AFRICAN JOURNAL OF MEDICINE
and Medical Sciences

Website: http://www.ajmms.com
 ISSN 1116-4077 EISSN 2659-143X

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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 act as a channel 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.

Publication details

The Journal is owned and published by the College of Medicine, University of Ibadan, Ibadan and the University College Hospital, Ibadan. The Journal is published quarterly; four issues form one volume and feature in Index Medicus.

All correspondence should be addressed to the Editorial Office, African Journal of Medicine and Medical Sciences, Institute for Advanced Medical Research and Training (IAMRAT), College of Medicine, University College Hospital, Ibadan, Nigeria. Telephone Numbers: 08190563347 and 08023451177. Fax: 234-022411768. E-mail: afrijmed@ comui.edu.ng; afrijmed@yahoo.com. Website: http://www.ajmms.com

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Finding solution to myriads of health challenges through research: from basic to clinical

This issue of the journal contains fifteen manuscripts produced from original research and a case report. The researched areas include ethnopharmacy, women's health, dental surgery, general surgery, public health and other selected topics in medicine. The article by Owoeye and others highlighted the protective potential of *Carica papaya*, a very common fruit in the environment when combined with vitamin E in reducing ischemic changes in the rat brain while the paper by Usman and colleagues reported possible use of the ethanol extract of the *Blighia sapida (Sapindaecea)* stem bark in managing psychosis. Using the mice model with paradigms for stereotypy and hyperactivity, the authors demonstrated the ameliorating effects of the extract. These two publications have great potential for translation if the findings are replicated by other researchers. Another manuscript on research in experimental animals reported on the adverse effect of tramadol on sperm motility sperm count and testosterone levels. These effects were reversed by Vitamin E. Tramadol is a medication that is currently a source of concern because of abuse and various unwanted effects. Finding an antioxidant like Vitamin E to reverse its adverse effects is a welcome development.

Five articles focus on women's health. Olukoya and Adebiyi proffered that major reasons for disparity in malaria treatment of pregnant women which were: level of education, wealth index, ethnicity, place of residence and parity of the respondents. Poor pregnancy outcome in women who have systemic lupus erythematosus presenting either as recurrent spontaneous abortions or unexplained deterioration in renal functions calls for supervised care for such patients as reported by Olatunde and colleagues. Obasola and Obajimi reported that about two-thirds of pregnant women consulted the internet to seek information on how to improve pregnancy outcomes. Staffing of private hospitals/clinics by more auxiliary nurses than qualified and registered nurses should be a cause for concern as well as the lack of facilities for optimal obstetric care. An interesting case report of transverse vaginal septum as a cause of primary infertility completed the gynaecology/obstetric collection in this issue.

Olatunji and colleagues have produced a manuscript on the importance of obtaining validated ratios for inter-premolar and inter-molar arch widths in dental surgery. They showed that using ratios derived from Caucasian population is fraught with errors. This should be a new standard and should be encouraged. Resin-bonded bridges are in vogue for tooth replacement but less than 10% of the Dentists surveyed in the study by Abiodun-Solanke et al have started using this. The place of continuing education in dental practice was appropriately emphasized.

The remaining articles will also interest readers because of the interesting findings on i) the use of immunohistochemistry combined with haematoxylin and eosin stains in the differential diagnosis of nasopharyngeal tumors; ii) lumbosacral spondylosis as the most common cause of low back pain particularly in female individuals; iii) high compliance with the use of the WHO surgical safety checklist to improve outcome and safety of procedures; iv) the reassurance that the installation of radiotherapy facility did not pose danger to the public; v) the application of molecular biology techniques for improved diagnosis of *Mycoplasma pneumoniae* virulent gene from sputum samples and vi) the need to train community health workers on preventive strategies against cholera.

The collection of articles in this issue of the journal cover a wide range of subjects and the implementation of the findings will go a long way in efforts to ensure improved health for the teeming populace. It is obvious that we need training of staff at various levels, provide more facilities at our various health facilities, foster more collaboration between basic and clinical researchers and perform better in the application of knowledge to improve health standards. Research is always the art of finding solution to perceived challenges.

A. Ogunniyi
Editor-in-Chief

Notes for Contributors

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Manuscripts, in English Language, should be submitted typed double-spaced. Author should indicate whether the article is from original research or a review, case reports are also published

On a single separate sheet, there must be the following: (a) title, (b) author's names and initials, (c) department/s in which the work was done, (d) the name and address of the author to whom correspondence should be addressed, (e) author's present address if different from the department/s in which the work was done, (f) if paper was presented at a meeting, please indicate name of organization, city month and year.

Titles should be short, specific and clear. Omit phrase such as "The use of, "observations on". Authors should provide a short running title and six keywords. Manuscripts must include a structured abstract not exceeding 250 words in a separate page. The abstract will be translated into French by the journal office at a cost to the author. Currently, the fee for translation is N2,500.00 ($50.00) non-refundable, which shall be paid when article is found acceptable for publication. The numbers of photographs and illustrations should be kept to a minimum. The legends for figures and tables should be numbered in Arabic numerals and should appear on a separate page.

The author(s) must pay for publication of coloured figures at the time of acceptance. All details on charts and graphs must be legible when reduced to the size used in this journal.

The onus of preparing a paper in a suitable form for publication rests with the author(s). The need for editorial revision for badly prepared typescripts or diagrams may lead either to rejection of the article or delay in publication.

Authors should indicate by a statement in the body of their paper that they complied with the standard requirements of the Ethics Committee of the institution in which the work was done. A Letter of Ethics Committee approval must also accompany the manuscripts at the time of submission. Where an Ethics Committee is not readily available, the Helsinki Declaration principles as revised should be followed strictly.

Workshop and conference reports should not exceed 3 to 10 double-spaced A4-sized pages. Viewpoints which could be papers expressing personal or group opinion on political, socio-economic and other matters as they relate to the practice of medicine should be limited to 10 A4-sized typed pages. Letters to the Editor may be comments on papers published in the Journal or clinical observations, replies to comments, or other matters of importance and relevance to medicine and related professions. It should not exceed 500 words with a few references and one or two tables and figures.

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Edington GM, Osunkoya BO and Smith JA. Immunopathology of Burkitt's lymphoma. West Afr Med J 1986; 85: 76 – 87.

Brown A. Primary Health Care and the Medical Curriculum Edinburgh: Universities Press. 1977.

Lewis A. Primary liver cell carcinoma. In: Ajose A. Odeku EL, Eds. Priorities in Health Planning. Ibadan: University Press, 1983; 110 - 117

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The protective effect of *Carica papaya* and vitamin E on ischaemic-reperfusion insult of rat brain following bilateral occlusion of common carotid artery

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Abstract

Introduction: Ischaemic stroke is a leading cause of death and neurological disability. Stroke models in animals attempt to mimic the events in human. This study investigated the possible neuroprotective effect of *Carica papaya* leaf aqueous extract (CPAE) and vitamin E on induced ischaemic-reperfusion injury from bilateral common carotid artery occlusion (BCCAO) in rats brain.

Materials and methods: Thirty-five female rats were randomly assigned into one of five groups (n=7): Control (1 mL distilled water); CPAE (500 mg/kg); BCCAO; BCCAO + CPAE (500 mg/kg); BCCAO + VIT E (500 mg/kg). BCCAO was carried out on day 21 for 30 minutes followed by 24 hours of reperfusion, while CPAE was administered daily for 21 days. Behavioural tests were done on day 22 after which rats were euthanized and biochemical and histological changes were assessed.

Results: The BCCAO produced significant ($p<0.05$) elevation in lipid peroxidation and reduced glutathione levels while increasing superoxide dismutase and catalase activities. It also significantly reduced the number of lines crossed, rearing, duration of forelimb grip but increased duration of negative geotaxis. It induced scattered pyknotic neurons in cerebral cortex and pyramidal neurons in the CA1 subfield of the hippocampus. Pretreatment with CPAE and vitamin E improved oxidative, behavioural response and histological alterations of the neurons in both cerebral cortex and CA1 subfield of the hippocampus.

Conclusion: The results support a protective role for CPAE and vitamin E on acute ischaemia/reperfusion injury induced by BCCAO in rats, thus contributing to the continuous search for neuroprotective strategies in stroke.

Keywords: *Bilateral common carotid artery occlusion, ischaemic/reperfusion injury, Carica papaya, oxidative damage, hippocampus, behavioural.*

Abstrait

Introduction : L'Accident Vasculaire Cérébral (AVC) ischémique est l'une des principales causes de décès et d'invalidité neurologique. Les modèles d'AVC chez les animaux tentent d'imiter les événements chez l'homme. Cette étude a examiné l'effet neuroprotecteur possible de l'extrait aqueux de feuille de *Carica pagaya* (CPAE) et de la vitamine E sur les lésions de reperfusion ischémique induites par l'occlusion bilatérale de l'artère carotide commune (BCCAO) dans le cerveau des rats.

Matériels et méthodes : Trente-cinq rats femelles ont été répartis au hasard dans l'un des cinq groupes (n = 7) : contrôle (1 ml d'eau distillée) ; CPAE (500 mg / kg) ; BCCAO ; BCCAO + CPAE (500 mg / kg) ; BCCAO + VIT E (500 mg / kg). La BCCAO a été réalisée au jour 21 pendant 30 minutes, suivies de 24 heures de reperfusion, tandis que la CPAE a été administrée quotidiennement pendant 21 jours. Des tests comportementaux ont été effectués au jour 22, après quoi des rats ont été euthanasiés et les modifications biochimiques et histologiques ont été évaluées.

Résultats : BCCAO a produit une élévation significative ($p <0,05$) de la peroxydation lipidique et une réduction des niveaux de glutathion tout en augmentant les activités de la superoxyde dismutase et de la catalase. Il a également réduit de manière significative le nombre de lignes croisées, l'élevage, la durée de l'adhérence des membres antérieurs, mais a augmenté la durée de la géotaxie négative. Il a induit des neurones pycnotiques dispersés dans le cortex cérébral et des neurones pyramidaux dans le sous-champ CA1 de l'hippocampe. Un prétraitement avec du CPAE et de la vitamine E a amélioré la réponse oxydative, comportementale et les altérations histologiques des neurones dans le cortex cérébral et le sous-champ CA1 de l'hippocampe.

Conclusion : les résultats confirment le rôle protecteur de la CPAE et de la vitamine E dans les lésions d'ischémie / reperfusion aiguë induites par BCCAO chez les rats, contribuant ainsi à la recherche continue de stratégies neuroprotectrices dans les accidents vasculaires cérébraux.

Mots clés : *Occlusion bilatérale de la carotide commune, lésion ischémique / reperfusion, Carica papaya, dommage oxydatif, hippocampe, comportemental*

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Introduction

In humans, ischaemic/reperfusion injury may occur in conditions such as stroke, cardiac arrest, subarachnoid hemorrhage, or head trauma [1]. A stroke, also known as a cerebrovascular accident, is the rapid loss of brain function(s) due to disturbance in the blood supply to the brain. Stroke may be due to ischaemia caused by blockage (thrombosis, arterial embolism) (85%) or haemorrhage (15%) [2, 3]. Tissue damage is observed maximally during reperfusion which is primarily attributed to oxidative injury resulting from the production of oxygen free radicals which exacerbate cerebral ischaemic injury [4]. Oxygen free radicals initiate lipid peroxidation which attack and inflict damage to the macro-cellular components of the cells that are crucial for cell function thus modifying their chemical and histological structures [5].

Consequent upon ischaemic injury, the affected area of the brain cannot function optimally and might result in hemiplegia, inability to understand or formulate speech, or an inability to see one side of the visual field [6]. The incidence of stroke is 254/100,000 population yearly in the United Kingdom (UK), 330/100,000 in Taiwan, and varies between 100 and 300/100,000 in the United State of America (USA) [7]-. In Nigeria, the Report of a Stroke Registry in Ibadan gave the incidence of stroke as 26/100,000 populations in 1977 [8] and in Lagos 1.14/1,000 [9]. In industrialized countries, ischaemic stroke accounted for about 10% - 17% of all deaths [10] and in Nigerian hospitals, it constituted 3.7% of emergency admissions, 8.7% of medical admissions, and 4-17% of medical deaths [11].-

Increasing interest in improving treatment options for ischaemic stroke requires the continuous exploration of new treatments options that may lead to a viable clinical application [12]. There is increasing interest in the neuroprotective potentials of plant natural products with antioxidative activity with the aim of reducing vulnerability of brain tissue to ischaemia since antioxidants curtail the damage caused by reactive oxidative species released during the reperfusion phase of stroke. *Carica papaya*, is a lozenge tropical fruit present in orange-red, yellow-green and yellow-orange hues, with a rich orange pulp. The whole *C. papaya* plant including its leaves, seeds, ripe and unripe fruits, and their juice have been used as traditional medicine [13]. It is a rich source of three vitamins: A, C and E; the minerals: magnesium and potassium; the B vitamin pantothenic acid and folate and fiber and is thus considered a nutraceutical fruit because of its multifaceted medicinal properties [13]. Phytochemically, the plant contains enzymes (papain), carotenoids, alkaloids, monoterpenoids, flavonoids, minerals and vitamins [13].

Vitamin E (α-tocopherol) is a primary membrane bound, lipid-soluble, chain-breaking antioxidant that has been reported to protect against lipid peroxidation-induced tissue damage [14]. Vitamin E pre-treatment has been reported to be beneficial in preventing 2, 2-dichlorovinyl dimethyl phosphate injury [15], formaldehyde-induced tissue damage in rats [14], gamma-radiation injury [16] and phenytoin-induced haematotoxicity and brain oxidative stress [17].

The cerebral cortex is the seat of cognitive functions as well as the control of movement while the hippocampus is involved in memory, learning and spatial cognition [18, 19]. Mammalian brain has been reported to be vulnerable to oxidative stress injury because of its high rate of oxidative metabolic activity, intense production of reactive oxygen species metabolites and relatively low antioxidant capacity [20]. Since oxidative damage has been implicated in ischaemia-reperfusion brain damage, we hypothesized that antioxidant augmentation prior to ischaemic injury should minimize the effect.

The study aimed to investigate the effect of the anti-oxidative properties of *Carica papaya* leaf aqueous extract on induced brain ischaemia by bilateral common carotid artery occlusion in rat brain, using vitamin E as a standard antioxidant.

Materials and methods

Plant material and extract preparation

Fresh, ripe mature fruits of *Carica Papaya* were purchased from Oje market, Ibadan, Nigeria in September, 2014. The fruits were identified and authenticated at the Forestry Research Institute of Nigeria (FRIN) Ibadan, Nigeria, as *Carica Papaya* Linn *Caricaceae* and given the Forest Herbarium Identification Number (FHI.110033) where a voucher specimen deposited. The fresh fruits of ripe *Carica Papaya* were peeled, seeds were removed and the pulp then cut into pieces. Five hundred grammes of the fruits were weighed and blended into a beaker and 1.5 L of distilled water added to soak the diced *Carica Papaya* overnight. The juice was filtered using a Whatmann filter paper and concentrated using a rotary evaporator. The filtrate was oven-dried at 40 °C to give a total yield of 162.5 g and a percentage yield of 32.50%. The dried *Carica Papaya* aqueous extract termed (CPAE) was diluted with distilled water and administered orally with syringe and clean intra-gastric gavage at a daily dose of 500 mg/kg for 21 days according to the method of Nayak *et al.* [21].

Ethical approval

The University of Ibadan Ethical Committee's approval with reference number UI-ACUREC/App/2014/002 was obtained and all procedures on animal handling conformed to the acceptable guidelines on the ethical use of animals in research.

Preparation and administration of α-tocopherol (vitamin E)

Each soft gelatin capsule containing 100 mg vitamin E acetate (BIOFEM Pharmaceuticals Nig. Ltd) was neatly and completely aspirated out with the 1 mL insulin syringe. The syringe was thereafter attached to a clean intra-gastric gavage through which each rat was administered orally the measured dose of 500 mg/kg/daily for 21 days [16].

Experimental animals

Thirty-five matured female rats of *Wistar* strain weighing from 150 g – 200 g used for the study were obtained from breeders in College of Medicine Animal House, University of Ibadan. The animals were acclimatized for one week and then randomized into experimental and control groups and housed in plastic cages measuring 39 x 29 x 27 cm with soft wood shavings at room temperature with a 12 hour light/dark cycle. They were fed with standard rat diet (Ladokun Feeds, Ibadan, Nigeria) and water *ad libitum*.

Experimental design

The 35 female rats were randomly assigned into one of five treatment groups of seven animals per group and then allowed one week to acclimatize to animal house conditions before administration of intervention parameters all through the remaining period of the research. The duration of treatment was twenty-one days. The rats were grouped as in Table 1 below:

Behavioural study

On the 22nd day of the experiment, behavioural study, wire grip test and negative geotaxis test were conducted on all rats:

Open field test

The open field apparatus was constructed of white plywood and measured 72 x 72 cm with 36 cm walls. Blue lines were drawn on the floor with a marker and were visible through the clear Plexiglas floor. The lines divided the floor into sixteen 18 x 18 cm squares. A central square (18 cm x 18 cm) was drawn in the middle of the open field with a central square distinct from the outer locations [22]. Rats were carried to the test room in their home cages and were handled by the base of their tails at all times. Rats were placed into the center of the open field and allowed to explore the apparatus for 5 minutes. After the 5 minute test, rats were returned in their home cages and the open field was cleaned with 70 % ethyl alcohol and permitted to dry between tests. The behaviours scored [23] included: Line Crossing (the frequency with which the rats crossed one of the grid lines with all four paws), Rearing (vertical posture), Stretch Attend Postures (frequency with which the animal demonstrated forward elongation of the head and shoulders followed by retraction to the original position), and Grooming (duration of time the animal spent licking or scratching itself while stationary).

Negative geotaxis

Negative geotaxis was defined as an automatic, stimulus-bound, reflexive response that results in a directional movement with or against the force of gravity. Each rat was subjected to three trials with at least a 2 min rest period between tests.

Wire grip test

Rats were timed for how long they can support their weight holding onto a metal rail suspended between

Table 1: Grouping and treatment of experimental animals.

Group	Treatment
Control	Rat feed and distilled water daily for 21 days
CPAE	500 mg/kg of CPAE daily for 21 days
BCCAO	Distilled water 1 mL daily + BCCAO only on day 21 of experiment
BCCAO+CPAE	500 mg/kg daily of CPAE for 21 days before BCCAO
BCCAO+VIT E	500 mg/kg daily of Vitamin E for 21 days before BCCAO

BCCAO = Bilateral common carotid artery occlusion, CPAE = Carica papaya aqueous extract

two pillars. Each rat was subjected to five trials with at least a 2 min rest period between tests [24].

Surgical procedure for dissection of the rat neck to ligate the common carotid arteries

Rats were transferred to the laboratory at least one hour before surgery and the weight of each rat measured with a Swiss Microwa balance type 7720 on the 22nd day of the experiments before surgery. All the surgical equipments and surgical pad were disinfected with 70% ethanol before the surgery to avoid infection and sepsis. Surgical procedures were performed between 08 - 14 hours in all rats. The surgical technique used in the present study for induction of cerebral ischaemia by BCCAO was adapted from the method of Iwasaki *et al.* [25] with slight modifications. Briefly, the rats were fasted overnight and at onset of surgery they were anaesthetized by an intraperitoneal injection of 100 mg/kg ketamine [26]. Each animal was fixed on a clean dissecting board with pins and their head stabilized on the dissecting board with the aid of plaster. The ventral surface of the rat neck was then cleaned with cotton wool soaked in methylated spirit. A median incision was performed in the skin of the ventral part of the neck of the animal from below the mandible to the manubro-sternal junction and the subcutaneous adipose tissue was dissected avoiding the salivary and the thyroid glands [27].

Using blunt dissection, the salivary glands were lifted to expose the sternomastoid and sternohyoid muscles. The sternomastoid was retracted laterally with a retractor and the common carotid artery freed from its adventitial sheath and the surrounding structures (Sternohyoid, vagus nerve etc) by blunt dissection with non-toothed forceps. The induction of ischaemic phase was performed by ligating the common carotid arteries bilaterally using 3-0 silk sutures for 30 minutes [25]. Skin was closed back by interrupted sutures and Ampiclox injection (100 mg/kg) given intraperitoneally to each animal to prevent infection. Reperfusion was done by loosening the ligatures and releasing the suture after 30 minutes after which the incision site was cleansed with savlon and spirit, dressings applied and rats returned to their cages with fresh beddings for 24 hours at room temperature [28]. On recovery, rats were allowed free access to feed and water.

Sacrifice and dissection

At the end of 24 hours of reperfusion, the animals were euthanized with ketamine (100 mg/kg) and diazepam (10 mg/kg) after which the whole brain was carefully dissected out and removed from the skull. Each brain was divided in a sagittal plane into two halves, rinsed and transferred to appropriate medium for biochemical and histological estimation. For biochemical analysis, the left side brain samples were homogenized in phosphate buffer (pH 7.4) and the resulting homogenate was centrifuged at 4 ^{0}C and the supernatant obtained was thereafter used for the biochemical estimations at the Biochemistry Laboratory of Obafemi Awolowo University, Ile-Ife, Nigeria. Brain samples for histology were fixed in neutral buffered formalin until the tissues were processed for wax embedment.

Biochemical Estimations

Determination of Lipid Peroxidation (LPO) products present in the brain samples was estimated by the thiobarbituric acid (TBA) method which measures the malondialdehyde (MDA) reactive products according to published method [29] and expressed as units/mg protein. Glutathione (GSH) estimation was done by the method of Beutler and Kelly [30]. Estimation of Superoxide dismutase (SOD) in the homogenates was done by measuring the inhibition of auto-oxidation of epinephrine at pH 10.2 at 30 ^{o}C using the method described by Misra [31]. Catalase (CAT) activity was determined according to the method of Sinha [32].

Tissue processing, histological studies and histomorphometry

The brain tissue for histological studies was passed through the processes of fixation, dehydration, clearing, infiltration and embedding. Serial sections of 5 microns thick were made using rotary microtome and the slides stained with Haematoxylin and Eosin. They were examined and then evaluated under the light microscope (Olympus 41CX Japan) for histological changes in the cerebral cortex and CA1 subfield of the hippocampus. Photomicrographs were captured using digital camera Sony 14.1 megapixels (Japan). Histomorphometric analyses were done using computerized image analyzer (Apache Open Office Tm4 4.0.0. software version). Using measured squares of the OpenOffice.org.Draw, the density of the cell profile of all neurons and those of dark (pyknotic) neurons of the frontal cerebral cortex and cornu ammonis1 subfield of the hippocampus in each group were obtained and the means calculated. Employing the method of Taveira *et al.* [33], the pyknotic index (PI) was calculated using the equation: PI = pyknotic neurons / total neurons x 100.

Statistical analysis

All data were expressed as means ± standard deviation. One-way analysis of variance (ANOVA) was used to test for differences among all the groups using GraphPad Prism 5.04, 2010 version software, San Diego, CA, USA. A p-value < 0.05 was considered statistically significant.

Results

General observations

Animals tolerated the treatments with *Carica papaya* extract well. During the 24 hours of reperfusion following bilateral common carotid artery occlusion (BCCAO), mortality in the treated rats was: BCCAO group four out of seven (57.2%), BCCAO+ CPAE group three out of seven (42.9%) and BCCAO+VIT E group two out of seven (28.6%). Rats in the BCCAO only and BCCAO+ CPAE groups were sluggish and inactive after recovery from surgery. Some animals which survived surgery adopted a "hunchback" posture, were hyper excitable and reacted to handling with forceful jerks. The animals of BCCAO+VIT E group were more active. There was no significant difference in body weight observed between the control and other groups.

Open field test

Results displayed in Figure 1, showed that BCCAO caused a significant reduction ($p<0.05$) of the frequency of lines crossed and rearings, while increasing that of grooming when compared with control group. In both BCCAO+CPAE and BCCAO+VIT E groups, there was increase in these parameters. However, BCCAO+VIT E significantly ($p<0.05$) elevated these parameters when compared with the BCCAO group.

Forelimb grip strength test and Negative geotaxis,

Figure 2 showed that BCCAO treatment significantly ($p<0.05$) reduced the forelimb grip strength test while increasing the duration of negative geotaxis relative to control, whereas treatment with both BCCAO+ CPAE and BCCAO+VIT E reversed these two parameters when compared with the BCCAO group.

Biochemical analysis results

Table 2 shows that BCCAO caused significant ($p<0.05$) increase in lipid peroxidation when compared with the Control group. The value was significantly ($p<0.05$) reduced in groups BCCAO+ CPAE and BCCAO+VIT E relative to the BCCAO group. The alterations in the GSH, SOD and catalase were not significant

Histological and histomorphometric evaluation of the prefrontal cerebellar cortex and cornu ammonis1 (CA1) of hippocampal formation.

