (pre-k), preparatory (prep) classes and other names as adopted by different management. Each of the Local Government Areas (LGAs) in Ibadan had an average of about six school zones- clusters of preschools facilities which affiliate within the same area or community.

The observational study was cross sectional in design and combined both key-informant interview and self-administered questionnaire methods to assess the preschool caregivers' sociodemographic and other work related variables.

The study population comprised of all caregiver staffs and headmistresses of preschool centres operating within Ibadan metropolis who were selected using a three-stage sampling technique. In the first stage, three Local Government Areas (LGAs) were selected by simple random sampling through balloting of the five LGAs that exists in Ibadan metropolis. About six school zones (SZ) were identified in each LGA from where four SZ each were selected by balloting - this gives a total of 12 SZ in all. In the last stage, five preschools were selected by balloting from the average of about nine preschools that make up each SZ. This made a total of 20 preschools from each LGA and 60 preschools for the entire three LGAs that were enrolled into the study. Since a minimum of 6 caregivers were anticipated in each preschool, then all the consenting caregivers in each of the selected preschools were enrolled in the study giving a total of 360 caregivers in all.

Ethical approval was obtained from the joint University of Ibadan/ University College Hospital (UI/UCH) ethical review committee (UI/EC/11/0039). Permissions were obtained from the Oyo state Ministry of Education and from the headmistress of each centre. Similarly, consent was obtained from the caregivers.

The qualitative part of the study involved a face-to-face semi-structured key informant interview with headmistresses of the preschools selected in the study. To be included in the study, the key informants needed to have a minimum of one year employment history in the preschool facility. Their interview schedule reflected eight questions which followed a "YES" response to the state of "currently operational preschool programme" in a facility and two questions following a "NO" response to the state of "currently operational preschool programme". Analysis was done manually. A document was created for each question on which informants' responses were summarized, commonality extents and variations were reflected and themes developed.

In the quantitative part of the study, the questionnaire enquiry from the preschool caregivers included relevant socio-demographic variables and some work-related variables such as daily working hours, employment duration, how many children under their care, how many carers in a classroom, monthly income and whether the job was a choice option. Inclusion criteria included: preschools accredited/ approved by government; caregivers who were aged 18 years or above and who cared for normal/healthy children; and caregivers who were in employment for at least three-month duration.

Instruments used for the study were tape recorders, field notes on observations made and questionnaire tools. Incentives were given to encourage participation. These were free dental consultation, free blood pressure check and scaling and polishing for participants found with poor oral hygiene. Financial exchange rate during study was at the rate of $1 to N360. Data were entered into the computer. Analysis was done using SPSS version 22.0 software package

## Results

*Key-informant interview- public preschools*

All of the headmistresses in the five-existing government owned/ public preschools facilities located within the study area were of the opinion that the preschool programme in their facilities were no longer operational. In a statement by a school headmistress, "*the parents long withdrew their wards from our school and even all other public school settings for the various private preschool establishments in the city- perhaps owing to repeated shutting down of schools following industrial strike actions by school teachers*".(KII 4, SZ 3). According to another headmistress: "*we do not have students anymore, the two caregivers posted to us were drafted to teach primary one pupils*" (KII 5, SZ 9)

*Key-informant interview- private preschools- summary of findings*

A total of 62 private schools within the study area were visited, 44(70.9%) headmistresses were available for interview and met the inclusion criteria. From the interview, the various preschool establishments had been operational for between 4 years and 32 years. They all claimed to engage preschool caregivers with specialized training in Early Childhood Care Education (ECCE) in addition to support staffs for preschool children care. In one of the headmistress words: *"Our policy for preschool teachers' recruitment is nothing short of an ECCE qualification"* (KII 37, SZ 2). Total number of pupil

**Table 1**: Socio-Demographic Distribution of Respondents (N = 362)

| Variables | Frequency | Percentage |
|---|---|---|
| *Sex* | | |
| Male | 32 | 8.8 |
| Female | 330 | 91.2 |
| *Age group (years)* | | |
| < 25 | 25 | 9.4 |
| 25 – 34 | 153 | 42.3 |
| 35 – 44 | 122 | 33.7 |
| ≥ 45 | 53 | 14.6 |
| *Marital status* | | |
| Never married | 91 | 25.1 |
| Married | 246 | 68.0 |
| Separated/divorced | 9 | 2.5 |
| Widowed | 12 | 3.3 |
| Cohabiting*Ethnic group* | 4 | 1.1 |
| Yoruba | 237 | 65.5 |
| Igbo | 72 | 19.9 |
| Hausa | 5 | 1.4 |
| Others | 48 | 13.2 |
| *Religion* | | |
| Christianity | 328 | 90.6 |
| Islam | 32 | 8.8 |
| *Others | 2 | 0.6 |
| *Educational Status* | | |
| Primary Education and < | 12 | 3.3 |
| Secondary Education | 71 | 19.6 |
| Post 2° Education e.g., NCE, Grade II, TT | 188 | 52.0 |
| University/Polytechnic | 91 | 25.1 |
| *Primary job option* | | |
| Yes | 262 | 72.4 |
| No | 100 | 27.6 |
| *ECCE training* | 132 | 36.5 |
| *Average daily working time (hours/day)* | | |
| < 8 | 59 | 16.3 |
| 8 | 182 | 50.3 |
| > 8 | 121 | 33.4 |
| Number of caregivers/teachers remunerated for work time above 8 hours | 19 | 15.7 (p=0.000) |