As shown in Figure 3, the histology of the prefrontal cerebral cortex in the Control, CPAE, BCCAO, BCCAO+ CPAE and BCCAO+VIT E shows cortical neurons whose nuclei exhibit open chromatin and distinct nucleoli. However, some cortical neurons in the BCCAO group were observed to have distinctly dark nuclei scattered among normal neurons. When compared with the control, this was statistically significant ($p<0.05$) although this was

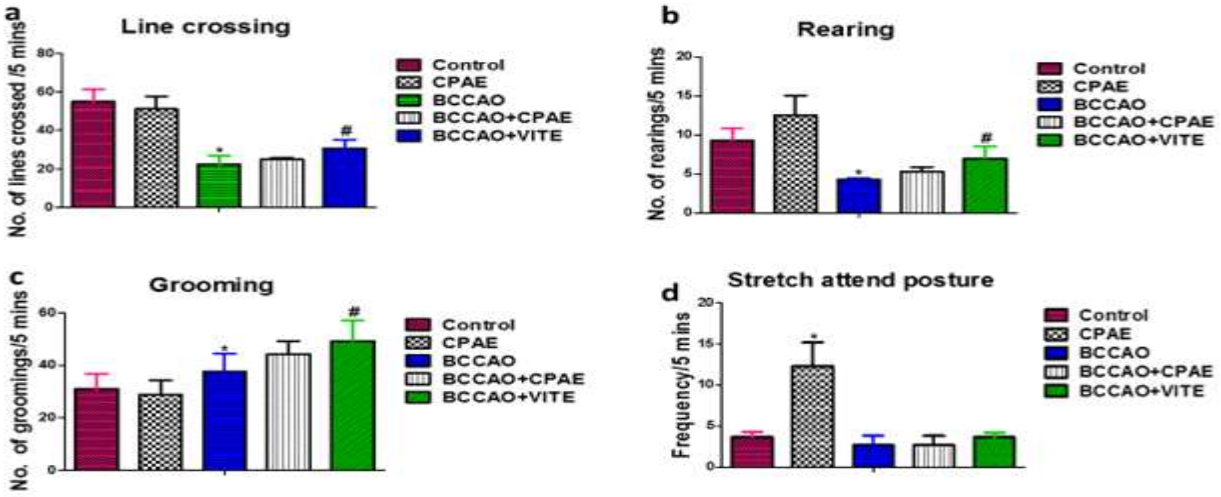

Fig. 1: Histogram showing effects of BCCAO and *Carica papaya* extract on bilateral common carotid occlusion on behavioural parameters. *Values are presented as mean ± SD. CPAE – Carica papaya extract, BCCAO - bilateral common carotid artery occlusion, VIT E- vitamin E. *P<0.05 versus Control; #P<0.05 versus BCCAO.*

Table 2: Effect of BCCAO and *Carica papaya* aqueous extract on lipid peroxidation, glutathione, superoxide dismutase and catalase.

Groups	LPO(µmoles/ protein)	GSH (µmoles/g tissue)	SOD (Unit/mg protein)	CAT(µmole mg H2O2/min/mg protein)
Control	1.077±0.17	0.206±0.08	0.246±0.10	0.127±0.01
CAPE	0.954±0.20	0.209±0.02	0.169±0.10	0.130±0.01
BCCAO	2.105±0.26*	0.198±0.00	0.308±0.08	0.132±0.01
BCCAO+ CPAE	1.324±0.14**	0.201±0.03	0.218±0.08	0.123±0.02
BCCAO+ VIT E	1.052±0.20**	0.205±0.02	0.369±0.06	0.143±0.01

*Values were presented as mean ± SD. CPAE – Carica papaya aqueous extract, BCCAO - bilateral common carotid artery occlusion, VIT E - vitamin E, GSH - Glutathione, SOD - Superoxide dismutase, LPO - lipid peroxidation, CAT - catalase. *P<0.05 versus Control; **P<0.05 versus BCCAO*

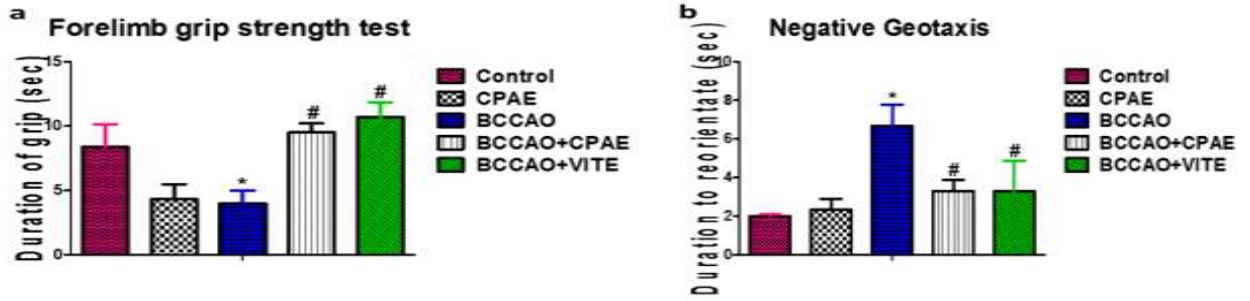

Fig. 2: Histogram showing effects of BCCAO and *Carica papaya* aqueous extract on bilateral common carotid occlusion on forelimb grip strength test and negative geotaxis. *Values are presented as mean ± SD. CPAE – Carica papaya aqueous extract, BCCAO - bilateral common carotid artery occlusion, VIT E- vitamin E. *P<0.05 versus Control; #P<0.05 versus BCCAO*

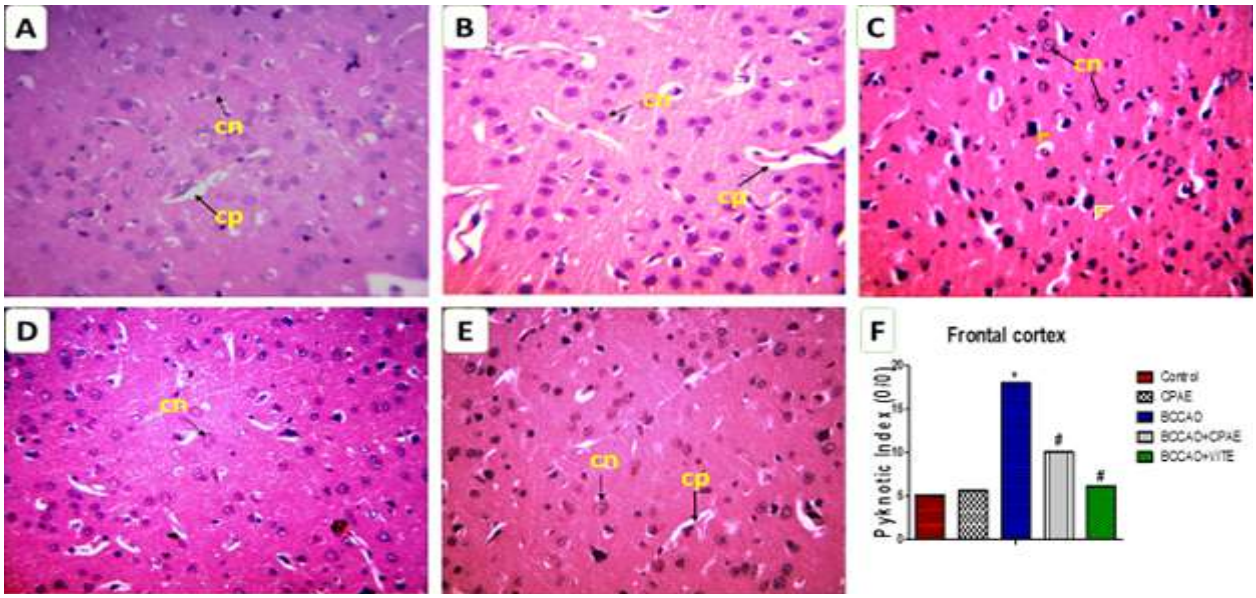

Fig. 3: Representative stained sections of cerebral cortex of rats. (A) Control (B) CPAE (C) BCCAO (D) BCCAO+ CPAE (E) BCCAO+VIT E. *Values were presented as mean ± SD. CPAE – Carica papaya aqueous extract, BCCAO - bilateral common carotid artery occlusion, VIT E- vitamin E. cn, cortical neuron; cp, capillary; yellow arrowhead, dark neuron. H&E. x400. *P<0.05 versus Control; #P<0.05 versus BCCAO.*

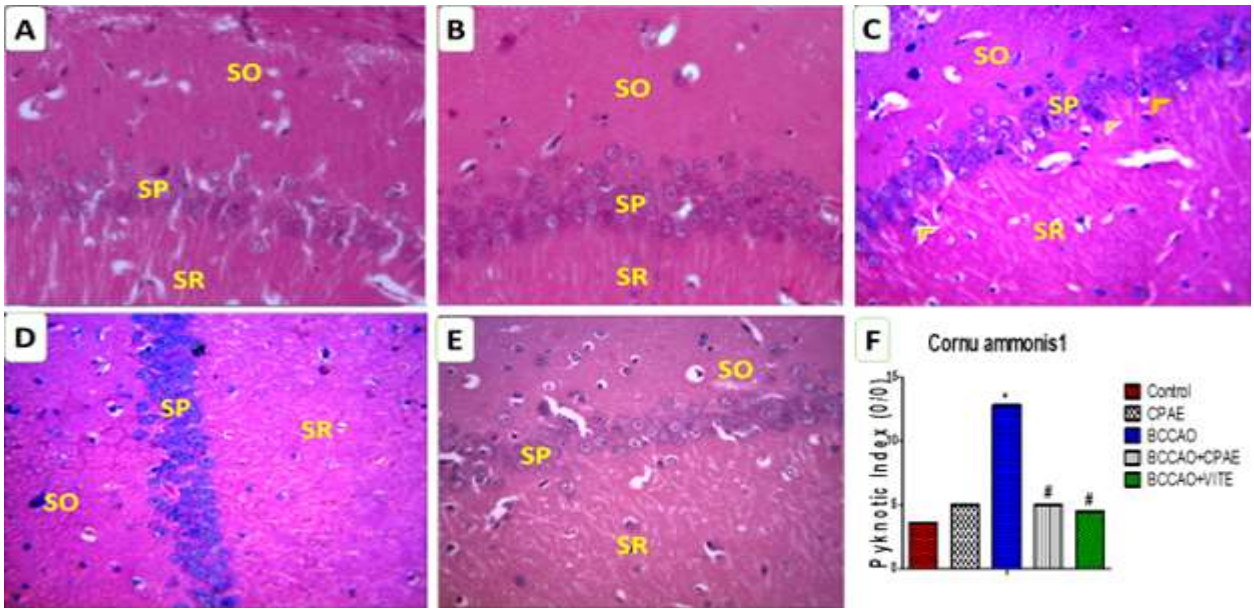

Fig. 4: Representative stained sections of the hippocampus of rats. (A) Control (B) CPAE (C) BCCAO (D) BCCAO+ CPAE (E) BCCAO+VIT E. *Values were presented as mean ± SD. CPAE – Carica papaya aqueous extract, BCCAO - bilateral common carotid artery occlusion, VIT E- vitamin E. SO, stratum oriens, SP, stratum pyramidalis, SR, stratum radiatum, yellow arrowhead, dark neuron. H&E. x400. *P<0.05 versus Control; #P<0.05 versus BCCAO.*

reduced in the pretreated BCCAO+ CPAE and BCCAO+VIT E groups (Fig. 3F).

The photomicrographs of the cornu ammonis1 (CA1) of hippocampus (Figure 4) shows normal layers of the sub-field with open faced pyramidal neurons of the stratum pyramidalis layer in the Control, CPAE, BCCAO, BCCAO+ CPAE and BCCAO+VIT E groups. The neurons of the BCCAO group are observed to exhibit some dark neurons which was quantitatively statistically significant ($p<0.05$) relative to the control. However, this was reduced in the pretreated BCCAO+ CPAE and BCCAO+VIT E groups as shown in Figure 4F.

Discussion

The behavioural and histological effects of *Carica papaya* Linn. aqueous extract (CPAE) and vitamin E (VIT E) on ischaemic-reperfusion insult by bilateral common carotid artery occlusion in rat brain was studied and the results demonstrated the ability of CPAE and VIT E to modulate some of the alterations induced by BCCAO treatment. Experimental models of stroke have been developed in animals in an attempt to mimic the events of human cerebral ischaemia that transient global cerebral ischaemia results in neurological abnormality. Therefore, global cerebral ischaemia of 30 minutes duration followed by reperfusion of 24 hours was employed in the present study [25, 34].

The significant reduction observed in the open field tests namely crossing and rearing, suggested that locomotion and exploratory ability of the rat were affected. Grooming and rearing have been considered as indicators of vertical locomotive activity, an index of alertness [35] and the excitability level of the central nervous system [36] respectively. The reduction in these two parameters of locomotion suggests that the effects of BCCAO reduced the alertness of the rats after recovery from surgery. The ability of CPAE and VIT E to reverse these effects suggests their ameliorative capability. Although BCCAO treatment reduced the stretch attend posture frequency which is an index risk assessment [37], the absence of a significant alteration in rats pretreated with CPAE and VIT E indicated their inability to modulate this parameter. The rats in the BCCAO group demonstrated fear or anxiety as monitored by the significant increase in grooming as reported by Jackson and Turkington [38] and this persisted even in the groups that received pretreatment with CPAE and VIT E. The forelimb grip strength test is an indicator of muscular strength and coordination of skeletal muscles which treatment with BCCAO significantly reduced indicating muscle weakness [39]. The maintenance of posture balance indirectly testing cerebellar coordination as well as vestibular integrity were monitored by the results of negative geotaxis [40]. Rats in the BCCAO group significantly spent longer time to re-orientate

themselves against gravity while coming down the slope, whereas this trend was reversed in the pretreated groups. The modulatory ability of both CPAE and VIT E used as pretreatment was thus demonstrated for both parameters.

The mortality recorded in all groups of rats that had BCCAO may be explained by the findings of Bruce-Keller *et al*. [41] that maximal tissue damage is observed during reperfusion as a result of the production of oxygen free radicals. While Panigrahi et al., [1] reported varying mortality ranging from 26% to 79%, Zhen and Dore [42] reported 11, 25, 38, 80, and 100% depending on the duration of occlusion. The BCCAO lasted for 30 minutes in this experiment followed by 24 hours of reperfusion and this was associated with increased generation of ROS and free radicals [25].

Overwhelming these rats with free radicals as observed by the significant elevation of malondialdehayde, an indicator of lipid peroxidation might be a source of injury. Elevation of lipid peroxidation and reduction of GSH as reported in this study established the involvement of oxidative stress in the animals of BCCAO group [43]. The increases in the SOD and CAT enzymes in the BCCAO group indicated the response of these enzymes to coping with released superoxide ions which SOD converted into hydrogen peroxide and molecular oxygen, while CAT decomposed the hydrogen peroxide into water and diatomic oxygen. SOD is an important endogenous antioxidant that prevents production of free radicals [44].

The ability to reduce lipid peroxidation and thus the oxidative stress as shown by CPAE and VIT E in the pretreated groups demonstrated their antioxidant activity. The lowest mortality recorded in the CPAE+VIT E group is in agreement with the study of Abd-El-Fattah e*t a*l. [45] whereby vitamin E was shown to have protected against cerebral ischemia, due to its anti-oxidative effects. The high mortality rate recorded in the CPAE pretreated group despite its rich source of three powerful antioxidants: vitamin C, vitamin A and vitamin E might be due to reperfusion injury which these vitamins did not effectively neutralize. Known to be particularly susceptible to oxidative stress is the central nervous system due majorly to the fact that the brain is rich in polyunsaturated fatty acids, relatively low in antioxidants, accumulates redox metal ions, consumes large amount of oxygen and is composed largely of non-mitotic highly differentiated cells that are difficult to repair when damaged [20].

The CPAE pretreated animals showed significantly less lipid peroxides due to ischaemic-reperfusion injury as compared to the untreated control animals group, while vitamin E-treated rats showed lesser degree of lipid peroxidation relative to control group. This suggests that the possibility that the mechanism of protection of brain by CPAE might be due to the anti-oxidative effects of its phenolic compounds especially the flavonoids, vitamins E, A and C.

The presence of scattered pyknotic cortical neurons among the normal neurons in the prefrontal cerebral cortex and selective pyramidal neuronal degeneration in the CA1 field of the hippocampus of rats in the BCCAO group might be the effect of the ischaemia following the reperfusion of the brain after the 30 minutes ischaemia occasioned by the bilateral occlusion of both common carotid arteries in these rats. This is consistent with the previous report that CA1 hippocampal neurons are highly susceptible and vulnerable to ischemia and reperfusion-induced injury [46, 5] and that BCCAO in lower animals lasting for three or more minutes results in selective neurodegeneration of the pyramidal neurons in the hippocampal CA1 subfield [47]. According to the ischaemic cascade of Danton and Dietrich [48], reperfusion, by enhancing production of free radicals, inflammation, and blood-brain barrier breakdown, contributes to cell damage and death.

The effects of this transient ischaemia/ reperfusion was evident in the lipid peroxidation observed and the mortality recorded in all BCCAO treated rats. The effect of cortical neuron death might affect the cerebral functions of cognition and control of voluntary movement. Similarly, death of CA1 pyramidal neurons might disrupt the neural sequences required for effective memory coding and recording of different forms of memory i.e episodic, semantic and spatial secondary to interruption of the trisynaptic pathway of the perforant path which the CA1 neurons of the hippocampus participates in [49].

The damage might alter the Schaffer's collaterals which CA1 neurons receive from the CA3 for onward projection to the subiculum and entorhinal cortex, a neural process that might be disrupted by the death of CA1 neurons [50]. Pretreatment with CPAE and vitamin E for 21 days prior to BCCAO improved behavioural response, reduced lipid peroxidation, increased endogenous enzyme levels of superoxide dismutase, glutathione and catalase. They also attenuated neuronal cell death both in the cerebral cortex and in the CA1 subfield of the hippocampus with a possible result of reduction of the effects of ischaemia on brain. The neuroprotective effect demonstrated in this study by

CPAE and vitamin E might be possibly related to their antioxidant activity.

Conclusion

The overall results of these studies indicate that BCCAO caused alterations in the behavioural, antioxidant and histological parameters of rat brain which pretreatment with CPAE and VIT E ameliorated possibly by their antioxidant activities. The outcome might contribute to the continuous search for neuroprotective strategies in stroke given the tremendous costs it poses on the individual and the society.

Acknowledgements

Author A. M. appreciates Dr. E.M. Obuotor and Mr O. Idowu of the Department of Biochemistry, Obafemi Awolowo University, Ile Ife, Nigeria for laboratory facilities provided for the antioxidant component of this work.

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Afr. J. Med. Med. Sci. (2019) **48,** 151-160

Antipsychotic effects of ethanol extract of *Blighia sapida* (Sapindaecea) stem bark on pharmacological models of psychosis in Swiss mice

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Abstract
*Background***:** *Blighia sapida* is a common plant consumed as vegetable in southern part of Nigeria. The ackee plant has a long history of use as a medicinal plant by several ethnic groups to treat a wide variety of Central Nervous System (CNS) disorders. The present study was designed to evaluate the antipsychotic effect of ethanol extract of *Blighia sapida* (*Sapindaecea*) stem bark in ameliorating psychotic features in mice.
Materials and methods: Graded doses of ethanol extract of *Blighia sapida* (EEBS) (10, 20, 40, 80 mg/kg, i.p) were administered 30 minutes prior to apormorphine (1 mg/kg, i.p) or ketamine (10 mg/kg, i.p). The animals were subsequently subjected to forced swim test to determine the effect of EEBS on ketamine enhanced immobility. Catalepsy and ptosis in the experimental mouse model were also assessed for probable side effects associated with antipsychotics. Doses of EEBS being tested and haloperidol (1 mg/kg) were administered intraperitoneally to animals (i.p) 30 minutes prior to the catalepsy and ptosis observation. Catalepsy was measured using the bar test, ptosis for each animal was evaluated in a transparent observation chamber at 30, 60, and 90 minutes post-treatment with EEBS or haloperidol.
Results: Ethanol extract of *Blighia sapida* stem bark (20, 40, 80 mg/kg, i.p) significantly decreased stereotyped behaviours induced by apomorphine (1mg/kg, i.p) and ketamine (10mg/kg, i.p) in a dose-dependent manner, as 10 mg/kg EEBS failed to significantly inhibit ketamine induced stereotyped behaviours. EEBS showed differential effects against the ketamine induced hyperactivity compared to negative control. EEBS significantly ($p < 0.05$) reduced the ketamine enhanced immobility in the forced swim test and did not show extra-pyramidal side effects in the bar test of catalepsy. EEBS at higher doses induced ptosis that is commonly observed with most antipsychotics.
Conclusion: Ethanol extract of *Blighia sapida* stem bark reduced apomorphine and ketamne induced stereotypy and hyperactivity in mice model suggesting its potential antipsychotic activity.

Keywords: *Blighia sapida, Psychosis, Apormorphine, Ketamine, and Stereotypy*

Abstrait
Contexte : *Blighia sapida* est une plante commune consommée comme légume dans la partie sud du Nigéria. La plante 'ackee' est utilisée depuis longtemps comme plante médicinale par plusieurs groupes ethniques pour traiter une grande variété de troubles du système nerveux central (SNC). La présente étude a été conçue pour évaluer l'effet antipsychotique de l'extrait à l'éthanol de l'écorce de la tige de *Blighia sapida (Sapindaecea)* dans l'amélioration des caractéristiques psychotiques chez les souris.
Matériaux et méthodes : Doses graduées d'extrait à l'éthanol de *Blighia sapida* (EEBS) (10, 20, 40, 80 mg / kg, ip) ont été administrés 30 minutes avant l'apomorphine (1 mg / kg, ip) ou la kétamine (10 mg / kg, ip). Les animaux ont ensuite été soumis à un test de nage forcée pour déterminer l'effet de l'EEBS sur l'immobilité accrue par la kétamine. La catalepsie et le ptosis dans le modèle expérimental chez la souris ont également été évalués pour déterminer les effets secondaires probables associés aux antipsychotiques. Des doses d'EEBS à l'essai et d'halopéridol (1 mg / kg) ont été administrées par voie intrapéritonéale aux animaux (ip) 30 minutes avant l'observation de la catalepsie et du ptosis. La catalepsie a été mesurée à l'aide du test de barre, le ptosis de chaque animal a été évalué dans une chambre d'observation transparente 30, 60 et 90 minutes après le traitement avec l'EEBS ou l'halopéridol.
Résultats : L'extrait d'éthanol de l'écorce de la tige de *Blighia sapida* (20, 40, 80 mg / kg, ip) diminuait significativement les comportements stéréotypés induits par l'apomorphine (1 mg / kg, ip) et la kétamine (10 mg / kg, ip) en fonction de la dose, comme 10 mg/kg d'EEBS n'a pas réussi à inhiber de manière significative les comportements stéréotypés induits par la kétamine . EEBS a montré des effets différentiels contre l'hyperactivité induite par la kétamine par rapport au control négatif. Les EEBS ont significativement ($p < 0,05$) réduit

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l'immobilité accrue par la kétamine dans le test de nage forcée et n'ont pas montré d'effets secondaires extra-pyramidaux dans le test de barre de catalepsie. EEBS à des doses plus élevées a induit un ptosis qui est couramment observé avec la plupart des antipsychotiques.
Conclusion : L'extrait d'éthanol de l'écorce de la tige de *Blighia sapida* a réduit la stéréotypie et l'hyperactivité induite par l'apomorphine et la kétamine avec des modèles de souris suggérant son activité antipsychotique potentiel.

Mots clés : *Blighia sapida*, *psychose, apomorphine*, *kétamine et stéréotypie*

Introduction

Psychosis is among the most severe and incapacitating medical diseases [1] and has been ranked the most disabling condition after quadriplegia and dementia in a WHO multi-country study [2]. Psychosis covers a range of psychiatric disorders and may present as: hypoactivity, hyperactivity, agitation, aggressiveness, hostility, and combativeness [3]. Affected individuals may exhibit: social withdrawal paying less-than-normal attention to the environment and other people; deterioration in self-care and interpersonal skills; hallucinations and paranoid delusions [4, 5]. Psychosis may be acute or chronic. Acute psychosis or acute confusional state or delirium usually develop suddenly within hours or days and may be secondary to organic diseases such as brain injury related to cerebrovascular disease or head trauma, metabolic disorders and infections. In addition, drug intoxication with adrenergic, antidepressants, illicit drugs such as amphetamines and cocaine, and drug withdrawal after chronic use (e.g., alcohol; benzodiazepine anti-anxiety or sedative-hypnotic agents) may also cause acute psychosis [6]. An acute psychotic episode may be superimposed on chronic dementias and psychoses, such as schizophrenia. Psychosis has been linked with abnormality in the brain structure and brain chemistry specifically imbalances and abnormal integration among several neural pathways and neurotransmission [7]. Three of the most prominent theories propounded to explain the basis of psychosis are linked to neurotransmission, namely: the dopamine hypothesis, serotonin (or serotonin–dopamine) hypothesis, and glutamate hypothesis [8]. The dopamine theory has been more extensively studied [8] and psychotic disorders have long been attributed to increased dopamine activity in the brain. Stimulation of dopaminergic pathway can initiate psychotic symptoms or exacerbate an existing psychotic disorder. The behavioural effects of dopamine (D_2) receptor agonists (apomorphine) in rodents, either locomotor hyperactivity or stereotypy, have a high degree of pharmacologic isomorphism as models for testing the efficacy of dopamine- antagonist treatments for psychosis [9, 10]. Mesolimbic dopaminergic neuron hyperactivity is linked to the positive symptoms [11]. Whereas, a decrease in the dopamine levels in fronto-cortical part of mesocortical dopamine neurons is linked to the negative symptoms [12].

Dysfunctional glutamate neurotransmission has been implicated in psychotic disorders. Antagonists of the N-Methyl-D-Aspartate (NMDA) subtype of glutamate receptors, phencyclidine (PCP) and ketamine produce a behavioural syndrome in healthy humans that closely resembles psychotic symptoms [13].

Ketamine, a PCP analog still used in human anesthesia, has been reported to cause reactions similar to but not as severe as those caused by PCP, including brief, reversible "positive" and "negative" schizophrenia-like symptoms [14, 15]. Both PCP and ketamine can exacerbate psychosis in schizophrenia [16, 17]. PCP-induced psychosis, unlike amphetamine or apormophine-induced psychosis, incorporates both positive and negative symptoms of schizophrenia [14, 15]. In addition, the fact that high doses of NMDA antagonists produce neurodegenerative changes in corticolimbic regions [18] has been cited as evidence that alterations in the glutamatergic system, particularly NMDA receptor function, might contribute to the negative symptoms of schizophrenia.

Antipsychotics may be broadly categorized as "typical," (also known as conventional or first-generation agents Phenothiazines and older nonphenothiazines) such as haloperidol [19] and "atypical" or second-generation agents, which can also be called newer nonphenothiazines (clozapine and risperidone). Newer (atypical) antipsychotic drugs offer not only a better therapeutic effect but, because of their stratified effect on the finer dimensions of psychotic symptoms, they also provide deeper insight into the pathophysiology of psychosis itself [20, 21]. Current antipsychotic drugs may be limited, sometimes by questionable effectiveness or poor tolerability [22, 23].

Blighia sapida is a "herbaceous tree" commonly found in the forests of most West African countries where it is mainly used for medicinal purposes. In Nigeria, various parts of *B. sapida* plant are said to be used for the treatment of psychosis, cancer, gonorrhea, stomach ache, hernia, backache, diarrhoea and constipation [24, 25]. *Blighia sapida*

leaves, stem bark and fruits are rich in phytochemicals including; saponins, anthraquinones, cardiac glycosides, flavonoids, alkaloids, tannins, phlobatannins and terpenes [26]. *Blighia sapida* has antimicrobial, antioxidant, anti-inflammatory activities and also a useful herb for the treatment of epilepsy [27, 28]. Few reports have suggested that *B. sapida* stem bark may be useful in treating psychotic disorders given its "dopaminergic or glutaminergic-inhibitory activity [27, 29].This study evaluated the effect of EEBS stem bark on psychosis in mice.

Materials and methods

Plant materials

The bark of the stem of *Blighia sapida (Sapindaecae)* was collected from Iloora farm settlement in Afijio, Oyo state, Nigeria and identified at the Forestry Research Institute of Nigeria (FRIN), Ibadan with voucher number 110254.

Preparations of Blighia sapida stem bark extract

The ethanol extract of *Blighia sapida* (EEBS) was prepared using cold extraction. The stem bark was air – dried for 4 weeks, and was pulverized with an electric crusher. Two hundred grams (200g) of the pulverized stem bark was soaked in 70% ethanol and left for 48 hours, after which, it was filtered using absorbent cotton and What man paper. The filtrate was concentrated using Rotary evaporator at 40^0C and the dark brown paste obtained was dried to a constant weight and kept in a desiccator.

Animal

Male and female Swiss mice (*Mus musculus)* weighing between 18-24g were used for the experiment. The animals were obtained from the central animal house, University of Ibadan. The male and female mice were housed separately in plastic cages and had unrestricted access to standard pellet feed and water. They were acclimatized for 1 week before use. All procedures in this study were performed in compliance with the World Medical Association Declaration of Helsinki regarding ethical conduct of research involving the care and use of laboratory Animal (American Physiological Society, 2002).

Drugs and chemicals

Apomorphine, Haloperidol (Sigma-Aldrich, St. Louis, MO, USA), Ketamine hydrochloride injection (SwissPharma) Risperidone (Ranbaxy). All drug solutions were prepared fresh in distilled water and administered intraperitoneally (i.p).

Experimental design

Acute toxicity studies

Male and female Swiss mice (18-24 g) were used. The study was carried out as described by Lorke [30] to determine the LD_{50}, which is the index of acute toxicity. The animals were divided into three groups of three animals in each group. Doses of 10, 100, and 1000 mg/kg of the ethanolic extract of *Blighia sapida* (*sapindaecae*) were administered intraperitoneally (i.p.). The treated animals were monitored for 24 hours for mortality and general behaviour. Number of death was recorded after 24 hours. From the results that were obtained from the initial procedure, three different doses ranging (2000, 3000 and 4000 mg/kg) were chosen, and administered intraperitoneally to three groups of one mouse per group respectively. The treated animals were monitored for 24 hours. Number of deaths after 24 hours was recorded. The LD_{50} was calculated as the geometric mean of the lowest dose showing death and the highest dose that caused no death.

Apomorphine-induced stereotypy

The antipsychotic effect of the ethanol extract of *Blighia sapida* was assessed using the Apomorphine-induced stereotyped behavioural paradigm in male mice [31]. The animals were divided into 7 treatment groups (n = 5). Groups 1 and 2 received vehicle (distilled water 10 mL/kg i.p), groups 3, 4, 5 and 6 were pretreated respectively with doses of EEBS (10, 20, 40, 80 mg/kg, i.p.), while group 7 was pretreated with haloperidol (HLP) (1 mg/kg, i.p.). Thirty minutes later, each animal received apomorphine (APO) 1 mg/kg intraperitoneally, except group 1.The animals were subsequently placed in a transparent observation chamber measuring: 20 cm × 20 cm × 23 cm. Thereafter, stereotype behaviours were observed for a period of 2 minutes at 10, 15, 30, 45, and 60 minutes after APO injection. Stereotype behaviours were scored as: 0 = absence of stereotype behaviour; 1 = presence of stereotype movements of the head; 2 = intermittent sniffing; 3 = chewing; 4 = intense licking [31].

Ketamine-induced stereotypy and hyperactivity

The male mice were divided into 7 treatment groups (n = 5). The animals in groups 1 and 2 received vehicle (distilled water 10 mL/kg i.p), while those in, groups 3,4,5 and 6 were pretreated with 10, 20, 40 and 80 mg/kg, i.p of EEBS respectively, and the group 7 mice were pretreated with risperidone (RISP) (0.5 mg/kg, i.p). Thirty minutes later, each animal was treated with sub anaesthetic dose of ketamine (KET) (10 mg/kg i.p) [31], except group 1.

Stereotype behaviours were assessed by Bourin *et al*. [31]. The hyperactivity was evaluated as described by placing each mouse individually at the center of an open field chamber measuring: 35 cm x 30 cm x 23 cm. The duration of ambulation and number of lines crossed were recorded for 5 min.

Ketamine-enhanced immobility in forced swim test
The male mice were randomly divided into 7 treatment groups (n = 5). Group 1 (vehicle) animals were pretreated with distilled water (10 mL/kg, i.p), groups 2, 3 ,4, 5, 6 and 7 were pretreated with subanaesthetic dose of ketamine (20 mg/kg, i.p.) daily for 5 days. Twenty four hours after the last treatment with distilled water and ketamine respectively, group 2 received nothing, group 3, 4, 5, and 6 received doses of EEBS (10, 20, 40 and 80 mg/kg i.p) respectively, while group 7 received RISP at a dose of 0.5 mg/kg intraperitoneally. Thirty minutes later, each animal was placed in a transparent glass cylinder (Height 46 cm, Diameter 20 cm) containing water at 25°C to a depth of 30 cm; and forced to swim for 6 minutes and the immobility time was recorded for a period of 4 minutes [33] after discarding activity in the first 2 minutes, during which the animal tries to escape [34]. After each session, the mice were removed immediately from the cylinder, dried with a towel and kept in an open space until completely dried before returning the mice to their home cages

Cataleptic behaviour
The male mice were divided into six treatment groups (n = 5). Group 1 was treated with distilled water (10 mL/kg, i.p.), groups 2-5 were treated with increasing doses of EEBS (10, 20, 40 and 80 mg/kg, i.p) respectively, while group 6 was treated with haloperidol (HLP) (1 mg/kg, i.p.), thirty minutes before testing for catalepsy. The test was done by gently placing the fore limbs of each animal on a horizontal plane wood surface (Height 6 cm; Width 4 cm; Length 16 cm) and the duration of akinesia (period of time the animal remained in one position, before initiating any active movement) in seconds was recorded [35].

Ptosis induction
Ptosis as described by Bourin *et al*. [36], was used as a model to screen for the antipsychotic properties of a drug. The male mice were divided into six groups (n = 5). Group 1 was treated with distilled water (10 mL/kg, i.p.), while group 2 - 5 were treated with different doses of the EEBS (10, 20, 40 and 80 mg/kg, i.p) respectively, while group 6 were treated with haloperidol (1mg/kg i.p). The degree of ptosis was evaluated at 30, 60, and 90 minutes post dose with EEBS and haloperidol. Each animal was placed in a transparent observation chamber measuring: 20 cm × 20 cm × 23 cm on a shelf 20cm above the bench top, immediately after EEBS and haloperidol were administered. Ptosis for each animal was recorded by observing the degree of dropping of eyelids through the transparent observation chamber. The degree of ptosis was rated according to the following rating scale: 0=eyes open; 1=eyes one-quarter closed; 2=eyes half closed; 3=eyes three-quarter closed; and 4=completely closed. The results obtained were compared with control group treated with distilled water.

Statistical analysis
Data obtained from this study were expressed as Mean ± S.E.M. The data were analyzed using one–way analysis of variance (ANOVA) and post hoc tests (Student's Newman-Keuls) for the multiple comparisons where appropriate using GraphPad InStat® Biostatistics software. The level of significant for all tests was set at $p< 0.05$.

Results
Acute toxicity
No lethality/mortality was recorded when doses as high as 1000 mg/Kg was given to the animals. The LD_{50} of *Blighia sapida* stem bark ethanol extract was estimated to be 1440 mg/kg intraperitoneally.

Stereotyped behaviours
Effect of EEBS on Apomorphine-induced stereotyped behaviour.
Animals pretreated with EEBS (10, 20, 40 and 80 mg/kg, i.p) showed resistance to apomorphine-induced stereotyped behaviours compared to the negative control group. However, animals pretreated with HLP (1 mg/kg, i.p), showed no stereotype behaviour (stereotype score 0) throughout the observation period suggesting significant ($P < 0.05$) inhibitory effect against the behavioural deficits (stereotype behaviours) induced by APO (1 mg/kg, i.p.), (Fig .1).

Effect of EEBS on Ketamine-induced stereotyped behaviour.
Pretreatment with EEBS (20, 40 and 80 mg/kg, i.p) significantly ($P < 0.05$) inhibited ketamine-induced behavioural deficits compared to the control group. Pretreatment with RISP (0.5 mg/kg, i.p), significantly ($P < 0.05$) demonstrated greater inhibitory effect against the behavioural deficits induced by ketamine (10 mg/kg, i.p.) (Fig .2).

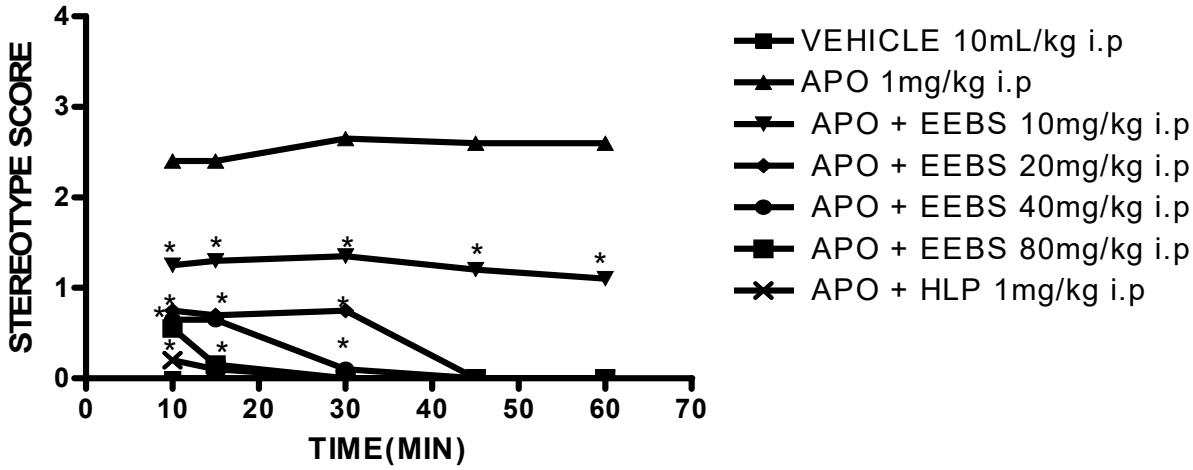

Fig.1: *Effect of EEBS on Apomorphine-induced stereotyped behaviour.*
*Point represent mean value (n=5). One way ANOVA revealed that there is significant [F (6, 28) =81.15, P < 0.001] differences between various treatment groups *Denotes P < 0.05 compared to APO 1 mg/kg i.p.* ***APO*** *= Apomorphine,* ***HLP*** *= Haloperidol,* ***EEBS*** *= Ethanol extract of B. sapida*

Effect of EEBS on acute ketamine-induced hyperactivity

EEBS pretreatment (10, 20, 40 and 80 mg/kg, i.p) significantly ($P< 0.05$) inhibited the hyperactivity induced by ketamine (10 mg/kg i.p). RISP (0.5 mg/kg, i.p), significantly ($P< 0.05$) inhibited the hyperactivity (Table.1.).

*Effect of EEBS on ketamine-enhanced immobility in forced swim test in mice***.**

Ketamine (20 mg/kg, i.p.) significantly enhanced the immobility ($P< 0.05$) compared to the group treated with vehicle (10 mL/kg, i.p) in the forced swim test in mice. EEBS (10, 20, 40 and 80 mg/kg, i.p)

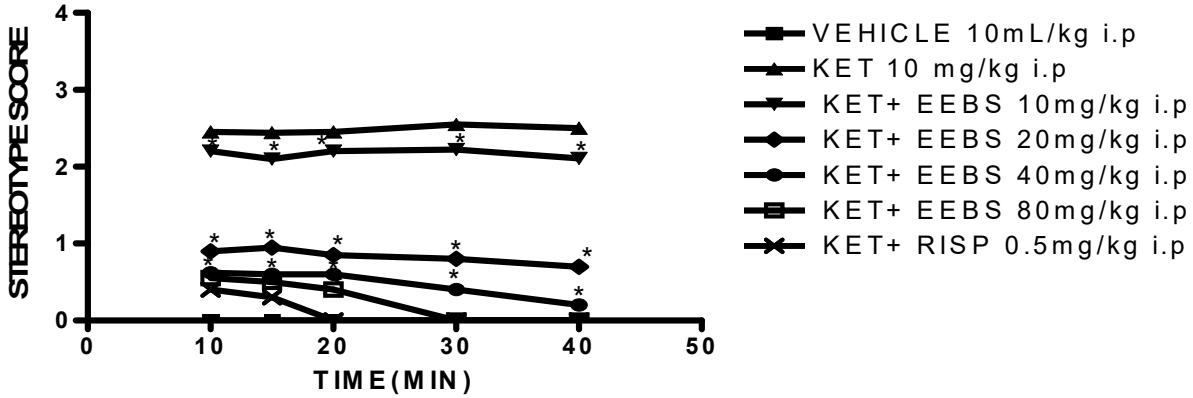

Fig. 2: *Effect of EEBS on Ketamine-induced stereotyped behaviour***.**
*Points represent the mean value (n=5). One way ANOVA reveal that there is significant [F (6, 28) =221.3, P < 0.001] differences between various treatment groups. *Denotes P < 0.05 compared to KET 10 mg/kg, i.p..* ***KET*** *= Ketamine,* ***RISP*** *= Risperidone,* ***EEBS*** *= Ethanol extract of B.sapida*

Table 1: Effect of EEBS on acute ketamine-induced hyperactivity.

Treatment and Dose	Number of line crossings	Duration of ambulation (s)
VEH (10 mL/kg)	75.10±3.12	170±2.1 ±2.10
KET (10 mg/kg)	130.4 ± 7.50	22.00 ± 3.11
EEBS (10 mg/kg) + KET	100.0 ± 3.71*	49.40 ± 2.24*
EEBS (20 mg/kg) + KET	63.40 ± 2.04*	100.4 ± 10.78*
EEBS (40 mg/kg) + KET	49.80 ± 5.30*	151.4 ± 7.30*
EEBS (80 mg/kg) + KET	36.60 ± 3.35*	184.8± 7.95*
RISP (0.5 mg/kg) + KET	36.40 ± 4.34*	175.8 ± 16.13*

Value represents mean ± S.E.M (n=5). One way ANOVA revealed that there is significant
[F (5, 24) = 57.41, P< 0.0001] and [F (5, 24) = 54.49, P< 0.0001] differences between various treatment groups for number of line crossing(s) and ambulation(s) time, respectively.
*Denotes P< 0.05 as compared with ketamine group.
KET = Ketamine, **RISP** = Risperidone, **EEBS** = Ethanol extract of *B.sapida*

significantly (P< 0.05) decreased immobility time compared to the group treated with ketamine (20 mg/kg, i.p.) alone (negative control).Similar effect was also observed in the group treated with RISP (0.5 mg/kg, i.p), as it significantly (P< 0.05) decreased immobility time compared to the ketamine treated group (Fig. 3).

Effect of EEBS on cataleptic behaviour.
The EEBS (10, 20 40 and 80 mg/kg, i.p) showed no significant prolongation in the duration of akinesia, compared with the vehicle (10 mL/kg, i.p) treated group. However, HLP (1 mg/kg, i.p) significantly (P< 0.05) prolonged the duration of akinesia in comparison with the group treated with vehicle (Fig .4).

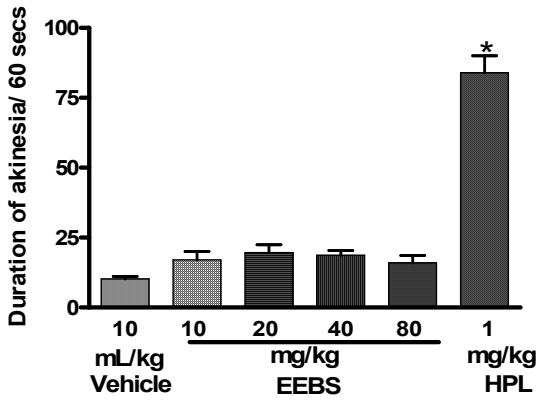

Fig. 4: Effect of EEBS on cataleptic behaviour
Columns represent Mean ± S.E.M (n=5).One way ANOVA revealed that there is significant
[F (5, 26) = 74.56, P< 0.0001] difference between various treatment groups.
* Denotes P< 0.05 compared to vehicle group
VEH = Vehicle, **HLP** = Haloperidol, **EEBS** = Ethanol extract of *B.sapida*

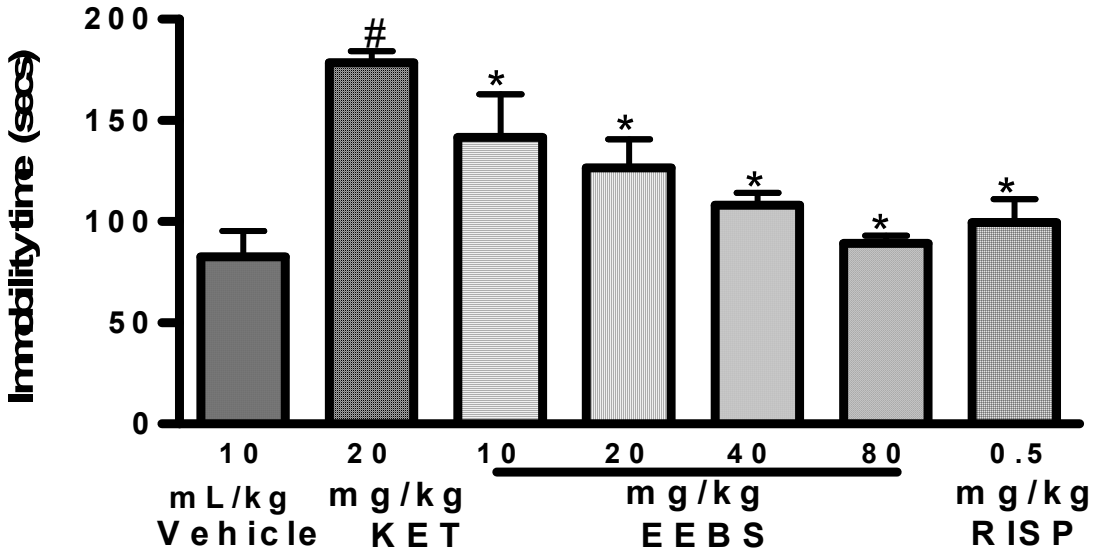

Fig. 3: Effect of EEBS on ketamine-enhanced immobility in forced swim test in mice.
Columns represents mean ± SEM (n=5). One way ANOVA revealed that there is no significant [F (6, 28) = 7.728, P<0.0001] difference between various treatment groups.
* Denotes P< 0.05 as compared with ketamine treated group.
# Denotes P< 0.05 as compared with vehicle treated group
KET = Ketamine, **RISP** = Risperidone, **EEBS** = Ethanol extract of *B.sapida*

Effect of EEBS on Drug-induced Ptosis

Treatment with EEBS (10, 20, 40, and 80 mg/kg, i.p) showed significant induction of ptosis compared to the vehicle (10 mL/kg, i.p). Similarly HLP (1 mg/kg, i.p) was also found to induce ptosis compared to the group treated with vehicle (10 mL/kg, i.p) (Fig 5).

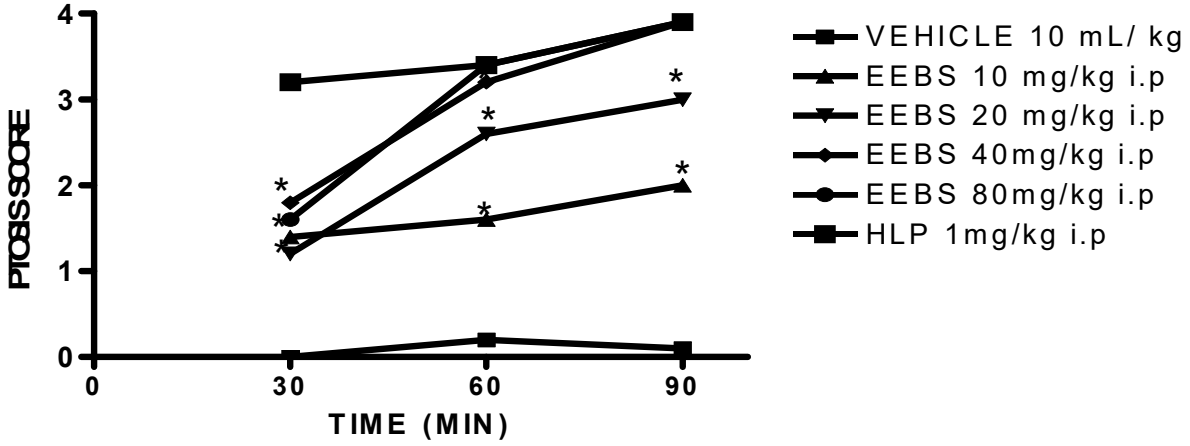

Fig. 5: Effect of EEBS on Drug-induced Ptosis

Points represent the mean (n=5). One way ANOVA shown that there is significant [F (5, 12) =7.283, P < 0.0024] differences between various treatment groups

* Denotes P < 0.05 as compared to vehicle.

APO = Apomorphine, **HLP** = Haloperidol, **EEBS** = Ethanol extract of *B.sapida*

Discussion

B.sapida stem bark attenuated psychotic behavioural manifestations induced by apomorphine and ketamine respectively in mice as compared to risperidone and haloperidol. Mesolimbic and nigrostriatal dopaminergic pathways play key roles in the mediation of locomotor activity and stereotyped behavior [29]. Antagonism of dopamine D_2 receptors may be a common feature of most clinically effective antipsychotic drugs, especially those active against hallucinations and delusions [37]. Activation of dopamine D_2 receptors located striatum induces stereotypes [38] and the nigrostriatal system mediates these stereotypes that predominate at higher doses of apomorphine. Apomorphine is an agonist at the dopamine receptor; it binds to D_2 receptor subtype resulting in inhibition of adenylyl cyclase which reduces potassium ion conductance, and enhances calcium ion channel activity with resulting stereotypes and hyperactivity [39].