in enrolment in all of the facilities was about 3792, while the total number of preschool caregivers staff engaged in all the facilities was 376 thus giving a caregiver pupil ratio of 1 : 10. Classroom arrangement was that of a caregiver and one or two assistants depending on the number of children. Minimum pay for the preschool caregivers per month was 15,000: 00 naira while the maximum was 35,000: 00 naira, in one of the quotes "*Anything less than 15K would be unfair*" (KII 21, SZ 11). Benefits attached to preschool caregiver engagements included subsidized health care in 41(93.2%), training scholarship in 16(36.4%), and subsidy on tuition fee for enrolled wards in all cases. Twenty-one (47.7%) informants admitted to observing a regular health promotion programme in their facilities out of which 14(66.7%) of them claimed that the programmes had no oral health content. (Table 1)

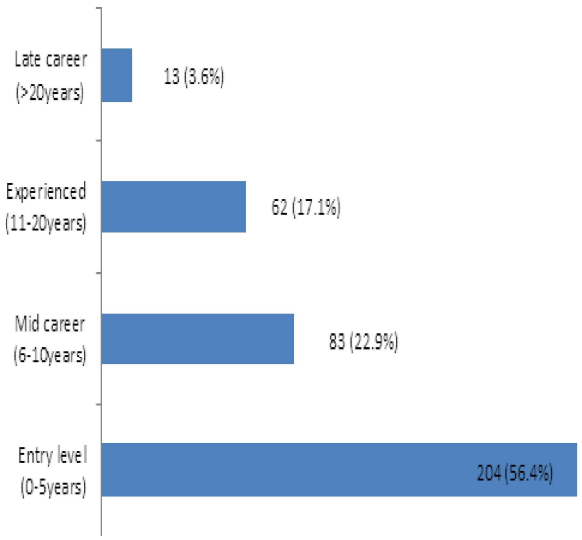


**Fig 1:** Caregivers' work experience

*Self-administered questionnaire on preschool caregivers*

A total of 362 caregivers were interviewed. The response rate was 96.3%. The male: female ratio of the respondents was 1: 9. The minimum age was 18 while the maximum age was 60 years. The mean age was 35.2 ±8.9 years. The highest proportion (42.3%) of participants fell within the age group 25 to 34 years of age and two hundred and forty-six (68%) of them were married (Table 1).

Participants were mostly of the Yoruba tribe and practiced Christianity. The majority (96.7%) of the respondents had at least, secondary school education. Of these, caregivers with post-secondary education in the form of National Certificate in Education (NCE), teacher training or Grade II certificates constituted the larger majority. About a quarter of the caregivers (25.1%) were graduates of a university or a polytechnic. More than a third of the caregivers (36.5%) had ECCE training. About 262 (72.4%) respondents admitted that their preschool caregiver job was a primary job option, the rest would have preferred other jobs (Table 1). Participants work experience as preschool caregivers ranged between 3months to 35 years. Majority of them (56.4%) had an entry level experience followed by 83(22.9%) of them with mid-level experience (Fig 1).

The median years of work experience recorded among the participants was 5.0 (34.8) years.

Daily working time ranged between 4 to 11 hours. About a third 121(33.4%) of the respondents worked for more than 8 hours daily on the average with the children. Of this, only 19 (15.7%) admitted to receiving remuneration for the extra hours spent ($p<0.001$). Mean working time spent each day on the job by the caregivers was 8.2±1.2 hours (Table 1).

Monthly salary ranged between ₦15,000 ($41.7) to ₦35,000 thousand ($97.2), and increased with increase in the number of years of experience, a rise in the level of education and whether or not the caregivers had ECCE training ($p<0.001$) (Table 2).

of the ECC centre ownership with private firms. In each classroom, a caregiver and an assistant cared for a number of pupils. This is an expected arrangement as it is the general practice in reports from other similar studies.[16,20]

Traditionally, child care is seen predominantly as the responsibility of the feminine gender and through the years, research identified gender polarisation in child care work force, placing the female as a preferred gender till date.[21] This explains the preponderance of female child care workers in this study and other similar studies[16, 20]. Though adoption of a motherly role in child care may have aided the preference for women, men on the other hand albeit fewer may be sought after

**Table 2:** Association between caregivers' socio-demographic characteristics and monthly income (N = 362)

| Variables | Monthly Income | | | | | $\chi^2$ | P-value |
|---|---|---|---|---|---|---|---|
| | <19,000 | 20,000 -¦ 24,000 | 25,000 -¦ 29,000 | 30,000 and Above | Total | | |
| *Caregivers' Work Experience (years)* | | | | | | | |
| Entry Level (0 – 5) | 72(35.3) | 105(51.5) | 22(10.0) | 5(2.5) | 204(100%) | | |
| Mid-career (6 – 10) | 13(15.7) | 45(54.2) | 20(24.1) | 5(6.0) | 83(100%) | | |
| Experienced (11 – 20) | 0(0.0) | 28(45.2) | 25(40.3) | 9(14.5) | 62(100%) | | |
| Late career (> 20) | 0(0.0) | 1(7.7) | 3(23.1) | 9(69.2) | 13(100%) | 135.088 | <0.001 |
| *Educational Status* | | | | | | | |
| No formal Education | 3(100.0) | 0(0.0) | 0(0.0) | 0(0.0) | 3(100%) | | |
| Primary Education | 7(77.8) | 2(22.2) | 0(0.0) | 0(0.0) | 9(100%) | | |
| Secondary Education | 42(59.2) | 26(36.6) | 3(4.2) | 0(0.0) | 71(100%) | | |
| Post 2° Education e.g., NCE, Grade II, TT | 28(14.9) | 96(51.1) | 47(25.0) | 17(9.0) | 188(100%) | | |
| University/Polytechnic | 5(5.5) | 55(60.4) | 20(22.0) | 11(12.1) | 91(100%) | 106.439 | <0.001 |
| *ECCDE training* | | | | | | | |
| Yes | 14(10.6) | 58(43.9) | 41(31.1) | 19(14.4) | 132(100) | | |
| No | 71(30.9) | 121(52.6) | 29(12.6) | 9(3.9) | 230(100%) | 42.618 | <0.001 |

## Discussion

All functional preschool care facilities within the study area were owned and operated by private establishments just as it was observed in similar reports from other studies in Nigeria [17,18]. Situations as such thus highlights the interest preschool educational sector in the country has received from the private sector. Although a growing demand for early childhood care (ECC) and education coupled with an official provision made for such needs in the National Policy on Education FGN paper of 2004 [19] of Nigeria may have contributed to the attention. According to one of the study informants, preschool care facilities previously existed in some government owned schools, but that they all suffered attrition probably due to repeated and incessant industrial actions by teachers in the parent schools thus leaving majority

because of the perceived need to have male role models for the children.[21]. Regarding the caregiver's educational qualification, emphasis appeared placed more on general education at the expense of the much needed training in Early childhood Care and Education as only a few of the caregivers acquired the specialized form of training. This observation is consistent with report from a similar study[22]. Perhaps, profit maximization in the hands of the businessmen/women who dominate the educational sector may have played a role since having a higher caregiver staff qualification should confer more in terms of financial commitment on the part of the owners of such institutions[18].

Fortunately, only a few study participants took up the child care giver job by chance unlike the finding in a similar study conducted in Malaysia[20]

where preschool child care was not a first job option for the majority of the caregivers. Conceivably, a lack of preferred job options which was fingered as a likely cause in the study may also have a bearing in Nigerian preschools. In such cases, the right qualifications, in terms of specialized training, skill, passion, patience, creativity, dedication and motivation which were identified as qualities in a good preschool caregiver staff, may be rare. [14, 23, 24]. Furthermore, as many researchers believe that the developmental well-being of the child depends on the quality of care received, [24, 25] then as much as possible, the child care profession should be an exclusive preserve of those for whom it is a first job option.

The caregiver-pupil ratio of 1:10 observed in this study, is in line with the recommendations of the Nigerian National Policy on Education[26] and recommendations from other researchers.[19, 27] These reports had shown an agreement on a caregiver-pupil ratio of not exceeding 1:20 and 1:15 with assistants respectively for pre-primary classes depending on age for both public and private school settings. It was thus argued that the ratio was acceptable in order for a child to receive optimum care and attention and ensure that the caregivers themselves were not overworked. However, the actual ratio for each class in this study, was observed to reduce with lower age range of the children in each classroom as stated in the recommendations [19, 26, 27] and similar to the study conducted in Lagos [17] and other centres in Nigeria[19, 26, 27]. None of the schools visited in the study had a caregiver/child ratio of greater than 1:20.