Similar to Dopamine (DA) agonists, stereotyped behaviours are also induced in rodents by noncompetitive NMDA antagonists acting at the ion channel associated with the NMDA subtype of the glutamate receptor, such as phencyclidine (PCP) and ketamine [40]. Ketamine may present an indirect dopamine agonist activity and induced behavioural stimulation that may be connected with the dopamine system. In the Pre-Pulse Inhibition (PPI) model, reversal of apomorphine- induced disruption does not dissociate between typical and atypical antipsychotic drugs (APDs), but reversal of NMDA antagonist- induced disruption apparently does (although conflicting results have been reported; [41-43], suggesting that behavioral PCP effects in general rather than disrupted PPI in particular are selectively sensitive to atypical APDs. Blockade of apomorphine and ketamine-induced stereotype behavior suggest neuroleptic activity [44]. In the context of this study, it was found that EEBS stem bark significantly produced an inhibitory activity against these stereotyped behaviours induced by both apomorphine and ketamine as a measure of positive symptoms in psychotic patient. Hence, theehanolic extract of *B. sapida* stem bark on the stereotype behaviours suggests the possible interference with central doparminergic neurotransmission and neuroleptic effect.

Acute administration of Ethanol extract of *B.sapida* stem bark prior to ketamine administration significantly antagonized the hyperactivity (hyperlocomotion) induced by ketamine, this also suggests that EEBS stem bark possesses antipsychotic property. It has been shown that dopamine neurotransmission is involved in the motor activating effects of ketamine via the blockade of NMDA receptors. The systemic administration of dopamine antagonist counteracts the motor

activation induced by the systemic administration of NMDA [45]. This shows that the EEBS stem bark may be acting as dopamine antagonist. This effect EEBS stem bark was compared to risperidone thus suggesting an atypical mechanism of action. This work is in agreement with the inhibition of ketamine-induced stereotypy and hyperlocomotion by the root extract of *Panax quinquefolium* [46].

Forced swim-induced immobility in rodent is an acceptable animal model of depression [47] and reduction in the immobility time serves as a specific and sensitive index of antidepressant activity [48, 49]. Consequently, an increase in immobility time in the FST following repeated administration of a subanaesthetic dose of ketamine indicates a depressive state [48]. Ketamine is known to interact with the 5-hydroxytryptaminergic system to decrease the 5-HT_{2A} binding sites in the frontal and parietal cortex associated with reduced $5HT_{2A}$ receptor mRNA abundance [49-51]. Ketamine-induced behavioural changes are inhibited by clozapine and risperidone [52, 53], which are widely believed to be 5-HT_{2A} receptors antagonists [54, 55]. Although, ketamine is known to interact with several other binding sites in the brain, including the PCP binding site within the NMDA receptor channel complex and dopamine-D_2 receptor binding sites at the hippocampus [49], findings suggest that ketamine-enhanced immobility in the FST might be mediated, at least in part, via 5- HT_{2A} receptors. Risperidone is known for its $5HT_{2A}$ receptor blockade, and through which it attenuates the ketamine-enhanced immobility time [56]. The antipsychotic property of EEBS stem bark against negative symptoms induced by ketamine demonstrated significant reduction of ketamine-enhanced immobility in FST compared to ketamine treated group. The EEBS stem bark attenuation of ketamine enhanced immobility in forced swim test may be mediated via the same $5HT_{2A}$ blockade.

Neuroleptics (antipsychotic drugs) which have an inhibitory action on the nigrostriatal dopaminergic system induced catalepsy, while neuroleptics with little or no nigrostriatal blockade produce relatively little or no cataleptic behaviour. The EEBS stem bark produced no extrapyramidal symptoms as compared to haloperidol. This may be as a result of preferential blockade of D2 receptors in the limbic system which confers antipsychotic effects with little or no tendency to produce extrapyramidal symptoms [57].

The phytochemical analysis of the EEBS stem bark has been shown to contain saponins, alkaloid, cardiac glycosides, reducing sugars and carbohydrates [58], hence the antipsychotic properties may be due to the presence of these phytochemicals

Conclusion

Ethanol extract of *Blighia sapida* stem bark inhibited psycho-stimulation induced by apomorpine and ketamine in male Swiss mice. The extract showed no significant prolongation in the duration of akinesia, suggesting that the extract may be devoid of extrapyramidal side effects.

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Afr. J. Med. Med. Sci. (2019) **48,** 175-182

Assessment of maternity services available to clients in private health facilities in Sagamu Local Government, Ogun State

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Abstract
Background: The quality of health care provided in various health facilities is one of the factors implicated for unabated high mortality and morbidity rate frequently reported. Care rendered to women in private health facilities has not been given the deserved attention. Yet significant proportion of women access perinatal care services in private health facilities. This is evident in the available very scarce literature. Therefore, this study sought to assess the nature of maternity services available to women in the selected private health facilities and the extent to which such care is satisfactory to the users.
Methods: The descriptive survey was conducted in Sagamu Local Government Area (LGA). The study utilized a simple random sampling to select 20 out 38 private health facilities within the LGA. All health workers providing nursing/midwifery care in each of the hospitals/clinics and all clients who were on admission or came on outpatient basis for treatment were purposively recruited for the study. The total sample was adopted based on relatively few numbers of clients and health workers patronizing and working in each of the private health facilities, respectively. A checklist was used to assess each selected private health facility, while two different structured questionnaires were used for data collection from clients and health workers. The data collected with the three instruments were analyzed using descriptive and inferential statistics. Thus, tests of association between variables of interest were done using Pearson chi-square; level of significance (*p-value)* was set at 0.05.
Result: The results reveal that 35% of health facilities had good building infrastructures; 50% had fairly good building infrastructure, while 60% had inadequate essential items for child delivery and management of a baby. Measurement and recording of blood pressure, abdominal palpation and fetal heart rate were commonly performed in the private hospitals. In addition, 51 (73.9%) of the mothers received antenatal care during their last pregnancies in the facilities that were assessed but only thirty three (47.8%) returned to the same facilities for childbirth. More than half of the clients had a positive perception towards and expressed satisfaction with services in the hospitals. Close to 90% of the staff who provide nursing/midwifery care were auxiliary nurses.
Conclusion: The study reveals that the selected private hospitals/clinics were staffed with more number of quacks (auxiliary nurses) than qualified and registered nurses. Some of the facilities did not have the essential items and maternity related service. Therefore, stakeholders of health care industries should advocate enactment of legislation against quackery in nursing and midwifery practice in Nigeria. In addition, appropriate criteria involving should be put in place for establishment of private health facilities. Effective and efficient monitoring/ inspection of established private hospitals/clinics should be promoted.

Keywords: *Assessment, maternity, services, client, private healthcare facility, Local Government Area.*

Abstrait
Contexte : La qualité des soins de santé dispensés dans divers établissements de santé est l'un des facteurs expliquant le taux de mortalité et de morbidité élevé et constant qui a été signalé. Les soins prodigués aux femmes dans les établissements de santé privés n'ont pas reçu l'attention méritée. Pourtant, une proportion importante des femmes accède aux services de soins périnatals dans des établissements de santé privés. Ceci est évident dans la très rare littérature disponible Par conséquent, cette étude a cherché à évaluer la nature des services de maternité offerts aux femmes dans les établissements de santé privés sélectionnés et les mesures dans lesquelles ces soins sont satisfaisante aux utilisatrices.
Méthodes : L'enquête descriptive a été réalisée dans la commune de Sagamu. L'étude a utilisé un échantillonnage aléatoire simple pour sélectionner 20 établissements sur 38 dans la commune. Tous les agents de santé prodiguant des soins infirmeries / obstétricaux dans chacun des hôpitaux / cliniques et

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tous les clientes admis ou en traitement externe ont été recrutés à dessein pour l'étude. L'échantillon total a été adopté sur la base d'un nombre relativement restreint de clientes et d'agents de santé fréquentant et travaillant dans chacun des établissements de santé privés, respectivement. Une liste de contrôle a été utilisée pour évaluer chaque établissement de santé privé sélectionné, tandis que deux questionnaires structurés différents ont été utilisés pour la collecte de données auprès des clientes et des agents de santé. Les données recueillies avec les trois instruments ont été analysées à l'aide de statistiques descriptives et inférentielles. Ainsi, des tests d'association entre les variables d'intérêt ont été réalisés à l'aide du test chi-carré de Pearson; le niveau de signification (*valeur p) a* été fixé à 0,05. *Résultat :* Les résultats révèlent que 35% des établissements de santé disposent de bonnes infrastructures de construction ; 50% avaient une infrastructure de construction assez bonne, tandis que 60% avaient des articles essentiels inadéquats pour l'accouchement et la gestion d'un bébé. La mesure et l'enregistrement de la pression artérielle, de la palpation abdominale et du rythme cardiaque fœtal étaient couramment effectués dans les hôpitaux privés. En outre, 51 (73,9%) des mères ont reçu des soins prénatals lors de leur dernière grossesse dans les structures évaluées, mais seulement 33 (47,8%) sont retournées dans les mêmes structures pour accoucher. Plus de la moitié des clients avaient une perception positive et étaient satisfaits des services fournis dans les hôpitaux. Près de 90% du personnel qui fournit des soins infirmeries / obstétricaux étaient des infirmiers auxiliaires.
Conclusion : L'étude a révélé que les hôpitaux / cliniques privés sélectionnés étaient dotés d'un plus grand nombre de charlatans (infirmiers auxiliaires) que d'infirmiers qualifiés et agréés. Certaines des établissements ne disposaient pas des articles essentiels et des services liés à la maternité. Par conséquent, les parties prenantes des industries de la santé devraient plaider en faveur de l'adoption d'une législation contre le charlatanisme dans la pratique des soins infirmeries et obstétricaux au Nigéria. En outre, des critères impliquants appropriés devraient être mise en place pour l'établissements des facilités de santé privés. Une surveillance / inspection efficace et efficiente des hôpitaux / cliniques privés établis devrait être encouragée.

Mots clés : *Évaluation, maternité, services, client, établissement de santé privé, commune*.

Introduction

Childbirth and its processes come with couples of health risk and concern which put the woman in the light of need for medical intervention and assistance. About 75% of all maternal deaths are those associated directly and indirectly with some sort of complications during delivery and the week immediately after and this could be attributed to the inability to access adequate care [1].

The World Health Organization (WHO) estimates that about 580,000 women of reproductive age die yearly as a result of complications associated with pregnancy, and a large proportion of these deaths occur in Sub-Saharan Africa. This region has a maternal mortality of about 686 per 100,000 live births, which is one of the highest in the World. In Africa, one explanation for poor health outcomes among women is non-use of modern health care services by a sizable number of women of child bearing age. Regular medical checkup during pregnancy is important to reduce the risk of illness and death for the mother and child during pregnancy and delivery [2]

Available evidence suggests that the presence of skilled birth attendants during delivery dramatically reduces maternal mortality [3, 4]. This is illustrated by historical evidence from industrialized countries where maternal mortality was reduced by half following the introduction of professional midwifery care at birth, in the early 20th century. Improved access to hospitals after the Second World War further reduced maternal death rates, subsequently resulting in the impressive low levels currently recorded [5].

The use of maternity services in developing countries can be influenced by factors such as the socio-demographic characteristics (SDC) of women; culture; as well as availability and accessibility of the services [7, 8]. Various studies indicate an association between factors such as income, education, ethnicity, religion, culture, age, parity and decision-making power to utilize maternity services. There is paucity of quantitative research on care rendered to women and their newborns in private health facilities in Nigeria [9, 10].

Quality care is the totality of features and characteristics of an entity (product or service) that bear on its ability to meet stated and implied needs. Quality care is needed for many reasons including increasing financial investment, emphasis on accountability, cost effectiveness, public scrutiny and customer forums, high level of disapproval eroding client confidence; quality creates loyal customers [11].

Quality maternity services must be: **Appropriate** (meeting the individual's client needs).

This is the key element in quality measurement. Even if high levels are met with respect to all the other elements, if this is absent then the service has no quality; accessible (Being readily available to the client), **acceptable** (meeting the expectation of the client), equitable (being equally available to all clients), **effective** (being of real benefit to the client), efficient (provided without waste of resources) [12]. Each of these six features of the element is independent of the others; however they are all necessary to achieve high quality of healthcare service provided. The quality of the services provided by a hospital is measured by a comprehensive assessment of the structure of the hospital, process of health care delivery and the outcome of healthcare services [12].

Materials and method

The research descriptive survey design utilized a simple random sampling technique to study 20 out of 38 private health facilities in Sagamu Local Government Area (LGA), Ogun State, Nigeria. All clients and health workers in each private health facilities were purposively recruited for the study. The total sample used for the selection of the human participants in this study was based on the few numbers of clients and health workers patronizing and working in each selected health facility, respectively. Three research instruments (a checklist and two structured questionnaires; one for the health care worker and one for the client) were used for data collection in this study. The questionnaire for clients was divided into two sections: section 'A' elicited the socio-demographic information of the clients, while section 'B' focused on the obstetric information of the clients. The questionnaire designed for health workers has three sections: section 'A' sought for the socio-demographic variables of the health workers, section 'B' elicited for the perception of health workers on available maternity services, while section 'C' focused on health workers' obstetric practice. Data collection was done by a trained research assistant coopted from each of the selected private health facilities using the self-administered structured questionnaires and the checklists. Each of the administered questionnaires were retrieved and checked for completeness on the spot. The data were analyzed using both descriptive and inferential statistics. Thus, tests of association between variables of interest were analyzed using Pearson chi-square or Fisher exact test (for 2x2 tables). The level of significance (p-value) was set at 0.05. The findings were presented in frequency/percentage tables, figures as well as texts.

Results

Findings from the assessment of the selected private health facilities

The results from this study show that seven (35.0%) of the hospitals examined had structural facilities that could be said to be in fair condition, while other seven (35.0%) were in good condition. The remaining six (30.0%) were in poor condition. The facilities had attended to an average of fifty six (56) pregnant women each in the last three months. On the average, 28 deliveries were conducted in each hospital within the said period, while average 32 newborns were brought for child immunization (particularly BCG vaccine) in the private health facilities in the last three months.

Ten (50.0%) of the private hospitals had no infrastructures for management of child deliveries immediate care of the newborn. Similarly, 8 (60.0%) had inadequate essential items for child delivery and management of newborn after delivery (table 1).

Table 1: Availability of infrastructure and adequacy of essential items (N = 20)

Infrastructure for child delivery services	Frequency	Percent
Available	10	50.0
Not available	10	50.0
Essential Items		
Inadequate	12	60.0
Adequate	8	40.0

Nearly all the hospitals that were assessed performed clinical services such as blood pressure measurement and recording, abdominal palpation and recording always. However, only few of them sometimes (occasionally) had services such as tetanus toxoid immunization, STD diagnosis and treatment, weight measurement and recording and blood samples for haemoglobin or packed cell volume (PCV) to render to clients who visited their health facilities. Eight of the hospitals (40%) sometimes (occasionally) had screens to provide privacy for clients during physical examination. Table 2 presents regularity of the essential antenatal services rendered to women (clients) in the selected private health facilities.

It was discovered from the study findings that all the selected hospitals had an integrated antenatal service and 13 (65.0%) of them had integrated immunization services, while 12 of them (60.0%) have fragmented family planning services. However, none of the hospitals had voluntary counseling and HIV treatment (Table 3).

Table 2: Regularity of essential antenatal services in the private health facilities

Antenatal services in the health facilities	Sometimes n (%)	Always n (%)
Tetanus toxoid immunization	1 (5.0)	19 (95.0)
STD diagnosis and treatment	6 (30.0)	14 (70.0)
Blood pressure measurement and Recording	-	20 (100)
Abdominal palpation and Recording	-	20 (100)
Foetal heart rate detection and recording	-	20 (100)
Weight measurement and recording	-	20 (100)
Blood samples for haemoglobin or PCV	2 (10.0)	18 (90.0)
Urine samples for proteinuria and bacteriuria	1 (5.0)	19 (95.0)
Distribution of iron and folate supplements	-	20 (100)
Distribution of malaria prophylaxis	-	20 (100)
Screens for provision of during physical examination	8 (40.0)	12 (60)

Key: *Sometimes = occasionally, Always = regularly*

Table 3: Availability of maternity-related services in the private health facilities

Types of service	Not available n = 20	Fragmented n = 20 (%)	Integrated n =20 (%)
Family planning service	-	12 (60.0)	8 (40.0)
Laboratory service	4 (20.0)	7 (35.0)	9 (45.0)
Immunization service	7 (35.0)	-	13 (65.0)
Antenatal care service	-	-	20 (100.0)
Voluntary counseling & treatment for HIV	20 (100.0)	-	-

Key: *Integrated – Services can be accessed daily at all times in the health facilities.*
Fragmented – Services can be accessed at a particular day and time of the week only.
Not available – Services are not rendered at all in the health facility

Socio-demographic information of the women (clients) using the private health facilities

The ages of the women who were users of the selected private health facilities ranged from 15 to 43 years; their mean age was 31 years ± std. deviation. Out the 69 women studied, 41 (59.4%) were between 20 and 34 years old, while, three (4.3%) and 25 (36.2%) were teenage mothers (ages 15 – 19 years) and elderly mothers (35 years and above), respectively. Besides, 28 (40.6%) of them had secondary education as their highest level of education. Table 4 presents detailed information on the socio-demographic characteristics of the women.

Additionally, the past obstetric history of the women was captured in the study. As at the time of data collection, 13 (18.8%) of the women had given birth to one child each, while 56 (81.2%) had delivered more than once. A total of 32 (46.4%) utilized family planning services previously, while 18 (26.1%) booked for ANC in more than one birthing centre. Thirty-three (47.8%) eventually delivered their babies in the selected private clinics/ hospitals. It was discovered, 38 (55.1%) of the clients were satisfied with the level of care rendered to them but the remaining were not satisfied.

Biodata of the health workers

The ages of the health workers ranged between 20 and 45 years; the mean age of the population was 30 years $\frac{2}{10}$ 6.2 standard deviation. Fifty percent were married. The professional profile of the health workers shows that 13 (21.7% were registered nurses (qualified nurses licensed by the Nursing and Midwifery Council of Nigeria), while 39 (65.0%) were quacks who were fondly called 'auxiliary nurses' in Nigeria (Table 5).

Responses from the health workers showed that a good number of them (88.3%) claimed that the hospitals where they were working always rendered antenatal services such as tetanus Toxoid

Table 4: Socio-demographic variables of mothers (N = 69)

Sociodemographic variables	Frequency	Percent
Age group (years)		
15 – 19 years (teenage mothers)	3	4.3
20 – 34 years (young mothers)	41	59.4
35 – 43 years (elderly mothers)	25	36.2
Religion		
Christianity	35	50.7
Islam	31	44.9
Traditional	3	4.3
Ethnicity		
Yoruba	48	69.6
Igbo	8	11.6
Hausa	5	7.2
Others	8	11.6
Marital status		
Married	63	91.3
Divorced	5	7.2
Widowed	1	1.4
Level of education		
Informal	7	10.1
Primary	9	13
Secondary	28	40.6
Tertiary	25	36.2

Table 5: The professional status of the health workers

Professional status	Frequency	Percent
Registered Nurse	13	21.7
Community Health Extension Worker	8	13.3
Auxiliary nurse	39	65.0
Total	60	100.0

immunization, STD diagnosis and treatment, blood pressure measurement, abdominal palpation and recording and fetal heart rate detection and recording rendered to the women (clients). However, 6.7% of the health workers confessed that the hospitals where they worked never rendered such services, while 5% said that such services were sometimes (occasionally) rendered (Figure 1).

Out of the health workers studied, 51 (85.0%) confessed that there were no written obstetric guidelines in the clinics/hospitals to guide their clinical practice. In addition, 57 (95.0%) were not trained in Life Saving Scheme (LSS). However, the remaining who claimed they had LSS training demonstrated lack of knowledge of LSS just as their counterparts who never had LSS training. Similarly, 37 (61.7%) of the health workers confessed that it was not in the practice of the clinics/hospitals where they worked to test the serum bilirubin of the newborns following childbirth. Besides, 38 (63.3%) claimed that the private health facilities were used to rendering postnatal care to clients.

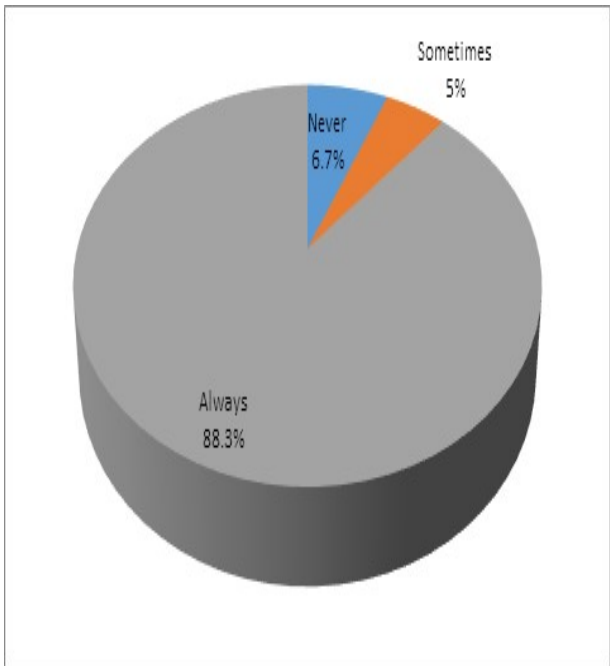

Fig.1: Report of health workers on antenatal clinic services rendered in health facilities

Findings of the tested hypotheses

$H_0$1: There is no significant difference in the number of women who booked for antenatal care and the

Table 6: Comparison between population of women who booked for ANC and women who returned for childbirth

Paired samples statistics/correlations	Mean	N	Std. Deviation	Std. Error Mean	pv	Remark	Decision
Women who received antenatal care	56.00	20	82.906	18.538	0.06	NS	$H_0$1 not rejected
Women who returned for childbirth	28.00	20	21.426	4.791			

***Key**: N = population sample, p-value = level of significance, NS = Not significant, H0 = Null hypothesis*

number of women who returned for deliveries in the selected private health facilities within the last three months.

The findings show that there was no significant difference in the number of women who booked for antenatal care and the number of women who returned for deliveries in the selected private health facilities within the last three months.; p-value > 0.05 (Table 6). Therefore, the null hypothesis ($H_0$1) was not rejected. Although, the mean population of women who booked for ANC in the private health facilities were more than the mean population of women who returned to the respective private health facilities for childbirth but the difference was not statistically significant.

influence the quality of health care delivery services available to the client. Perhaps, this was responsible for the reported drop in population of women (clients) who returned to the hospitals where they booked for ANC initially for deliveries. Besides, since child immunization is always given on outpatient basis, the women population who brought their children for BCG vaccines was more than that of women who returned to the hospitals for childbirth. From the responses of the clients, majority would likely seek other health facilities they might consider better for services requiring admission. The unacceptable deplorable infrastructural condition of most private hospitals is likely to contribute to the annually reported maternal and neonatal mortalities in Nigeria [13].

Table 7: Comparison between population of women who returned for deliveries and population of women who brought their babies for BCG immunization

Paired Samples Statistics/Correlations	Mean	N	Std. Deviation	Std. Error Mean	p-value	Remark	Decision
Women who brought babies for BCG vaccine	31.85	20	38.356	8.577	0.023	S	Reject $H_0$2
Women who returned for childbirth	28.00	20	21.426	4.791			

Key: N = population sample, p-value = level of significance, S = Significant, H_0 = Null hypothesis

$H_0$2: There is no significant difference in the number of women who returned to the private health facilities for childbirth and the number of newborns for child immunization in the respective health facilities.

The mean population of women who returned to the private health facilities for childbirth was fewer than the mean population of women who brought their newborns to the respective health facilities for child immunization (particularly for BCG vaccine). This was found to be significant; p-value < 0.05 (Table 7).

Discussion

Many (35%) of the private hospitals/clinics had structural facilities that could be said to be in fair condition, while 30% were observed to in poor (deplorable) condition. Less than 40% of these health facilities were observed to be in good condition. For instance 50% of the private hospitals had no infrastructures for management of deliveries and 60% had inadequate essential items for immediate newborn care. To a very large extent, the condition of infrastructures of the health facilities would definitely

Meanwhile, the few private health facilities where administration of Tetanus Toxoids, diagnosis and treatment of STDs, laboratory investigations and provision of privacy were not rendered to women call for reproductive health attention. Therefore, initial and periodic inspection of private health facilities should strictly precede issuance and renewal of licenses for their operations, respectively.

In addition, the non-availability of voluntary counseling (VCT) /HIV screening in all the selected private hospitals should be an issue of serious concern to health workers and governments (at all levels). The omission of VCT/HIV screening by the private hospitals/clinics might be due to fact that this type service will not likely attract financial benefit to the establishments, more so, the services are usually provided by hospitals and centres owned by the government or non-governmental organizations (NGOs) at no cost. By implication, the selected private health facilities were rendering services that could be considered as inconsistent with quality health care that has the totality of features and characteristics of product or service that is capable of meeting stated and implied needs [14]. These

unacceptable ethical and legal implications pose numerous risks to staff, and clients, their relations and of course the larger society. Thus, availability of efficient VCT/HIV screening should be one of the criteria for establishment of any private health facilities designed to render maternity services.

Moreover, it is advisable and of course it should be mandatory for private health facilities that do not have qualified obstetrician and midwives not to attempt management of labour and childbirth for high risk mothers such as teenage and elderly mothers reported in this study. From the findings of the study, significant proportions of women were still not utilizing formal centres for ANC. This category of women has been implicated for contributing to persistent high rate of maternal and neonatal morbidities and mortalities in Nigeria and other developing countries. Meanwhile, what were responsible for non-utilization of ANC by over one-quarters of the women in the last pregnancy requires further study.

The use of quacks popularly referred to as auxiliary nurses by proprietors/proprietresses of private hospitals/clinics is a serious issue that requires urgent intervention if the sustainable development goals is going to be achieved optimally in Nigeria. Therefore, stakeholders are to seek for enactment and enforcement of appropriate legislations to stop the unethical and illegal practice. The educational and professional preparation of nurses/midwives is integral part of quality care.

Quality care has been defined as "the degree to which health services for individuals and population increases the likelihood of the desired health outcomes [14, 15]. Hence, the quality of personnel is part of the element and even the main determinant of this quality. It was discovered from this study that majority of the health personnel providing midwifery care to the clients were quacks with no formal clinical training to provide such level of care. This implies that these private hospitals/clinics had been rendering substandard and crude quality of midwifery care to women and their newborns. These facilities must have been exposing the clients to a very high level of risk and varying degree of malpractices capable of worsening the quality of care rendered to clients who attended these hospitals/clinics [15]. From the aassessment of level of client's satisfaction with care they received from the health facilities, it was discovered close to 50% expressed dissatisfaction with care rendered to them. This might have been the reason for some of them booking for ANC in more than one health care facility and why some did not access ANC in the last pregnancies. Besides, this might have been one of the reasons that compelled majority of the women not to return to the place of their initial booking for childbirth. Women who are not satisfied with services rendered are likely going to move from one health facility to another in search of care that guarantees them desired satisfaction [13].

Conclusion

The study reveals that the selected private hospitals/clinics were staffed with more number of quacks (auxiliary nurses) than qualified (registered) nurses. Some of the facilities did not have the essential items and maternity related services, Therefore, health care industries and relevant government and non-governmental agencies such as the ministry of health (MoH), the Nursing and Midwifery Council of Nigeria (NMCN) and National Association of Nigerian Nurses and Midwives (NANNM) should seek for enactment of legislation against quackery in nursing and midwifery practice in Nigeria. In addition, appropriate criteria involving infrastructures, human and materials resources should be put in place for establishment of private health facilities. The monitoring and inspection unit of the MoH should be strengthened to promote effective and efficient monitoring and inspection of established private hospitals/clinics. The potential users of private hospitals/clinics should be empowered through creation of aggressive awareness campaign for identification standard of care in health facilities.

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Afr. J. Med. Med. Sci. (2019) **48,** 199-206

Low back pain and radiculopathy in a rheumatology clinic: a clinical and radiological audit

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Abstract

Background: Back pain is mostly mechanical in aetiology. Low back pain (LBP) has been reported at various times as a non-specific health problem and a general complaint among people of all ages with severe effect and complaint among the middle aged and the elderly. It is more often reported in developed than in the developing countries and has been reported as a major economic disease burden and cause of hospital visits, work absenteeism and disability.

*Aim and Objective***:** To determine the clinical and radiological patterns of Low back pain among patients attending a private practice rheumatology clinic over a five year period (2009-2013)

Method: This was a retrospective audit of subjects presenting with low back pain at a private practice rheumatology clinic. Diagnoses were made following detailed history, physical examination as the patients presented. Imaging studies were done as required. Management was with standard medications and physiotherapy. Treatment modalities were with Analgesics-narcotics and NSAIDs, neuromodulators, muscle relaxants in different combinations. Eight patients (2.5% of total) were referred for surgery.

Results: 316 patients presented with low back pain and/or features of radiculopathy with duration of symptoms prior to presentation between 16 -96 weeks with a mean (±SD) of 34(±1.4) weeks. Low back pain and paraesthesia/neuropathic pain were the main complaints at presentation. The findings on physical examination showed that most patients had positive femoral nerve stretch test, accounting for 44% of total and suggesting an upper lumbar spine nerve root compression. Straight leg raising test was positive in 25% of patients and FABER in 19.3% of patients. Lumbosacral spondylosis was the commonest aetiology and accounted for 70% of total cases. Back pain from spinal canal stenosis was the least accounting for 2.9% of total presentation. The patients were aged between 21 and 82 years with a mean (±SD) of 56.4(±2.4) years and female preponderance. One hundred and seventy five (175) females and 141 males at ratio of 1.2: 1. Blood tests which included white cell count, haematocrit, uric acid and erythrocyte sedimentation rate were essentially normal. 126 patients had plain radiography of the lumbosacral spine done which generally revealed osteophyte formation. 56 patients had MRI of the lumbosacral spine done further, revealing mostly disc herniation and desiccation, nerve compression and spinal canal stenosis.

Conclusion: Back pain has been found to be more common in females with lumbosacral spondylosis as the commonest aetiology. Although, plain radiography is useful for demonstrating features of degenerative bone changes in LBP without objective pathology, its request should be justified while MRI is beneficial for causes of LBP due to other spinal disorders other than degenerative lesions. Multidisciplinary approach was adopted in managing low back pain; which includes medical, physical and occupational therapy and surgery when indicated.

Keywords: *Low back, pain, rheumatology clinic; neuromodulators, muscle relaxants*

Abstrait

Contexte : Le mal de dos est essentiellement mécanique en étiologie. La lombalgie (LBP) a été signalée à plusieurs reprises comme un problème de santé non spécifique et une plainte générale parmi les personnes de tout âge avec un effet grave et une plainte parmi les personnes d'âge moyen et âgées. Il est plus souvent signalé dans les pays développés que dans les pays en développement et a été signalé comme un fardeau de maladie économique majeur et une cause de visites à l'hôpital, d'absentéisme au travail et d'invalidité.

But et objectif **:** Pour déterminer les tendances cliniques et radiologiques de la lombalgie chez les patients fréquentant une clinique de rhumatologie en cabinet privé sur une période de cinq ans (2009-2013).

Méthode : Il s'agissait d'un audit rétrospectif de sujets présentant des douleurs lombaires dans une clinique de rhumatologie en cabinet privé. Les diagnostics ont été établis à la suite d'un historique détaillé et d'un examen physique à la présentation

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des patients. Des études d'imagerie ont été effectuées au besoin. La gestion était avec des médicaments standard et la physiothérapie. Les modalités de traitement étaient les suivantes : Analgésiques-Stupéfiants et AINS, neuromodulateurs, myorelaxants dans différentes combinaisons. Huit patients (2,5% du total) ont été référés pour une chirurgie.
Résultats : 316 patients présentaient une douleur au bas du dos et / ou des signes de radiculopathie avec une durée des symptômes avant la présentation, entre 16 et 96 semaines avec une moyenne (± ET) de 34 (± 1,4) semaines. La douleur au bas du dos et la paresthésie / douleur neuropathique étaient les principales plaintes à la présentation. Les résultats de l'examen physique ont montré que la plupart des patients avaient un test d'étirement du nerf fémoral positif, représentant 44% du total et suggérant une compression de la racine nerveuse de la colonne lombaire supérieure. Le test d'élévation de la jambe droite était positif chez 25% des patients et FABER chez 19,3% des patients. La spondylose lombo-sacrée était l'étiologie la plus fréquente et représentait 70% du total des cas. Les maux de dos dus à une sténose du canal rachidien étaient les moins importants, représentant 2,9% de la présentation totale. Les patients étaient âgés de 21 à 82 ans avec une moyenne (± ET) de 56,4 (± 2,4) ans et une prépondérance féminine. Cent soixante-quinze (175) femmes et 141 hommes selon un ratio de 1,2 : 1. Analyses sanguines comprenant la numération des leucocytes, l'hématocrite, l'acide urique et le taux de sédimentation érythrocytaire étaient essentiellement normales. Une radiographie de la colonne lombo-sacrée a été réalisée chez 126 patients, révélant généralement la formation d'ostéophytes. L'IRM de la colonne lombo-sacrée a été pratiquée chez 56 patients, révélant principalement une hernie discale et une dessiccation, une compression nerveuse et une sténose du canal rachidien.
Conclusion : On a constaté que les maux de dos étaient plus fréquents chez les femmes atteintes de spondylose lombo-sacrée comme étant l'étiologie la plus courante. Bien que la radiographie simple soit utile pour démontrer les caractéristiques de modifications osseuses dégénératives dans la lombalgie sans pathologie objective, sa demande doit être justifiée, alors que l'IRM est bénéfique pour les causes de la lombalgie dues à d'autres troubles de la colonne vertébrale que les lésions dégénératives. Une approche multidisciplinaire a été adoptée dans la gestion des douleurs lombaires ; qui comprend la thérapie médicale, physique et occupationnelle et la chirurgie lorsque cela est indiqué.

Mots clés : *Bas du dos, douleur, clinique de rhumatologie ; neuromodulateurs, relaxants musculaires*

Introduction

Low back pain (LBP) can be defined as pain limited to the region between the lower margins of the 12th rib and the gluteal folds.[1] LBP is the most common musculoskeletal symptom and is a major socio-economic burden worldwide. An estimated 80% of the population will experience back pain during their lifetime; 90% of these patients will have resolution of their symptoms within 6 weeks.

Low back pain is second only to common cold as the commonest affliction of mankind. LBP is the fifth most common reason for visiting a physician, according to a US National Ambulatory Care Survey [2]. Most cases of back pain are mechanical, but there are other aetiological factors such as infections, degenerative and inflammatory diseases and neoplastic disorders [3]. The lifetime prevalence of LBP (at least one episode of LBP in a lifetime) in developed countries is reported in up to 85%. LBP results in significant level of disability, producing significant restrictions on usual activity and participation such as an inability to work. Furthermore, the economic, societal and public health effects of LBP appears to be increasing, with the burden of particular concern in poorer nations such as Africa [4].

LBP usually originates from the lumbar spine; and pain is rarely referred to the spine from other structures. It is generally as a result of problems associated with the spine and other adjoining tissues. Mechanical disorders cause the vast majority of low back episodes [5]. Over 95% of LBP is mechanical. Mechanical pain is generally due to an anatomical abnormality that increases with physical activity and is relieved by rest and recumbence.[6] Characteristically, mechanical disorders are exacerbated by certain physical activities and are relieved by others. Most of these disorders resolve over a short period of time. Back pain may persist for 1 year and longer in 10% of the spinal pain population [6,7].

Plain radiography remains a veritable baseline imaging modality, being an affordable, accessible and cost effective radiological investigation for evaluation of nonspecific low back pain of degenerative spinal origin. Other advanced imaging modalities (Magnetic Resonance Imaging (MRI), (Computerised Tomography (CT) and bone scans) have very low risk of missing a case of serious cause of back pain in those without objective pathology. There have been few reports on the clinical and imaging presentations of LBP in Nigeria. This retrospective study is aimed at presenting an audit of cases of LBP seen at a private rheumatology clinic in Lagos Nigeria.

Patients and methods

This is a retrospective case study of consecutive adult patients who presented with history of low back pain

of three (3) months or more to Arthrimed Specialist clinic, a private practice rheumatology clinic in Lagos, Nigeria over a 5-year period-January 2009 to December 2013. Diagnoses were made based on clinical presentation and physical examination including Straight Leg Raising, Femoral Nerve Stretch Test and FABER's test- a composite of Flexion, Abduction and External Rotation. Patients who had features of Hypermobility were diagnosed using the Beighton Hypermobility criteria. Blood tests were carried out on the patients which include Full blood count, serum uric acid and erythrocyte sedimentation rate (ESR).

Plain radiography and MRI were done as indicated on patients who can afford the investigations, as well as subjects with systemic features or with doubtful diagnoses and those not doing well on medications and physiotherapy. Patients were treated with analgesics, neuromodulators, muscle relaxants and physiotherapy. Radiographs and MRI were reviewed by the third author.

Results

A total of 316 subjects were seen and followed up for various periods over the 5-year study period. The demographic characteristics of the patients are as shown on table 1. The patients were aged between 21 and 82 years with mean age of 56.4 years and a female preponderance with one hundred and seventy five (175) females and 141 males and ratio 1.2:1.Pain in the lower back and paraesthesia/ neuropathic pain were expectedly the main complaint at presentation.

Table 1: Demographic characteristics of patients with low back pain

Age	Years
Range	21-82
Mean(±sd)	56.4(±2.6)
Sex	No (%)
Female	175 (55.4)
Male	141 (44.6)
Female: Male	1.2:1
Duration of symptoms before presentation (weeks)	
Range:	16 to 96
Mean(±sd)	34(±1.4)

The duration of symptoms before presentation was between 16 and 96 weeks with a mean of 34±1.4 weeks. Two hundred and seventy five (275) patients, accounting for 87% of the 316 patients had radicular pain or/and paraesthesia complicating their low back pain with 149 females and 126 males at ratio of 1.2:1. Of these, 85 (31%) patients had strictly radicular pain while the remaining 190 (69%) patients had paraesthesia in both lower limbs. Forty one (41) patients accounting for 13% of total patients however presented with low back pain without radicular pain or/and paraesthesia in the lower limbs. (table 2).

Table 2: Sex distribution of LBP and Radiculopathy

Gender	LBP No (%)	Radicular pain No (%)	Paraesthesia No (%)
Male	15(37)	38(45)	88(46)
Female	26(63)	47(55)	102(54)
Total	41(100)	85(100)	190(100)

The findings on physical examination showed that many patients were positive for the Femoral Nerve Stretch Test (FNST) [8]. This accounted for 44% of total number of patients and indicates an upper nerve root involvement in the lumbar spine. Straight Leg Raising test was positive in 25% of patients and FABER in 19.3% of patients. Deformities ranging from lateral scoliosis to kyphotic disorders and gibbus formation were seen in 11 patients (5 males, 6 females) accounting for 3.5% of total patients. 8.5% of patients did not have any remarkable physical signs. Full blood count was carried out on some of the patients on suspicion of either an infection or other co-morbidities.

One hundred and twenty four (124) patients, accounting for 39% of total patients had their White cell count checked. This ranged between 4.5 and $5.5x10^9$/L with a mean (±sd) of 4.8(±1.9) while the haematocrit ranged between 37 and 45%(0.37-0.45L/L) with a mean(±sd) of 40%(0.40L/L)±(7.5). Thirty five (35) patients, (11%) had serum uric acid checked. This ranged between 6-8g/dl with a mean (±sof 6.7(±0.6).Clinical findings revealed Lumbosacral spondylosis as the major aetiology of low back pain,accounting for 70% of total number of patients, as shown in table 3.

Others were Disc herniation, Spondylolisthesis and Spinal canal stenosis accounting for 12.9%, 9.5%, and 2.9% respectively. Fifteen (15) patients (7 males, 8 females), accounting for 4.7% of total patients presented with features of Benign Joint Hypermobility Syndrome (BJHS). More females were found positive for Straight Leg Raising and Femoral Nerve Stretch Test at ratio 1.5:1 and 1.2:1. Both males and females test almost equally positive for FABER's test. (F:M; 1.03:1). One

hundred and twenty six (126) of the total 316 subjects had Lumbosacral x-ray done with 74(23.4%) females and 52(16.6%) males.

Table 3: Clinical diagnoses of patients

		Lumbosacral spondylosis	Disc herniation	Spinal canal stenosis	Spondylolisthesis	Hypermobility syndrome
		Number (% of Total)				
Male	141	89(28.2)	19(6.0)	4(1.3)	14(4.4)	7(2.2)
Female	175	132(41.8)	22(7.0)	5(1.6)	16(5.1)	8(2.5)
Total	316	221(70.0)	41(12.9)	9(2.9)	30(9.5)	15(4.7)

Fifty six (56) subjects had MRI done with 32(10.1%) females and 24(7.6%) males. Loss of lumbar lordosis and osteophyte changes spanning L1-L5 and S1 were the most common presentation and were reported in all the 52 male and 74 female patients respectively, 92% of female patients and 86.5% of male patients presented with joint space narrowing affecting mainly L3-4,4-5,L5-S1.Male:Female = 0.9:1. Similarly, 92.3% of male patients and 83.3% female patients had bony sclerosis affecting the L3,4,5 at a ratio of M;F = 1.1:1. Osteopenic changes were found in 70.2% of male patients and in 54.0% of female at a ratio of M:F 1:1.3. Spondylolisthesis was reported at L3,4 to 5 in 27% of male and 22% female patients at a male to female ratio of 1.2:1

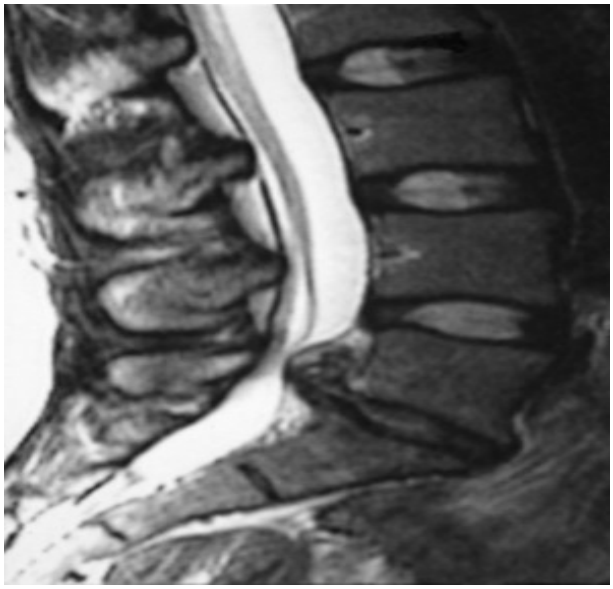

Fig. 1: MRI showing a posterolateral disc prolapse

Fifteen subjects had both MRI and lumbosacral x-ray done with 9(2.8%) females and 6 (1.9%) males. Low back pain was characterized by Loss of lumbar lordosis in all patients who had MRI in this study. 75.0% of male patients and 87.5% of female patients presented with disc desiccation affecting L3-5,L5-S1 vertebrae with Male :Female = 0.9:1.Posterolateral disc herniation was reported

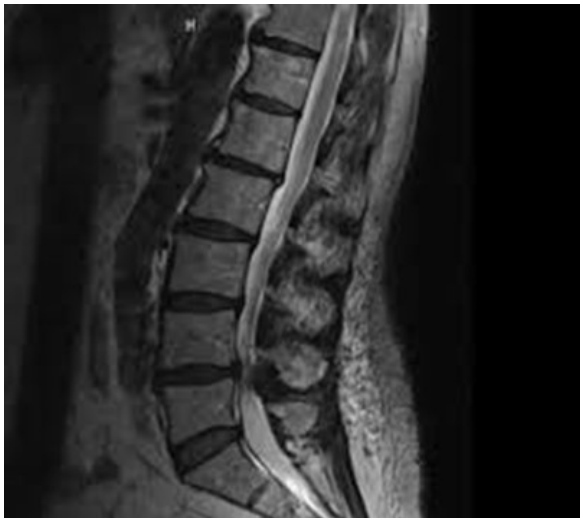

Fig. 2: MRI of a patient with Spinal canal stenosis

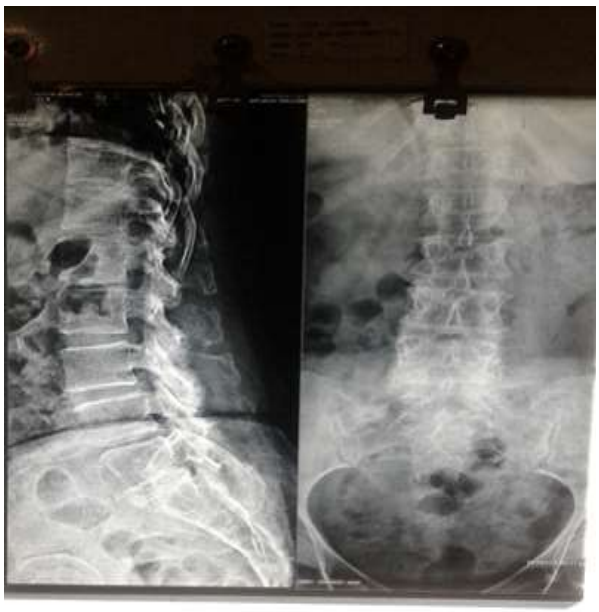

Fig. 3: Plain radiograph of a patient with Lumbosacral spondylosi

in 79.2% of males and 68.3% of females affecting L2-3,3-4,4-5 and L5-S1 vertebrae at M:F 1.2:1(fig. 1). Spinal canal stenosis was reported in 58.3% of male and 78.1% of female patients at L2-5 vertebrae

at M:F 0.7:1 (fig. 2). Reduced joint space was reported at L2-5 to S1 in 75% of male and 78.1% female patients in almost equal distribution (fig. 3). Spondylolisthesis at L3-4, L4-5 in 70.8% male and 37.5% female patients in M:F 1.9:1. Neural foraminal stenosis and Ligamentum flavum hypertrophy were also reported at L3-5,L5-S1 in a Male to Female ratio of 1.2:1 and 1:1.4 respectively. Others are Annular bulge at L4-5, L5-S1 and Schmorl's node in a Male to Female ratio of 1:1.4 and 1:1.7 respectively.

combined narcotic analgesics and NSAIDs; 64 (20.3%) had analgesics and muscle relaxant combination; 32 (10.1%) had analgesics and neuromodulators combination while 26 (8.2%) were given neuromodulators and muscle relaxant combination. However 10 (3.2%) and 8 (2.5%) subjects had only neuromodulators and muscle relaxants respectively. Twelve (3.8%) patients had only physiotherapy, including McKenzie extension exercises. Eighty six (86) patients, accounting for 27.2% of total patients had all forms of therapy and

Table 4: Lumbosacral X-Ray Reports

Features	**Male(52)** S/level	No (%)	**Female(74)** S/level	No (%)	**Total (126)** No (%)
1. Loss of lumbar lordosis		52(100)		74(100)	126(100)
2. Narrowed intervertebral joint space	L3-4,4-5 L5-S1	45(86.5)	L3-4,4-5 L5-S1	68(92.0)	113(89.7)
3. Osteopenic changes		28(54.0)		58(70.2)	86(68.3)
4. Osteophytes(Anterior/ Marginal)	L1-5,S1	52(100)	L1-5,S1	74(100)	126(100)
5. Spondylolisthesis	L3-4,-5	14(27.0)	L3-4,-5	16(22.0)	30(24.0)
6. Bony sclerosis	L3,4,5	48(92.3)	L3,4,5	62(83.3)	110(87.3)

Table 5: MRI Reports of 56 subjects

Features	Male(24) S/level	No (%)	Female(32) S/level	No(%)	Total (56) No/ %
1. Loss of lumbar lordosis		24(100.0)		32(100)	56/100
2. Narrowed intervertebral joint space	L2-3,4-5 L5-S1	18(75.0)	L2-3,3-4 4-5, -S1	25(78.1)	43(76.8)
3. Disc herniation	L2-3,3-4 L4-5,-S1	19(79.2)	L2-3,3-4 L4-5,-S1	22(68.8)	41(73.2)
4. Disc dessication	L3-4,4-5 L5-S1	18(75.0)	L3-4,4-5 L5-S1	28(87.5)	46(82.1)
5. Spondylolisthesis	L3-4,L4-5	17(70.8)	L3-4,L4-5	12(37.5)	29(51.8)
6. Ligamentum flavum hypertrophy	L3,4,5, L5-S1	12(50.0)	L3,4,5, L5-S1	22(68.8)	34(60.7)
7. Neural foramina compression/stenosis	L3-4,4-5 L5-S1	14(58.3)	L3-4,4-5 L5-S1	16(50.0)	30(53.6)
8. Spinal canal stenosis	L2,3,4,5	14(58.3)	L2,3,4,5	25(78.1)	39(69.6)
9. Annular/Paracentral bulge	L4-5, L5-S1	15(62.5)	L4-5, L5-S1	27(84.4)	42(75.0)
10. Schmorl's node	L2-3,L3-4,L4-5	7(29.2)	L2-3,L3-4,L4-5	16(50.0)	23(41.1)

Multi-disciplinary approach was adopted in treating the patients. Drugs were combined in different combinations as follows: Seventy eight (78) patients accounting for 24.7% of total were given intervention combined. simple and narcortic analgesics were used either singly or in combination. The neuromodulators used include Selective Serotonine Reuptake Inhibitors (SSRIs) -

Fluoxentine and anticonvulsants, Pregabalin and Gabapentine. Tizanidine was the muscle relaxant of choice. Eight (8) patients, accounting for 2.5% of total patients were referred for surgery. One hundred and nineteen (37.7%) of total patients showed definitive response to therapy. Forty four (13.9%) showed marginal response. Response could not be ascertained in 153(48.4%) of patients. Only 36(11.4%) patients were seen on follow-up visits as majority of patients had defaulted presumably due to improvement in clinical condition or alternative modality of therapy.