The mean working hours of 8.2 hours per day which was observed in this study sums up to 41 hours per week. Similarly, in Malaysia, a mean working hour of 9.9 hours per day[20] was reported. Clearly, these two values were in contrast with average of 36 hours per week obtained in similar child care settings in developed countries like the United States of America [10]. Moreover, such values were undoubtedly higher than the maximum of 40 hours per week recommended world over, for workplace productivity and profit[28]. The Nigerian government, in line with this recommendation, had through a decree in 1974 stipulated payment for extra work done over the legal limit of 40 hours per week. Unfortunately, of the entire third of all the participants who had admitted to having worked for more than 8 hours per day (40hours per week) on the average, very few (16%) acknowledged a form of remuneration for the extra hours put in. This situation, in accordance with work place productivity and profit recommendations, may result in less efficiency and less productivity among preschool teachers.

Regarding remuneration in terms of monthly salary, the preschool caregivers' take home which stood between $41.7 and $97.2 was quite low unlike in United States of America where such jobs attract an average hourly payment of $11.47 with attendant benefits. Albeit, the Nigerian national minimum wage which currently stands at N18,000 naira ($50) per month, still translates to less than one dollar per hour. These types of remunerations may risk placing a family of three or more below the poverty line[29]. According to some researchers, job satisfaction and work place motivation towards effectively caring for and interacting with children is influenced not only by the caregivers' level of education and training but also by external factors, such as salary and other benefits such as welfare packages, training scholarships, nonfinancial support and incentives. [8, 12, 30, 31]

The importance and benefits of inclusion of oral health promotional activities in schools cannot be overemphasized [32-34]. In WHO health promoting school (HPS) models, it is established that the need to plan educational content and oral health practices to be offered in schools together with the professional development for teachers and collaboration with health professionals/educators/agencies are essential to the success of oral health promotion. It is believed that these measures aids the process of delivery by improving participation by school staff and sustaining their commitment[34]. Unfortunately, less than half of the informants (headmistresses) claimed to observe a regular health promotional programmes in their facilities. Worrisome still, was the fact that, a significant proportion of the few that observe a regular health promotional activities admitted to not having oral health contents included in such programmes.

**Limitation of study**

The study is subject to some limitations. First, the self-reported nature of the questionnaire tool may render some of the data subject to recall bias in reporting. Second, the cross-sectional design precludes causal inferences and only associations can be drawn. Finally, the samples were not selected from across the country, and so the findings may not be representative of caregivers in Nigeria. However, the strengths of the study include the fact that clusters of school were selected at random to ensure representativeness while using appropriate sampling strategy. The questionnaire was pilot tested to ensure

the quality and face validity of the data collection tool and key informant interview conducted as check for some claims. Overall, the study highlighted the sociodemographic and work related variables of Ibadan preschool caregivers.

**Conclusion**

Preschool care outfits in the study area were majorly private owned. Though the majority of the caregiver staffs were well educated but few of them had the required specialized training. The monthly remuneration though associated non-financial benefits, was low. Many preschools centres did not observe a regular health promotion programme and a significant number of the few that observed it did not have oral health content

It is clear that the preschool caregivers' capacity to deliver quality education and skills towards optimal oral health of young children beginning at very early ages is critical, and that previous researches have linked these capacities with the caregiver's socio-demographic and work related profile.[11, 12] Therefore, efforts should be made at enhancing motivational factors among staffs in preschool work places.

There is a need to enhance some of the work conditions of the caregivers to bring these closer to the set standards in order to improve the delivery of oral health education at the preschool level. A re-vamping of the government owned but non-functional preschool facilities should be considered and these facilities should be set up as model preschools with more approving work conditions in accordance with standard practice for private investors to copy. Introduction of equal working conditions in terms of wages, benefits and professional development opportunities for similar qualifications across preschool settings should be considered by concerned regulatory bodies. The issue of minimum educational requirement for a preschool caregiver employment should be critically looked into in order to arrive at basic requirements. Specialized early childhood care training should be emphasized in addition to the other educational requirements. Similarly, the job should be a preferred or primary job option for applicants. These conditions would ensure, attraction of more competent hands for the job. The standard number of 8 work hours should be adhered to across board and forms of remuneration instituted for all extra hours above it. Health promotional programmes with inclusion of oral health contents should be observed as regular activities in all pre-school establishments and should be considered mandatory requirement in the curriculum.

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