Discussion

LBP is the most prevalent musculoskeletal condition and the most common cause of disability the world over especially in the developed nations. There is suggestion that the prevalence of LBP in Africa is comparatively lower than in developed countries [9] but there are now various anecdotal evidence to the contrary. A recent global review indicates that there is little difference in the prevalence of LBP among Africans compared to the prevalence of LBP in developed countries [10, 11]. In this retrospective study of patients that presented with LBP at a private rheumatology clinic in Lagos, the number of patients considered during this 5-year study might just be enough evidence that LBP prevalence is truly on the increase in Nigeria and in Africa as an extension. The demographic characteristics of LBP in Nigeria are similar to previous studies done elsewhere [12, 13] with female preponderance of F:M; 1.2:1. Duration of symptoms before presentation in this study and the mean age of 56.4 years are in keeping with the 4th to 5th decade peak presentation of the various aetiologies of LBP observed in previous studies [14]. Lumbosacral spondylosis is the commonest cause of LBP, usually as a result of mechanical stress or trauma.

Fifty six patients had MRI done which further aided the diagnoses. MRI is a very sensitive and useful imaging technique in patients with LBP.[15] Fifty six (17.7% of total) patients were able to do the study in addition to plain radiography in 15 of these 56 patients. Straightening of the lumbar spine or loss of lumbar lordosis, due to muscle spasm and the presence of osteophytes are the commonest findings reported for both plain radiography and MRI. MRI however further revealed disc herniation and desiccation, neural foramina compression and spinal canal stenosis. A systematic review had previously concluded that the Straight Leg Raising test which was a useful tool in this study has low specificity, therefore limiting its diagnostic accuracy in patients with lumbar radiculopathy secondary to disc herniation and in those undergoing surgery for disc prolapsed [16]. However, this test is a pointer to radiculopathy and is useful in resource-poor countries like Nigeria. The pooled sensitivity of the SLRT was 91% with a pooled specificity of 26% [17]. A more recent systematic review to assess clinical utility of SLRT has shown a wide variation in the sensitivity and specificity of the test partly due to differing reference standards and method used. It was also noted that hamstring tightness can give rise to a falsely high sensitivity of the SLRT [18]. In a general practice setting the reproducibility of SLRT was found to be low [19]. Similarly, the femoral nerve stretch test (FNST) used in this study to assess high lumbar radiculopathy has been reported to be falsely positive in some affected patients due to tight or injured muscles of the anterior thigh, and to osseous or joint pathology in and about the hip. The crossed FNST, may however improve the specificity of the FNST and further supports a diagnosis of upper lumbar radiculopathy.[20]

FABER test is also a vital tool in patients with low back pain and was applied in this study. It is indicated in sacroiliac (SI) and hip pathology. With SI joint dysfunction, FABER test has 77% sensitivity and 100% specificity. For hip articular pathology, the FABER test has 81% sensitivity and 25% specificity.[21] FABER test may also be positive in patients with radiculopathy. Advanced Imaging (MRI, CT scan & bone scan) is often thought as having little clinical usefulness in the assessment of spinal pain without specific clinical features to indicate a non-benign cause [22]. Most spinal pains are not accompanied by objective pathology and are often referred to as mechanical pains, myofascial pains or neuropathic pains.

Despite this knowledge, advanced imaging modalities are requested for fear of missing a serious disorder by clinicians. It is normal for healthy individuals, beginning in 3rd decade of life, to have increased prevalence of degenerative changes in their spine with spondylosis, minor degrees of vertebra slippage and foramina stenosis. In fact, clinical care without immediate imaging seems to result in no increased odds of failure in identifying serious underlying conditions in patients with risk factors for these conditions. Furthermore, routine imaging is associated with radiation exposure, financial burden on patient & may lead to unnecessary procedures. [23]

Lumbar spine radiography in primary care patients with low back pains of at least 6 weeks duration is not related with improved functioning,

severity of pains or the overall health status but has increased general practitioners workload. Patients receiving x-rays are more satisfied with their care, but more reassured about the possibility of more serious disease causing their low back pains. [23] It is imperative that further research be required to develop & test an educational package that educates patients and GPs about use of radiography and provide the strategies for diagnosing and meeting the needs of patient and of GPs and to be reassured without missing serious underlying disease as cause of spinal pains.[24]

The overall protocol or guidelines on management of low back pain in primary care should be consistent and the unjustified request for radiography in patients with low back pain especially in the absence of red flags for serious spine pathology should be discouraged. Currently, MRI is the preferred investigation for most spinal diseases and is increasingly requested for people with low back pain with objective pathology. However, determining the cause of back pain is complicated as it is often multifactorial and anatomical abnormalities are common in the spine and may not necessarily translate into clinical symptoms. It also has an acknowledged role in planning surgical management in cases of radiculopathy and spinal stenosis.[25]

Basic treatment modalities for LBP are rest and analgesia [26]. Anti-inflammatory drugs, muscle relaxant, immunomodulatory drugs and physiotherapy are added as required. Surgery is usually required in recalcitrant cases and specifically when there is disc herniation or spinal canal stenosis with compressive symptoms as is the case with 8 of the patients who were referred for surgery. The high rate of defaulters recorded is presumably due to poor response to therapy with patients seeking alternative solutions or possible improvement in symptoms of the patients. The other interventions available elsewhere include epidural corticosteroid injections, chiropractic care, spinal manipulation, manipulation under anaesthesia, acupuncture, psychotherapy, amongst others.[27-29].These were however not done in our study.

Our study has therefore shown that LBP may not be as uncommonly seen among Africans as earlier reported. A high index of suspicion is needed in detecting remote causes of some back pain particularly that have extended beyond the 'self-limiting' window of acute low back pain. This enhances early intervention and thereby preventing functional impairment or disability which are direct societal, economic and public health burden.

Acknowledgement

Many thanks to Drs. Iyun and Puneet Jalan – Radiologists at Mecure Healthcare, Lagos for interpreting the radiographs and MRI. Also to the radiologists at Afriglobal Medicare and to Dr. M.A Olusola-Bello, Radiologist at CLINIX Healthcare.

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Afr. J. Med. Med. Sci. (2019) **48,** 217-223

Impact of radiotherapy facility on indoor background radiation exposure at the University College Hospital, Ibadan

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Abstract
Background: The impact of high energy radiotherapy machine, used for cancer management at the University College Hospital, Ibadan, on indoor background radiation exposure of humans (staff, patients and their relatives) has been assessed.
Methods: Gamma radiation detectors were used to measure background radiation exposure rate at designated areas within the Department of Radiation Oncology over a period of three years (2014 – 2016).
Results: The mean indoor background radiation exposure rate (μR/hr) measured at these areas ranged from 0.139±0.053 to 0.157±0.061 while the corresponding mean absorbed dose rate (nGy/hr) ranged from 1.210±0.459 to 1.367±0.531. The effective dose, which is the radiation quantity defined by the International Commission on Radiation Protection (ICRP) to specify annual dose limit for both radiation workers (20 mSv averaged over 5 years) and the general public (1 mSv), was determined from the background radiation absorbed dose rate per annum and compared with the ICRP recommended radiation dose limit for general public. The mean annual effective dose (mSv) arising from background radiation obtained within the department of Radiation Oncology ranged from 0.019 to 0.021, which is about 2% of the recommended dose limit (1 mSv) for general public.
Conclusion: This result showed that the presence of high energy radiotherapy machine located in this department has no significant effect on the indoor background radiation exposure of people who work in or visit the department. Further study is aimed at measuring both indoor and outdoor background radiation exposure at other departments in the hospital and estimate their health impact on humans.

Keywords*: Indoor background radiation, Radiotherapy machine, Gamma rays, Cancer management, Exposure rate, Effective dose*.

Abstrait
Contexte : L'impact de l'appareil de radiothérapie à haute énergie, utilisé pour la gestion du cancer au Collège Hospitalier Universitaire d'Ibadan, sur l'exposition au rayonnement intérieur des êtres humains (personnel, patients et membres de leur famille) a été évalué.
Méthodes : Des détecteurs de rayonnement gamma ont été utilisés pour mesurer le taux d'exposition au rayonnement de fond dans des zones désignées du Département de radio-oncologie sur une période de trois ans (2014 - 2016).
Résultats : Le taux moyen d'exposition au rayonnement intérieur (μR / h) mesuré dans ces zones variait de 0,139 ± 0,053 à 0,157 ± 0,061, tandis que le débit de dose moyen absorbé correspondant (nGy / h) était compris entre 1,210 ± 0,459 et 1,367 ± 0,531. La dose efficace, qui correspond à la quantité de rayonnement définie par la Commission Internationale de Protection contre les Radiations (CIPR) afin de spécifier la limite de dose annuelle pour les travailleurs sous rayonnement (moyenne de 20 mSv sur 5 ans) et pour le grand public (1 mSv), a été déterminée à partir des résultats suivants : dose de base absorbée chaque année et comparée à la limite de dose de rayonnement recommandée par la CIPR pour le grand public. La dose efficace annuelle moyenne (mSv) résultant du rayonnement de fond obtenu au sein du département de radio-oncologie allait de 0,019 à 0,021, soit environ 2% de la limite de dose recommandée (1 mSv) pour le grand public.
Conclusion : Ce résultat a montré que la présence d'un appareil de radiothérapie à haute énergie situé dans ce département n'avait pas d'effet significatif sur l'exposition au rayonnement de fond à l'intérieur des personnes qui travaillent ou visitent le département. Une étude plus approfondie vise à mesurer l'exposition aux rayonnements de fond intérieurs et extérieurs dans d'autres départements de l'hôpital et à estimer leur impact sur la santé humaine.

Mots clés *: Rayonnement ambiant intérieur, appareil de radiothérapie, rayons gamma, gestion du cancer, taux d'exposition, dose efficace*.

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Introduction

High energy ionizing radiation from megavoltage teletherapy machines are used for the management of cancer patients. This procedure, known as Radiotherapy, is one of the treatment modalities (Surgery, Radiotherapy, Chemotherapy, hormone therapy etc.) of cancer management [1]. Radiotherapy machine is one of the man-made (artificial) sources of ionizing radiation through which patients (medically exposed), radiation workers (occupationally exposed) and the general public can be exposed to ionizing radiation [2]. Radiotherapy machine emits beam of ionizing radiation such as x-rays, gamma rays and electrons, which are used for breaking cancer cells' DNA molecules and destroy their ability to grow or divide [3]. During the process of patients' treatment, some of these radiations (x or gamma rays) from the treatment machine get scattered in all directions. Consequently, the level of background radiation around (indoor and outdoor) the treatment facility can be increased if the treatment room or bunker is not well shielded with adequate thickness of concrete or materials of high density (such as Lead) to absorb these scattered radiations.

Naturally (background) occurring radiation is one of the sources of exposure of humanity to ionizing radiation. The sources of background radiation are both external (cosmic and terrestrial) and internal. Cosmic radiation includes charged particles from the sun, galaxies and stars. Terrestrial radiations are those from radioactive materials found in the soil, water and vegetation and they include Uranium, Thorium, Radium and their decay products [4]. Internal radiations on the other hand are radiation from isotopes inside the human body from birth. These include Potassium-40, Carbon-14 and Lead-210. The radiation doses from cosmic and terrestrial sources vary in different parts of the world due to differences in elevation, locations and effects of the earth's magnetic field.

This study was carried out to assess the impact of scattered radiation (gamma rays) from high energy radiotherapy machine on indoor background radiation exposure of humans (staff, patients and their relatives) at the Radiation Oncology Department, University College Hospital, Ibadan, Nigeria.

Materials and methods

This study was carried out at the Department of Radiation Oncology, University College Hospital, Ibadan, which is one of the eight and most functional radiotherapy centres in Nigeria. The Department has one external beam radiotherapy machine, Cobalt-60 unit (Bhabhatron-II, India) which continuously emits gamma-ray for treatment of about fifty patients, who are living with cancer, per day.

The walls of the treatment room (bunker) housing the Cobalt-60 unit are shielded with concrete of appropriate thickness and density while the remote-controlled door to the bunker is Lead lined. All these mechanisms are put in place to ensure adequate protection of people and the environment against scattered radiation arising from the bunker during patients' treatment.

The department of Radiation Oncology comprises of four major sections namely, clinical area, Brachytherapy suite, External beam treatment area and patients' lying-in wards. The clinical area includes the general waiting area, records unit, consulting rooms, Nurses' table/reception, toilets, departmental offices, seminar room and staff offices while the brachytherapy suite consists of all the facilities for high dose rate brachytherapy procedures. The external beam treatment area consists of waiting area for patients to be treated, dose planning room, engineering room, consulting rooms, chemotherapy room, simulator room, changing cubicle, Orderlies' corner, operators' table/ treatment console and the treatment room. The patients' lying-in ward is located on the first floor and it accommodates both male and female patients on admission.

The locations within the Department, where background radiation exposure was measured were namely, entrance to the department, reception, corridor, waiting area, Orderlies' corner, changing cubicle, treatment console/Operators' area and control area. These areas were monitored for measurement of natural indoor background radiation between July 2014 and September 2016 with calibrated digital gamma survey meters, Victoreen 672 and ThermoEberline FH 40 G. These Survey meters were calibrated once in a year at the Secondary Standard Laboratory located at the National Institute of Radiation Protection and Research, University of Ibadan, Ibadan under the Nigerian Nuclear Regulatory Authority (NNRA), Abuja. The Activity of Cobalt-60 radioactive source in the radiotherapy machine as at July 2014 and September 2016 was 224.5 TBq and 168.8 TBq respectively. This area monitoring was part of routine quality assurance procedures put in place in the department to ensure radiation protection of patients, personnel and the environment.

The survey meters were used to measure background radiation exposure (in air) rate in μR/hr

Table 1: Exposure Rates measured at various locations at the Department of Radiation Oncology

Location	Exposure Rates (μR/hr)							
	2014		2015		2016			
	VT	TE	VT	TE	VT	TE	Mean	SD
Entrance	0.141	0.163	0.146	0.118	0.092	0.249	0.152	0.054
Reception	0.130	0.161	0.218	0.117	0.079	0.238	0.157	0.061
Corridor	0.134	0.158	0.144	0.109	0.079	0.236	0.143	0.053
Waiting Area	0.128	0.157	0.142	0.114	0.080	0.230	0.142	0.051
Orderlies' Area	0.125	0.157	0.135	0.109	0.077	0.232	0.139	0.053
Changing Cubicle	0.125	0.153	0.136	0.105	0.141	0.237	0.149	0.046
Operators' Area	0.123	0.154	0.138	0.108	0.078	0.244	0.141	0.057
Control Area	0.127	0.155	0.145	0.100	0.141	0.240	0.151	0.047

Table 2: Absorbed Dose Rates measured at various locations at the Department of Radiation Oncology LocationAbsorbed Dose Rates (nGy/hr)

Location	Absorbed dose rates (nGy/hr							
	2014		2015		2016			
	VT	TE	VT	TE	VT	TE	Mean	SD
Entrance	1.228	1.420	1.266	1.029	0.804	2.167	1.319	0.467
Reception	1.128	1.397	1.892	1.022	0.689	2.072	1.367	0.531
Corridor	1.162	1.377	1.254	0.950	0.687	2.057	1.248	0.465
Waiting Area	1.114	1.362	1.238	0.990	0.692	1.998	1.232	0.440
Orderlies' Area	1.091	1.363	1.173	0.948	0.666	2.017	1.210	0.459
Changing Cubicle	1.086	1.327	1.180	0.912	1.222	2.066	1.299	0.401
Operators' Area	1.073	1.337	1.197	0.939	0.680	2.123	1.225	0.494
Control Area	1.109	1.346	1.259	0.866	1.225	2.087	1.315	0.413

and a conversion factor of 8.7 nGy/μR was used to convert it to absorbed dose rate in nGy/hr. In order to convert the absorbed dose in air to its equivalence in human body, a conversion factor of 0.7 Sv/Gy was used [5]. Also, to estimate the average number of hours people, especially the personnel, spend indoors within the department of radiation oncology, an occupancy indoor factor of 0.75 was used [6]. The effective dose per annum received by an individual at each of the areas monitored was then evaluated from the measured exposure rate and the correction factors mentioned above. All data was analyzed using the Microsoft excel software version 2016 and the results were presented in tables and clustered column charts.

The equations used for determination of various radiation quantities considered in this study are as shown below:

$$\text{Absorbed dose rate } \frac{\text{nGy}}{\text{hr}} = \text{Exposure dose rate } \frac{\mu\text{R}}{\text{hr}} \times 8.7\ \text{nGy}/\mu\text{R} \quad (1)$$

$$\text{Effective dose mSv/yr} = \text{Absorbed dose rate } \frac{\text{nGy}}{\text{hr}} \times 8760\ \frac{\text{hr}}{\text{yr}} \times 0.75\ \text{Gy} \times 0.75\ \frac{\text{Sv}}{\text{Gy}} \quad (2)$$

Results

The mean value and standard deviation (SD) of exposure rates measured with Victoreen (VT) and ThermoEberline (TE) survey meters at selected areas of the department within a period of three-year (2014 – 2016) are presented in Table 1. These values, which ranged from 0.139±0.053 to 0.157±0.061μR/hr, are the background radiation exposure rate in air measured at various locations within the Department of Radiation oncology. Similarly, the absorbed dose rate derived from the measured background exposure rates are presented in Table 2. These ranged from 1.210±0.459 to 1.367±0.531 nGy/hr. The annual effective doses evaluated from the absorbed dose rates and corrected for number of hour per year, the indoor occupancy factor and absorbed dose rate in air to tissue conversion factor are presented in Table 3. These values ranged from 0.019±0.032 to 0.021±0.035 mSv/yr. Figures 1 and 2 are clustered column charts showing the average annual effective doses measured at different locations using VT and TE detectors respectively while the clustered column chart in figure 3 compares the mean average annual

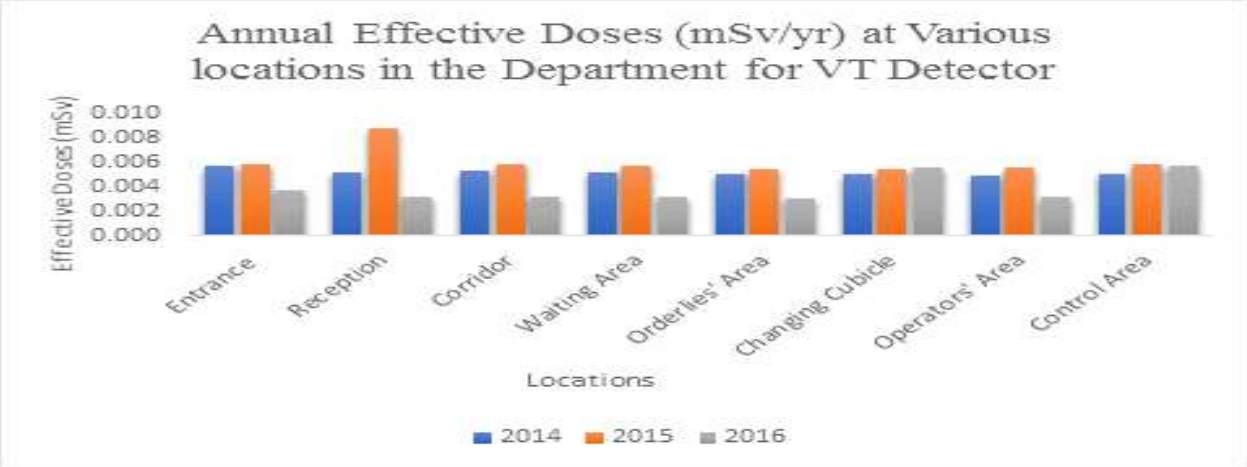

Fig 1: Annual effective dose measured with victoreen detector

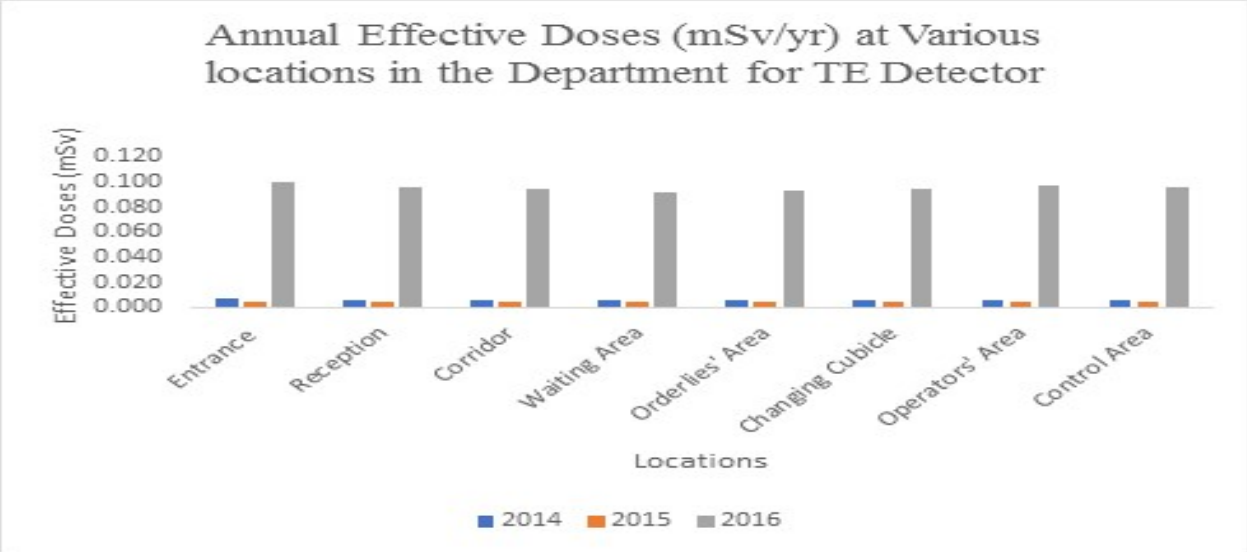

Fig 2: Annual effective dose measured with thermoeberline detecto

Table 3: Annual effective dose measured at various locations at the Department of Radiation Oncology

Location	Annual Effective Dose (mSv/yr)							
	2014		2015		2016			
	VT	TE	VT	TE	VT	TE	Mean	SD
Entrance	0.006	0.007	0.006	0.005	0.004	0.100	0.021	0.035
Reception	0.005	0.006	0.009	0.005	0.003	0.095	0.021	0.034
Corridor	0.005	0.006	0.006	0.004	0.003	0.095	0.020	0.033
Waiting Area	0.005	0.006	0.006	0.005	0.003	0.092	0.019	0.032
Orderlies' Area	0.005	0.006	0.005	0.004	0.003	0.093	0.020	0.033
Changing Cubicle	0.005	0.006	0.005	0.004	0.006	0.095	0.020	0.034
Operators' Area	0.005	0.006	0.006	0.004	0.003	0.098	0.020	0.035
Control Area	0.005	0.006	0.006	0.004	0.006	0.096	0.020	0.034

effective doses obtained in this study with the International Commission on Radiation Protection (ICRP) recommended dose limit of 1 mSv per annum for the general public [7].

Discussion

Radiation Oncology Department is usually misconceived as a place, where anyone who works in or visits the Department will always be exposed

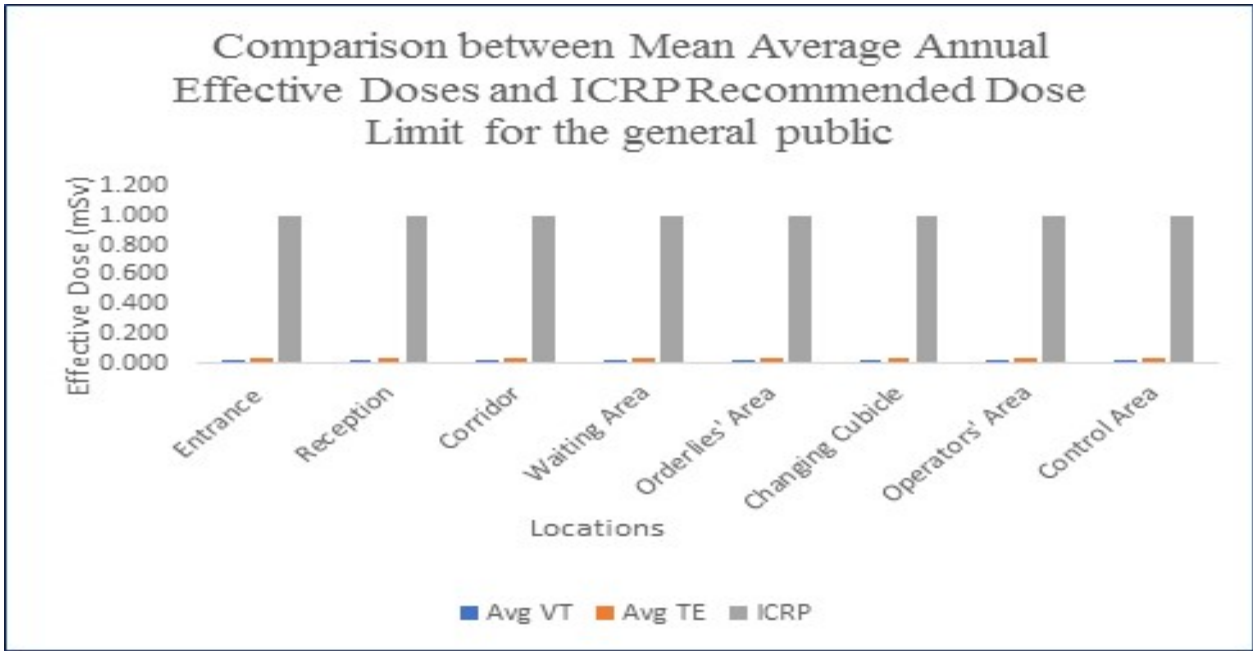

Fig 3: Comparison between mean average Annual effective doses and ICRP Recommended dose limit for the general public

to excessive level of ionizing radiation from high energy radiation treatment machine capable of inducing cancer and prevent procreation. This myth is usually believed by some health workers (Nurses, Health attendants, Hospital maids, Orderlies, etc.), who do not have adequate knowledge about radiation protection of radiotherapy facility during their routine duty posting to the Department or when they accompany referred patients to Radiotherapy clinic.

Therefore, this study was conducted partly to correct this myth and also to estimate the impact of ionizing radiation (gamma rays) from high energy radiation therapy machine on the indoor background radiation within the Department and compare the results with the International recommended dose limit for the general public, people who are not radiation workers in a radiation generating facilities.

It can be seen from Table 1 that the lowest mean background exposure rate value (0.139 ± 0.053 μR/hr) was obtained at the place, where Orderlies are normally found during working hours while the highest mean background exposure rate value (0.157 ± 0.061 μR/hr) was obtained at the reception, where the patients and visitors (non-members of staff) to the Department are normally received. This is followed by 0.152 ± 0.054 μR/hr obtained at the entrance to the Department. Although, the place where the Orderlies are located is about 5 m away from the treatment room/bunker yet a minimal background radiation exposure was found there as compared to the background radiation exposure measured at the reception, which is about 20 m away from the treatment room. Therefore, the relatively high background radiation exposure measured at the reception cannot be associated with the radiation emanating from the treatment machine according to the inverse square principle [8]. Apart from radiation from primordial radionuclides in the soil, there is also radiation from the atmosphere (cosmic rays), which tends to raise the level of background radiation in any location close to the outdoor area compared to the areas located indoor. The relatively high background radiation measured at the reception might have been influenced by the cosmic rays due to its closeness to the outdoor. The world is naturally radioactive and approximately 82% of human-absorbed radiation doses which are out of control, arise from natural sources such as cosmic, terrestrial and exposure from intake radiation sources [9].

A similar study (but not in radiotherapy facility), carried out in Keffi Nigeria reported that the indoor background radiation exposure (effective dose) to humans obtained from various houses (residential, churches, etc.) ranged from 0.21 to 0.28 mSv per annum [10]. Also, another study conducted to determine indoor background radiation exposure to humans from soil samples collected from various districts of India reported an indoor background annual effective dose of 0.38 mSv [11]. These values, though within the ICRP recommended dose limit for the general public, are higher than the values obtained in this study.

Jwanbot *et al* [12], Okoye *et al* [13] and Abubakar *et al* [14] conducted similar study in radiology department of hospital in Jos, Port Harcourt and Asaba, Nigeria respectively. The mean indoor radiation level obtained and reported were 2.44 mSv/yr, 0.57 mSv/yr, 0.79 mSv/yr respectively. While the values obtained in Port Harcourt and Asaba were within the acceptable radiation dose limit for the general public, that of Jos was higher, even higher than what is obtained in Radiotherapy department (this study).

It is important to note that Thermo Eberline detector recorded relatively higher values in the year 2016 compared to values in the previous years as shown in fig. 2. This may be due to random nature of radioactivity, the state of its counting device at the time of measurement, power fluctuation and other technical factors. This is why it is advisable in radiation survey measurements to use more than one type of radiation detector (ionization chamber, proportional counter, Geiger counter, etc.) and taking several readings at a given location during measurements.

The ICRP recommends a dose (effective dose) limit of 1 mSv per annum for general public, people who are not radiation workers in a radiation facility. In this study, the annual effective dose obtained from background radiation at strategic locations, where people, other than radiation workers, are likely to be found ranged from 0.019±0.032 mSv to 0.021±0.034 mSv. This value is about 2% of the ICRP recommended dose limit for general public, meaning that the radiation exposure to any visitor to the department of radiation oncology is within the acceptable dose limit.

Conclusion

This study has assessed the impact of a high energy Radiotherapy machine (Telecobalt unit) on indoor background radiation level within a radiation oncology Department in Ibadan. Background indoor radiation doses measured across areas in proximity to the Telecobalt machine and those at distant points were found to be comparable. The annual effective doses resulting from background radiation measurements at all locations were also related and much significantly lower than the recommended dose limit of 1mSv published by the ICRP for general public. This attests to the fact that the telecobalt unit was adequately shielded to ensure radiation safety in the facility when the Cobalt-60 source is both in use and out of use.

Acknowledgements

We sincerely appreciate the undergraduate students of Physics from tertiary institutions in Nigeria, who were on industrial training at the University College Hospital, Ibadan, Department of Radiation Oncology, Medical Physics Unit between 2014 and 2016 for their contributions towards data collection.

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Implementation and assessment of the knowledge and attitudes towards the WHO surgical safety checklist amongst theatre personnel of the University College Hospital, Ibadan: a two year review

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Abstract

Background: - the World Health Organization Surgical Safety Checklist (WHO-SSC) can decrease morbidity and mortality.

Objective: - This study assesse knowledge, satisfaction of theatre personnel and compliance with the WHO-SCC at the University College Hospital, Ibadan

Methods: - Compliance rate was the percentage of records found with WHO-SCC while completeness rate was the percentage of checklists filled. For the staff survey, a self-administered validated questionnaire was used.

Results: - Between January 2014 and December 2015, 8,480 surgeries were performed with 8,140 checklists accounted for (compliance rate of 96%). The completeness rate ranged from 58-92%. Off 455 theatre staff approached, 318 (69.8%) participated (33.3% surgeons, 13.2% anesthetists, 53.5% nurses). Nurses reported satisfaction (p=0.018); more anesthetist than surgeons reported satisfaction (p=0.074). Subjective knowledge was reported as excellent/ very good in nurses 148 (87%), anesthetists 30 (72%) and surgeons 71 (67%). Objective knowledge revealed no significant difference between all groups (p=0.032). Anesthetists believed the checklist improved safety of procedures, surgeons felt it was a waste of time whilst nurses believed it improved communication. All disciplines believed in its ability to enhance safety culture.

Conclusion: - Although the WHO-SCC is used regularly in University College Hospital, Ibadan there is a need for more training to ensure a robust knowledge base.

Keywords: *WHO, safety checklist*.

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Abstrait - 3889

Contexte : - La liste de contrôle de la sécurité chirurgicale de l'Organisation mondiale de la santé (OMS-SSC) peut réduire la morbidité et la mortalité.

Objectifs : - Cette étude évalue les connaissances, la satisfaction du personnel de théâtre et la conformité avec l'OMS-SSC au Collège Hospitalier Universitaire d'Ibadan.

Méthodes : - Le taux de conformité était le pourcentage d'enregistrements trouvés avec l'OMS-SSC, tandis que le taux de complétude était le pourcentage de listes de contrôle remplies. Pour l'enquête auprès du personnel, un questionnaire validé auto-administré a été utilisé.

Résultats : - Entre janvier 2014 et décembre 2015, 8.480 chirurgies ont été effectuées, dont 8.140 listes de contrôle ont été comptabilisées (taux de conformité de 96%). Le taux de complétude variait de 58 à 92%. Sur 455 membres du personnel de théâtre approchés, 318 (69,8%) ont participé (33,3% chirurgiens, 13,2% anesthésistes, 53,5% infirmiers). Les infirmiers ont déclaré être satisfaits (p = 0,018) ; plus d'anesthésistes que de chirurgiens ont déclaré être satisfaits (p = 0,074). Les connaissances subjectives étaient considérées comme excellentes / très bonnes chez les infirmiers 148 (87%), les anesthésistes 30 (72%) et les chirurgiens 71 (67%). La connaissance objective n'a révélé aucune différence significative entre tous les groupes (p = 0,032). Les anesthésistes pensaient que la liste de contrôle améliorait la sécurité des procédures, les chirurgiens estimaient que c'était une perte de temps, tandis que les infirmières pensaient que cela améliorait la communication. Toutes les disciplines croyaient en sa capacité à renforcer la culture de sécurité.

Conclusion : - Bien que l'OMS-SSC soit utilisé régulièrement au Collège Hospitalier Universitaire d'Ibadan, il est nécessaire de renforcer la formation pour assurer une base de connaissances solide.

Mots - clés : *OMS, liste de contrôle de sécurité*.

Introduction

Surgical care usually provides a one stop treatment for a variety of conditions and it will continue to play a strategic role in healthcare globally. However, the increasing complexity of surgical care, most especially the peri-operative period compels the various disciplines (Surgery, Anaesthesia, and Nursing) to complete multiple processes (preventive and therapeutic) both in parallel and sequentially in a bid to ensure that a good outcome for the prospective surgical patient is achieved [I]. Interdisciplinary dialogue fostered by the use of a 'challenge-confirm' checklist focuses attention on critical concerns, opens line of communication and helps members of a surgical team to recognize their important roles in the safe delivery of surgical care [1].

The World Health Organization Surgical Safety Checklist (WHO-SS.C) created in 2008 is an in-expensive but highly effective [2-4] tool capable of fostering patient safety attitudes [3] while also decreasing morbidity and mortality in surgical procedures [5-7]. The 19-item WHO-SSC with 3 distinct phases was designed, like all functional checklists, to integrate into a specific (theatre) work flow pattern to minimize disruption while allowing identification of critical steps/ procedure as well as corrective action if necessary [1]. These phases are the sign-in (SI) phase before anaesthesia, the team time out (TTO) phase before skin incision and the sign out (SO) phase before leaving the theatre suite [8]. A designated checklist coordinator "challenges" the specific discipline to perform the slated task; following which an item is ticked if an answer was given to the corresponding question [1,3]. The generated WHO-SSC becomes incorporated into the patient's clinical notes thereafter.

Reports show that the WHO-SSC has been embraced in at least 122 countries worldwide since its inception, encompassing approximately 4000 hospitals [9], with slightly less than half reporting on its routine use [10,11]. Thus far, the noted barriers of correct implementation include disruption of work flow patterns, unfamiliarity, hierarchy issues, attitude of the surgeon, timing of checks, duplication and lack of communication [12-14]. Further reasons adduced for difficulty in implementing the checklist in healthcare setting include social, cultural and operational factors [2]. A systematic review of the effectiveness of the safety checklist in surgery showed a reduction in the relative risk of morbidity and mortality when the WHO-SSC is used [15] and the largest reduction in morbidity was noted in the low and middle-income countries of the world [6]. However, to replicate the positive impact on morbidity all key operating room personnel must understand the concept and use of the WHO-SSC and there must also be compliance with its use (i.e. completeness and fidelity) [15,16].

Studies in resource poor settings on WHO-SSC have mostly focused on assessing outcomes of its implementation [6, 17, 18], without necessarily examining issues impacting on compliance. We aimed to determine the knowledge, level of satisfaction with use and attitude to the WHO-SSC by the various specialties involved in its use. We also evaluated the level of compliance in the use of the WHO-SSC 24 months after its introduction into our 18 operating suites. To the best of our knowledge, this is the first such report examining these aspects of the use of the WHO-SSC by health care personnel in Nigeria.

Methodology

Setting: The study was conducted at the University College Hospital, Ibadan. This is a 1,200-bedded teaching hospital in south western Nigeria with 18 operating theatre suites serving the diverse specialties of Orthopaedics/trauma, General surgery (colorectal, endocrine, hepatopancreaticobiliary and Surgical oncology), Oral and maxillofacial surgery, Obstetrics/gynecology, Paediatric surgery, Cardiothoracic and vascular surgery, Urologv, Neurosurgery, Otorhinolaryngology, Plastic, Reconstructive and Aesthetic surgery. Following in-service training of the theatre operative team, the WHO-SSC was rolled out simultaneously in all the 18 suites in December 2013.

Assessment of compliance

The study included all surgical procedures performed under general and regional anesthesia between January 2014 and December 2015. During this period, a total of 8,480 surgeries were performed. Cases done under local anaesthesia in the outpatient surgery unit and gastrointestinal endoscopy cases in the endoscopy suite were excluded because the implementation of the WHO-SSC did not include these units. The administered checklists were duplicated with a copy included in each patient's case note, while the second copy was retained in theatre records. All the theatre copies were retrieved and reviewed. The WHO-SSC were collected and compared with the number of performed operations. The number of performed operations (elective/ emergency) and the number of collected WHO-SSC were matched.

The compliance rate was the percentage of patients/medical /theatre records found with checklists while the completeness rate was the

percentage of WHO- SSC that were completed. A complete checklist is a checklist in which all items have been checked.

Health team professional survey

The anonymous self-administered questionnaire was distributed to all theatre personnel (nurses, anesthesiologists and surgical personnel). The nurses included all cadres involved in the perioperative process while anaesthesia and surgery included all doctors in training and consultant staff. The questionnaire forms were handed-out individually after obtaining an informed consent from each respondent. The questionnaire (survey instrument), recently validated and published by Mascherek *et al* [3,19], was used to assess the frequency of use of WHO-SSC, satisfaction with implementation as well as the subjective and objective knowledge along with the attitude norms and behavior towards the WHO-SSC. 1t was pretested in our setting with a consultant and resident each in the specialty of General surgery, Obstetrics and gynecology and anaesthesia and a nurse from each cadre in the theatre.

Outcome measure

The primary outcome measures were whether the WHO-SSC was generally used, the level of compliance and completeness, and the secondary outcome measures were the knowledge of the staff, the level of satisfaction with the WHO-SSC and the attitude to the WHO-SSC.

Data analysis

The data was analysed using descriptive statistics for the total cohort and for each professional group (surgery, anaesthesia, nurses). Categorical variables were presented as frequencies and percentages whereas continuous variables were presented as mean (± standard deviation), median and range. A sum score was calculated based on the number of correctly answered questions out of 10 in assessing their objective knowledge. Differences between continuous variables were assessed using student's T-test, Mann-Whitney test and ANOVA while differences between categorical variables were assessed using chi-square test. In all analysis, a P value of <0.05 was considered statistically significant. Analysis was done using Statistical Package for Social Sciences (SPSS) version 21.

Results

A total of 8,480 surgeries were performed with 5,560 (65.6%) and 2,920(34.4%) cases performed under general anaesthesia and regional anesthesia respectively. In the first year under review (2014), 4,115 surgeries were performed while in the second year (2015) there were 4,365 surgeries. These consisted of 5,142 elective surgeries and 3,338 emergency surgeries. Of the 8,480 surgeries performed, 8,140 cases had checklists available for review giving an overall compliance rate of 96.0%. The highest compliance rate of 93.0% was observed in the 3rd month post-implementation and the lowest of 71% was observed 21 months post-implementation (figure 1). The completeness rate of the checklist reviewed ranged from 92.0% in the third

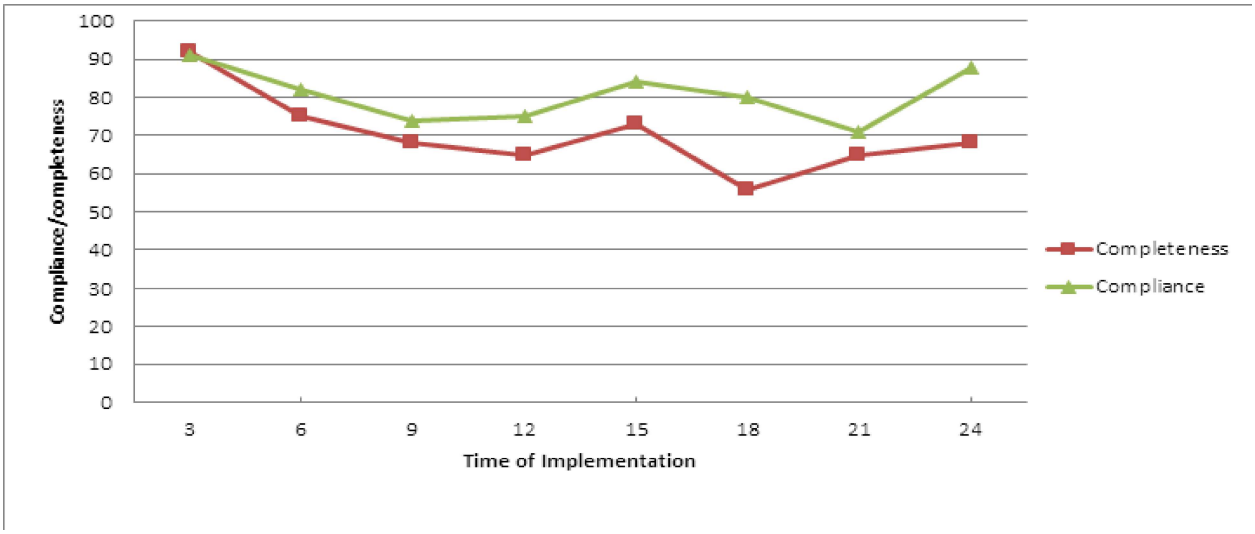

Fig. 1- Showing the compliance rate and completion over the period of review

month post implementation to 58% in the 18th month post-implementation. The completeness and compliance rate varied with year under review and by type of surgery i.e. emergency or elective (see figure 2).

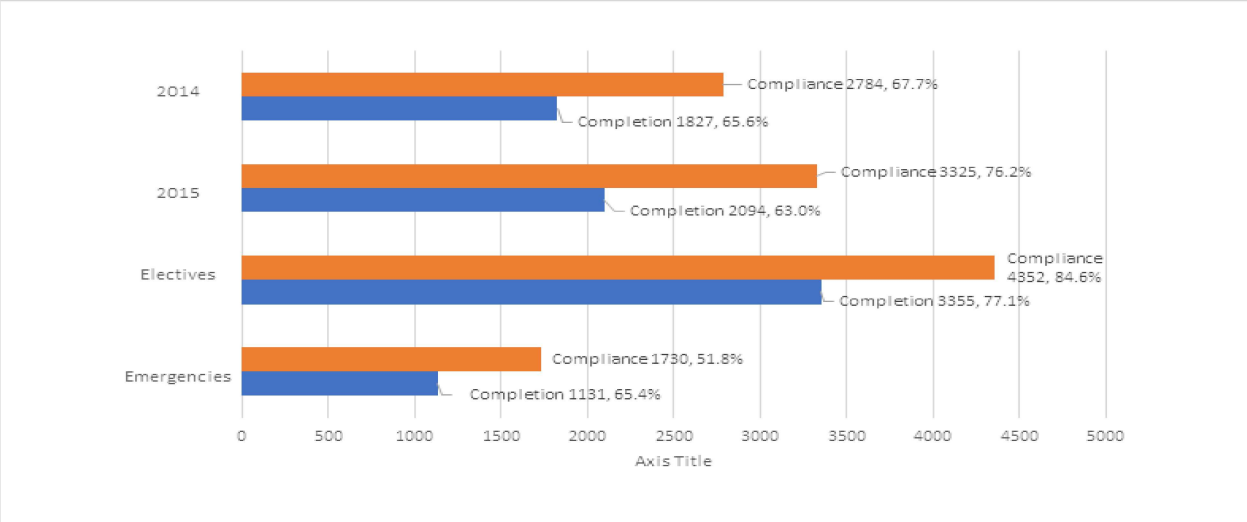

Fig. 2: compliance and completion by year and operation type

Of the 455 health care professionals approached, 318 consented to completing the forms, giving a response rate of 69.8%. This consisted of 106 (33.3%) surgeons, 42 (13.2%) anaesthetists and 170 (53.5%) nurses respectively (Table 1). There were more males among the surgeons (87, 82.1%) and anaesthetists (29, 69.1%) than the nursing group (16, 9.4%). Slightly over a third of the surgeons were of the junior cadre (40, 37.7%), over half of the anaesthetists were of the junior cadre (24, 57.2%) while the nurses were mostly lower (51, 30%) and middle cadre (84, 59.4%) in level. About half (88, 51.7%) or over half (67, 63.3%) of the nurses and surgeons respectively had been practicing for ten years or less, while most (31, 73.7%) of the anaesthetists had been practicing for a similar period. About a quarter of the anaesthetists had some form

Table 1- Demographical Characteristics of Health Professionals

	Surgery (n=106)	Anaesthesia (n=42)	Nursing (n=170)
Mean age in years (SD)	41(SD±8)	37(SD±7)	38 (SD±8)
Gender			
i.Male	87 (82.1%)	29 (69.1%)	16 (9.4%)
ii.Female	19 (17.9%)	13 (30.9%)	154 (90.6%)
Cadre	Consultant- 27 (25.6%) Senior Registrar-39 (36.7%) Registrar-40 (37.7%)	Consultant- 7 (16.6%) Senior Registrar-11(26.2%) Registrar-24 (57.2%)	Assistant Director-11(6.5%) Chief Nursing Officer-24(14.1%) Assistant CNO-47 (27.7%) Senior NO-37 (21.7%) Nursing Officer-51(30%)
Years of Practice			
i. 0-10	67 (63.3%)	31 (73.7%)	88 (51.7%)
ii. 11-20	19 (7.9%)	6 (14.3%)	71 (41.8%)
iii. 21-30	17 (17.0%)	3 (7.1%)	11 (6.5%)
iv. >30	3 (2.8%)	2 (1.9%)	-
Foreign Exposure			
i. Yes	17 (16.0%)	11 (26.2%)	13 (7.7%)
ii. No	89 (84.0%)	31 (73.8%)	157 (92.3%)

CNO-Chief Nursing Officer, NO-Nursing Officer

of foreign exposure while less than a fifth of the surgeons (17, 16.0%) or nurses (13, 7.7%) had similar exposure.

A total of 239 (75.2%) respondents knew of the WHO-SSC whereas 79 (24.8%) were not aware. A breakdown showed that it consisted of 35 (44.3%) surgeons, 33 (41.7%) nurses and 11(13.9%) anesthetists respectively. A total of two hundred (63%) theatre professional staff specifically alluded to using the WHO-SSC for 81-100% of all operations. Overall the surgeons' estimation (72.6%) of use of WHO-SSC was the highest among the 3 disciplines (p=0.029). Generally, the level of satisfaction with the level of implementation was high. More of the nurses reported being very satisfied than the surgeons (71.2% vs 58.5%; p=0.018), similarly the anesthetists reported being very satisfied than the surgeons (66.7% vs 58.5%; p=0.074). No significant difference was noted between the level of satisfaction reported by the nurses and the anesthetists (71.2% vs 66.7%; p=0.201) (Table 2). Subjective knowledge was self-reported, and it was highest among nurses (148, 87.1%), this was followed by anaesthetists (30, 71.5%) and lowest (71, 67.0%) among the surgeons. With regards to objective knowledge (total number of correctly answered true/false question) overall, a median score of 6.6 out of 10 questions (minimum 3, maximum 10) were answered correctly. No significant difference was found between all three professional groups (p=0.32).

A review of the attitude towards the WHO-SSC showed no specialty predominance, but more staff were positively disposed towards its implementation and use in the operating room. Overall, the anaesthetists believed the WHO-SSC checklist improved the safety of procedures (40, 95.2%) whereas surgeons felt the WHO-SSC checklist time-out was a waste of time (94, 88.7%) and lastly the nurses believed the WHO-SSC checklist time-out improved communication (150, 88.2%) in the operating room.

Discussion

The introduction and implementation of the WHO-SSC into routine procedures at the University College Hospital, Ibadan were done simultaneously in all operating rooms with a desired 100% score both in compliance and completeness. However, the highest ever compliance rate of 93% was achieved in the 3rd month post-implementation. This figure is comparable to the findings by Sendlhofer *et al* and Fourcade *et al* working in other institutions [3,8]. Ensuring consistency in patient safety, while introducing a culture that values achieving it are the main goals for implementing the WHO-SSC [20]. Barriers to the implementation that have been identified by other workers include limited resources that preclude the acquisition of standard infrastructural and technical requirements in the low-income countries [2I-24). A vivid example is the finding by Kwok *et al* [17] who identified insufficient

Table 2-Frequency of use, satisfaction, subjective knowledge and attitude to use of the WHO-SSC

	Surgery (n=106)	Anaesthesia (n=42)	Nursing (n=170)
Frequency of use			
i. 0-20%	3 (2.8%)	-	9 (5.3%)
ii. 21-40%	6 (5.7%)	6 (14.3%)	3 (1.8%)
iii. 41-60%	7 (6.6%)	6 (14.3%)	11 (6.5%)
iv. 61-80%	13 (12.3%)	11 (26.2%)	43 (25.2%)
v. 81-100%	77 (72.6%)	19 (45.2%)	104 (61.2%)
Satisfaction			
i. Very Satisfied	62 (58.5%)	28 (66.7%)	121 (71.2%)
ii. Somewhat Satisfied	37 (34.9%)	11 (26.2%)	43 (25.3%)
iii. Rather and very Unsatisfied	6 (5.7%)	3 (7.1%)	6 (3.5%)
Subjective Knowledge			
a. Excellent/ very good	62 (58.5%)	22 (52.4%)	130 (76.5%)
b. Good	9 (8.5%)	8 (19.1%)	18 (10.6%)
c. Poor and very poor	35 (33.0%)	12 (28.6%)	22 (12.9%)
Attitude to use			
Improves safety of procedures	12 (11.3%)	40 (95.2%)	15 (8.8%)
A waste of time	94 (88.7%)	11 (26.2%)	24 (14.1%)
Improves team communication	11 (10.4%)	22 (53.4%)	150 (88.2%)

numbers of pulse oximeter as a barrier to checklist compliance. These barriers were not the objectives of our study.

The variability in compliance and completeness when comparing the two years that we reviewed suggest that implementing a WHO-SSC into a routine theatre protocol may represent a paradigm shift that requires not only willing health care professionals but also the expertise to implement and constantly improve such a tool [3]. This variability in compliance and completeness was similarly observed by Sendlfoher G *et al* [3]. ln assessing and comparing compliance between institutions that have adopted a stepwise approach to implementation of the checklist and institutions such as ours with a one -off clinical in-service training, we found subtle differences in the compliance rates but notable difference in the completeness rates [3,25,26]. The stepwise approach to implementation consists of focus group discussions, role play and contact person introduction as argued by Sendlhofer [3]. Other factors that one must also take into consideration when implementing the WHO-SSC checklist are the inherently problematic hierarchical team dynamics and a more complex interrelation between checklist procedures, context, culture and behavioral changes [16]. Not to be underestimated when comparing different settings is the disparity in availability of infrastructural requisites and systems support, because while regular audit, robust data collection systems, institutional support protocols are the norm in the western world it is the exception in our setting.

Adopting the 'challenge-confirm' checklist protocol, such as implemented in our center, rather than the 'read-do' protocol has been associated with achievement of improved communication amongst all health care professionals [2]. While the 'challenge-confirm' checklist protocol utilizes a designated checklist coordinator the 'read-do' protocol has a single person who does not speak to anyone in the WHO-SSC process, but ticks off the 'to do' list [1]. The theatre staff in our operating rooms agreed with the assertion that the WHO-SSC checklist improved communication in the operating theatre setting after its implementation [2]. Indeed the 'to do' lists have been found to rarely address the more complex cases of error and ultimately patient harm in an operating theatre setting [I]. To further ensure compliance some authors have suggested the inclusion of unannounced external observers (on-site visits) into the SSC implementation process [27]. They however, noted that there maybe overestimation that may arise from the presence of an external observer (Hawthorne effect) [27].

Our study revealed a high level of acceptance of the WHO-SSC among all cadres of theatre staff, a finding that agrees with previous studies [2,28]. In comparing the noted awareness level with previous studies from Europe and South America [2,29], our level of awareness (75.2%) was however suboptimal because the minimum recorded awareness level was 90% in those climes. Subjective knowledge was mostly reported as very good in all cadres of staff, but the mean objective knowledge did not confirm thorough understanding by all. It is still early days in the implementation of the WHO-SSC in our center but having inculcated it as part of routine theatre protocol for more than 2 years; we expect a commensurate improvement in knowledge by now. Both objective and subjective knowledge are key factors for the evaluation of situations, attitudes and behavior [30]. The suboptimal objective knowledge may be attributed to the on-off clinical in-service implementation process adopted by the hospital management which only highlights why the WHO-SSC should be used but fails to show how it should be implemented [9]. Secondly, audit and refresher courses which have been shown to improve uptake and continued use of the WHO-SSC [3], was lacking. These may be responsible for the dip in compliance / completeness after the initial high of 93% and 92% respectively.

The frequency of use reported in our study was high. This can be interpreted along with the level of satisfaction in reflecting the level of acceptance by the theatre personnel [27]. Surgeons had the highest level of frequency of use and fair level satisfaction reported despite the appellation of being the least enthusiastic of a theatre team in changing their habits [3]. From the foregoing, we agree with Aveling *et al* [16] that with more effort directed at engaging and securing buy-in from surgeons there can be successful adoption of innovative ideas such as the introduction of the WHO-SSC in peri-operative care. We did not find any significant difference in level of satisfaction between the three professional groups as opposed to the finding by Maschereck *et al* [19]. We attribute this to the difference in the number of respondents recruited as they had a larger sample size than ours.

Limitations of the study include its' cross-sectional nature and the lack of baseline figures on the WHO-SSC in the institution to compare with. In addition, we did not collect data to demonstrate the

impact of the WHO-SSC on the rate of complications before and after. Finally, the study did not assess the impact of the equipment constraint inherent in many of our government centres on the utilization of the checklist. However, these can be the objective of future prospective studies.

In concluding, we note that although the WHO-SSC is used on a regular basis in the University College Hospital, Ibadan, more training is necessary to improve the knowledge base of the staff. In addition, ticking off a checklist does not by itself reduce intra or post-operative complications but the actual performance of the actions it calls for [31]. The potential benefits accruable from the use of the WHO-SSC in a low-cost setting is not in doubt. This is however, predicated not only on a successful but isolated implementation but also ensuring that acknowledged deficits and gaps in operating rooms in low income setting are resolved because the WHO-SSC of itself will not provide the important technical resources (diathermy, anaesthesia machine, antibiotics etc.) that improves patient outcome. Hospitals in developing countries need to attain an acceptable minimum standard in terms of operating room equipment to ensure completeness of the process.

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Afr. J. Med. Med. Sci. (2019) **48,** 183-189

Contributors to disparity in missed opportunity for intermittent preventive treatment for malaria in pregnancy in Nigeria

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Abstract

Background: Malaria remains a challenging public health issue in Africa, with preponderance for pregnant women. Considering Nigeria's significant contribution to the global burden of malaria, the low uptake of IPTp-SP is of significant concern considering several evidences of disparity in missed opportunity for delivering IPTp-SP. This study was conducted to determine the contributors to and the magnitude of their effect on uptake, to provide baseline information for measuring disparity and monitoring effects of interventions through trend analysis.

Method: The Nigeria Demographic Health Survey (NDHS) dataset 2013 was used and data on socio-demographic, (Antenatal care) ANC characteristics and IPTp-SP use were used to assess IPTp uptake and missed opportunity. A missed opportunity for IPTp delivery is an ANC visit in which IPTp was not delivered per policy. Analysis was done using SPSS version 21. Measures of associations used chi-square test. The level of significance was set at 5%. Index of disparity was used as a summary measure of disparity for determinants of missed opportunity.

Results: The mean age of the respondents was 28.69±0.19 years. Majority (25.4%) were Hausa/ Fulani tribe, 41.5% had secondary education. Most (28.6%) are of the richest wealth quintile, 52.6% are Christians and 94.9% are currently cohabiting. Majority (51.1%) resided in urban area and (23.5%) South West while 41.1% had less than two previous pregnancies. Contributors to disparity for missed opportunity in Nigeria were level of education, wealth index, ethnicity, place of residence, region and parity of respondents. The greatest contributor to disparity for missed opportunity was region of residence with the least being parity.

Conclusion: The need for strategic cost-effective interventions that focuses on the greatest contributors to decrease disparity for missed opportunity is important. There is an increased need to explore regional determinants of missed opportunity.

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Keywords: *Disparity, missed opportunity, intermittent preventive treatment of malaria, malaria in pregnancy, Nigeria.*

Abstrait

Contexte : Le paludisme reste un problème de santé publique difficile en Afrique, avec une prépondérance pour les femmes enceintes. Compte tenu de l'importante contribution du Nigeria à la charge mondiale du paludisme, la faible absorption d'IPTp -SP est très préoccupante compte tenu de plusieurs preuves de disparité dans occasion manquée pour la prestation IPTp -SP. Cette étude a été menée dans le but de déterminer les facteurs contributifs et l'ampleur de leur effet sur l'absorption, afin de fournir des informations de base permettant de mesurer les disparités et de surveiller les effets des interventions au moyen d'une analyse des tendances.

Méthode : L'ensemble de données de l'enquête sur la santé démographique du Nigeria (NDHS) 2013 a été utilisé et les données sur les caractéristiques socio-démographiques de l'ANC, (soins prénatals) et l'utilisation d'IPTp -SP ont été utilisés pour évaluer l'absorption d'IPTp et opportunité manquée. Une opportunité manquée pour la prestation IPTp est une visite ANC au cours de laquelle IPTp n'a pas été livré conformément à la stratégie. L'analyse a été réalisée à l'aide de la version 21 de SPSS. Les mesures d'associations ont été utilisées avec le test du chi-carré. Le niveau de signification a été fixé à 5%. L'indice de disparité a été utilisé comme mesure synthétique de la disparité pour les déterminants des opportunités manquées.

Résultats : L'âge moyen des répondants est de 28,69 ± 0,19 ans. La majorité (25,4%) était composée de tribus Hausa / Fulani, 41,5% avaient suivi des études secondaires. La plupart (28,6%) appartiennent au quintile de richesse le plus riche, 52,6% sont chrétiens et 94,9% cohabitent actuellement. La majorité (51,1%) réside en zone urbaine et (23,5%) dans le sud-ouest, tandis que 41,1% ont eu moins de deux grossesses antérieures. Les facteurs contribuant à la disparité des opportunités manquées au Nigéria sont le niveau d'éducation, l'indice de richesse, l'origine ethnique, le lieu de résidence, la région et la parité des répondants. Le facteur qui contribue le plus à la disparité des opportunités manquées est la région de résidence, le moins égal étant la parité.

Conclusion : Le besoin d'interventions stratégiques rentables axées sur les principaux contributeurs afin de réduire les disparités pour les opportunités

manquées est important. Il est de plus en plus nécessaire d'explorer les déterminants régionaux des opportunités manquées.

Mots - clés : *Disparité, opportunité manquée, traitement préventif intermittent du paludisme, paludisme pendant la grossesse, Nigéria.*

Introduction

Malaria remains a challenging public health issue in the African region, where the impact of the disease is particularly predominant [1]. Although the disease is known to affect all persons living in malaria endemic regions, vulnerability is higher for pregnant women and children under five in these regions [2]. Of the 125 million pregnant women at risk of malaria globally, approximately half of this burden is from malaria endemic regions of which sub-Saharan Africa contributes 50% [3, 4].

In view of the dire consequences that malaria has on pregnant women and their fetus, the World Health Organization (WHO) in conjunction with several stakeholders [2] under the Roll Back Malaria Initiative in 2001 recommended the intermittent preventive treatment of malaria in pregnancy (IPTp-SP) as one of the malaria control strategies targeted specially for pregnant women in malaria endemic regions. It recommends that every pregnant woman be administered at least two doses of Sulphadoxine Pyrimethamine during Antenatal care (ANC) visit starting from the second trimester, as a preventive treatment for malaria in pregnancy. This recommendation is based on the evidence that IPTp-SP is cost effective and reduces the risk for maternal anemia, low birth weight, and perinatal mortality by 38%, 43% and 27% respectively among first and second time pregnancies [5].

Following this, IPTp-SP adoption across Africa has been slow and national implementation has been slower. More so, adoption across countries was largely dependent on political will and the strength of the national health system [6, 7]. These coupled with the low uptake of IPTp-SP has been largely responsible for the slower progress in the prevention of the occurrence of malaria in pregnancy compared to the success reported in the battle against malaria [8]. Hence, no African country has met the RBM uptake target since 2006 where only 6 countries met the 60% expected coverage for IPTp-SP. This low uptake for IPTp-SP was initially attributed to low ANC attendance, but recent evidences have shown that this trend is independent of ANC attendance [9]. This sub-optimal IPTp-SP uptake within the context of reported high ANC attendance represents significant missed opportunities for IPTp-SP at ANC facilities [10]. Consequently, an ANC visit with non-delivery of IPTp-SP as per policy is termed a missed opportunity [9].

Nigeria is not exempt from this, with persistently high level of missed opportunities despite high rates of ANC visits. Five years post implementation, the 2010 Nigeria Malaria Indicator survey reported that only 15% of women who had given birth in the last two years preceding the survey had received even one dose of SP during ANC [12]. While several studies have shown that missed opportunity for IPTp-SP uptake is a complex mix of social, demographic, economic and cultural factors that influence the demand side for service [13,14,11], institutional challenges are also significant influences on the supply side [13,14]. These factors have resulted in observed disparities for missed opportunities for IPTp-SP across socio-demographic characteristics of pregnant women and exploring the contribution of each of these characteristics can assist in proffering effective and practical solutions to the challenge of low uptake and high missed opportunity for IPTp-SP in Nigeria. This initiative has become imperative following the global call for the upscale of IPTp-SP uptake across implementing states following the updated recommendation for the preventive treatment of malaria in pregnancy [15]. This study utilizes secondary data to explore the pattern of disparity in missed opportunity for IPTp-SP and its contributors across Nigeria.

Methods

We carried out a secondary analysis of data from the 2013 National Demographic and Health Survey (11); a nationally representative population-based cross-sectional survey involving data collection from selected locations in the 36 states of the federation and the Federal Capital Territory. Permission to use the NDHS dataset was obtained from the MEASURE DHS program.

The study population was randomly selected using a three-step stratified sampling method. Stratification was achieved by separating each state into urban and rural areas. Selected localities were used in the first stage, enumeration areas in the second and a fixed number of household were selected through equal probability sampling for the third stage. All women aged 15-49 who were either permanent residents of the selected households or visitors who stayed in the households the night before the survey were eligible to be interviewed.

The women's health questionnaire was administered to women aged 15- 49 years where a

sample of 37,928 individuals was originally drawn. For the purposes of this study a total of 6910 women whose most recent pregnancy resulted in a live birth in the past 2 years with more than 4 ANC visits were analyzed. Respondents were recategorized into 2 groups; those who received less than two doses of IPTp-SP and those with two or more doses. As nearly all surveys were conducted before the updated WHO policy in 2012 emphasizing dosing of IPTp-SP at each ANC visit, the proportion receiving two or more doses of IPTp-SP was used as the primary comparison in this analysis.

Relevant questions were identified from the women questionnaire dataset. To ensure that calculated estimates were independently observed from recent births, analyses was performed using information on the most recent pregnancy resulting in a live birth within the last two years prior to survey date. Data on pregnancy, ANC attendance and Sulphadoxine pyrimethamine use were extracted from the survey and analyzed using SPSS statistical package (version 21). The data was weighted using the women individual sample weight. The independent variables were derived from the socio-demographic details of the women while the dependent variable used for this study was missed opportunity for IPTp-SP. Bivariate analyses of selected socio-demographic characteristics were associated with missed opportunity for IPTp-SP.

Statistical significance level was set at P <0.05. Missed opportunity among women whose most recent pregnancy resulted in a live birth in the past 2 years in percentage was defined as:

Women aged 15-49 who had a live birth 2 year preceding the survey and who attended ANC at least 4 times in their last pregnancy and received less than 2 doses of IPTp.

Total number of women aged 15-49 who had a live birth 2 year preceding the survey and who attended ANC at least 4 times in their last pregnancy.

Negative values show lower rates compared to reference while positive deviance values indicate rates that are more than the reference. The index of disparity was used to summarize the observed disparity from a pre-determined reference value (national average of missed opportunity for IPTp-SP) and was defined as the ratio of the absolute differences between rates of the specific groups within the population and the total population and the number of specific groups within the population, multiplied by the total population rate as a percentage. This was used to measure disparity as a reference to total population across the different socio-demographic characteristics by standardizing disparity measure. It gave a summary of deviation across the observed socio-demographic contributors of disparity for missed opportunity in Nigeria while providing a standardized measure for determining the magnitude of contribution to disparity across the different contributors to missed opportunity for IPTp-SP. It is also an effective measure for tracking disparity for different health parameters across sub-population groups and changes over time.

Index of Disparity = $(^1| r_{(1-n)}\text{-}R|/n)/R*100$

r=Group rate, R=Total population rate, n= number of sub-populations

Table 1: Socio-demographic characteristics of respondents

Variables N=6910	n(%)
Respondents age group (years)	
<20	418 (6.1)
20-34	5028 (72.8)
≥35	1464 (21.2)
Mean age in years	28.69±0.19
Ethnicity	
Yoruba	1375 (19.9)
Igbo	1288 (18.6)
Hausa/Fulani	1753 (25.4)
Others	2493 (36.1)
Highest level of education	
No education	1807 (26.1)
Primary education	1467 (21.2)
Secondary education	2867 (41.5)
Higher/Tertiary education	769 (11.1)
Wealth Index	
Poorest	607 (8.8)
Poorer	1086 (15.7)
Middle	1466 (21.2)
Richer	1776 (25.7)
Richest	1976 (28.6)
Living status	
Never in union	204 (3.0)
Currently in union/Living with partner	6558 (94.9)
Formerly in union/Living with man	148 (2.1)
Religion	
Christian	3614 (52.6)
Islam	3217 (46.9)
Traditionalist	35 (0.5)
Missing data	44
Type of place of residence	
Urban	3531 (51.1)
Rural	3379 (48.9)
Region of residence	
North central	996 (14.4)
North east	936 (13.5)
North west	1475 (21..3)
South east	1024 (14.8)
South south	857 (12.4)
South west	1623 (23.5)

Table 2: Missed opportunity across selected socio-demographic characteristics and its index of disparity

Variable N=6788	Missed opportunity (%)	Disparity from National Average	Index of disparity	95% CI	x^2	p-value
Level of education						
No education	61.6	-11.8	7.9	58.2-64.9	175.250	<0.001
Primary	75.9	2.5		73.2-78.4		
Secondary	78.5	5.1		76.4-80.5		
Tertiary	77.1	3.7		73.1-80.7		
Wealth index						
Poorest	69.3	-4.1	5.2	65.0-73.3	69.670	<0.001
Poorer	68.9	-4.5		65.0-72.5		
Middle	70.8	-2.6		67.3-74.0		
Richer	72.2	-1.2		69.0-75.2		
Richest	80.2	6.8		77.6-82.6		
Ethnicity						
Yoruba	86.0	12.6	12.5	83.4-88.3	383.687	<0.001
Igbo	79.0	5.6		75.9-81.8		
Hausa/Fulani	56.8	-16.6		53.5-60.1		
Others	75.3	1.9		72.8-77.7		
Place of residence						
Urban	76.0	2.6	3.5	73.8-78.0	23.571	0.001
Rural	70.8	-2.6		68.4-73.0		
Region of residence						NC
68.4	-5.0	13	63.8-72.7	526.780	<0.001	
NE	70.8	-2.6		67.7-73.7		
NW	53.8	-19.6		49.6-57.9		
SE	78.3	4.9		74.8-81.4		
SS	85.2	11.8		82.1-87.8		
SW	86.7	13.3		84.3-88.8		
Parity						
1-2	76.1	2.7	3	74.1-78.1	25.662	<0.001
3-4	73.5	0.1		70.9-76.0		
>4	69.6	-3.8		66.9-72.2		
National Average	73.4			71.8-75.0		

Results

This study analyzed socio-demographic and health data of 6,910 women aged 15 to 49 years who gave birth within two years of the survey and who made a minimum of four antenatal care (ANC) visits during the last pregnancy. Socio-demographic characteristics are presented in Table 1. The mean age of the women was 28.69±0.19 years, with majority 5028 (72.8%) of the eligible respondents falling within the age group of 20-34 years. The Hausa/Fulani tribe comprised about a quarter, 1753 (25.4%) of the respondents. The highest level of education for 2867 (41.5%) of the respondents was secondary education. Most of the respondents 6558 (94.9%) were currently in union or living with a partner, 1976 (28.6%) were in the richest wealth quintile and 3614 (52.6%) were Christians. Furthermore, it shows that most 3531 (51.1%) of the respondents resided in the urban area and aggregation by region of residence shows that 1623 (23.5%) of the women reside in the South west region while only 857 (12.4%) resided in the South South.

Table 2 shows the rates of missed opportunity across selected socio-demographic characteristics of respondents, deviation from the National average rate for missed opportunity for IPTp-SP and index of disparity for each variable analyzed. Missed opportunity was highest amongst respondents with secondary education (78.5%) compared to those with other levels of education. It was also highest among those within the richest wealth quintile (80.2%) compared to those within other level of the wealth index. Regarding ethnicity, missed opportunity was highest among the Yorubas (86.0%) compared to other tribes and higher in the

South West (86.7%) compared to other regions. Missed opportunity in urban places of residence (76.0%) was also higher than those in rural places (70.8%) while those with 1-2 children had more missed opportunity (76.1%) compared to those with 3-4 (73.5%) or those with greater than 4 children (69.6%). All these differences were statistically significant.

Region of residence was the greatest contributor to disparity in missed opportunity with an index of disparity of 13, followed by ethnicity (12.5), level of education (7.9), wealth index (5.2), place of residence (3.5) and the least is parity with an index of 3.

Discussion

This study explored the disparate rates of missed opportunity across selected socio demographic and economic characteristics and provides information on disparity using a summary measure of health disparity.

The study shows that level of education, wealth index, ethnicity, type of place of residence, region and parity are associated with missed opportunity in Nigeria. Similar studies have also shown the association between education [8] and socio-economic status [16,17] with missed opportunity for IPTp-SP. This study showed that women with secondary and tertiary education were more at risk for missed opportunity compared to those with no education which is contrary to the study by Masaninga *et al.*, (2016) where increased uptake of IPTp-SP was associated with secondary education [17]. This is likely because educated women are more likely to have a busier schedule because of work and thus do not fully maximize all the benefits of the ANC visit. This may be problematic in the face of other limited information provided by lower level health workers on the rationale for using IPTp-SP in pregnancy. This same pattern was observed among women within the richest quintile who were more likely to have missed opportunity compared to women of other quintiles.

Bivariate analysis shows that type of place of residence was associated with missed opportunity which was higher in the urban place of residence; this is in contrast with findings from the study of uptake of intermittent preventive treatment for malaria in pregnant women in Zambia [17]. This might be due to the inequity of access which may be higher in the urban compared to the rural type of residence hence the increased chances for missed opportunity among clients. This study also shows that region of residence is also associated with missed opportunity for IPTp-SP which is similar to report from other studies [8, 18] done on determinants of IPTp-SP which is a proxy measure for missed opportunity.

The highest rate for missed opportunity was found in the South West while the lowest was reported in the North West region. Previously in Nigeria, the Northern part of the country was reported to have worse pregnancy related indices. A case in study is that of a comparative study of ANC attendance in the Northern region compared to other regions of the country [19], which showed better ANC attendance in the Southern regions. This current reversal may be due to more detailed programme planning and implementation in the Northern part of Nigeria compared to the Southern part because of perceived cultural and religious belief that hinder uptake of hospital-based health interventions.

With regards to pregnancy characteristics, this study in similarity with others shows that parity is a contributor to missed opportunity; with missed opportunity reducing with increasing birth orders [8,16,18]. This may reflect a better knowledge about IPTp-SP with increasing birth order occasioned from attending ANC from previous pregnancies.

The deviance from national average rate for missed opportunity shows the highest deviation was under region of residence where North West region had a deviance of -19.6 which reports the widest negative disparity which was better than the national average. Using the same reference, ethnicity reported a deviation of -16.6 among Hausa/Fulani. This shows that these sub populations have very good indices for missed opportunity when compared to the deviance reported from South West (SW) and South South (SS) with values of 13.3 and 11.8. These deviations from SW and SS are significant and worse compared to the reference rates from the national average for missed opportunity for IPTp-SP. It shows at a glance that rates from these sub population groups with the positive values are worse than national average for missed opportunity for IPTp-SP and such sub units will require strategic interventions focused on reducing the observed margin compared to the reference value (national average for missed opportunity for IPTp-SP). Interestingly, personal characteristics such as education and wealth index were not the greatest contributor. Conversely, region was the greatest contributor to disparity wherein the regions in Northern part of Nigeria where cultural and religious factors predominate have the best indices. This

suggests that other factors such as organization of health services not studied herein may be important.

Conclusion

In the face of the global call to scale-up national uptake of IPTp-SP, by reducing missed opportunity for delivery of IPTp-SP, there is need for stronger political commitment to enforce its implementation and uptake in clinics, as well as increased community awareness about malaria in pregnancy to correct misconceptions about SP. It is also expedient that to reduce or eliminate health disparity with missed opportunity for IPTp-SP, the most cost-effective strategies that will target regional factors responsible for disparity is mandatory while interventions should be individualized to local circumstances within each region. There is a need to highlight the disadvantages of focusing interventions to perceived economically or educationally disadvantaged regions to the neglect of other regions. Replicating successful programme to other regions and allowing programme adaptability to local circumstance is a key way of ensuring successful malaria control interventions in Nigeria.

Ethics approval and consent to participate

The study utilized a secondary data analysis of the Demographic Health Survey, the ethical approval and consent to participate is as described in the Nigerian Demographic Health Survey report of 2013 [20].

Availability of data and material

The data that support the findings of this study are available from the women individual recode dataset of Nigeria Demographic and Health Survey 2013 (NDHS) but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of Demographic and Health Survey (DHS) Program.

Acknowledgements

The authors acknowledge all teaching and administrative staff of the Department of Community Medicine, University of Ibadan for their support and commitment towards the production of a quality manuscript.

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Afr. J. Med. Med. Sci. (2019) **48,** 191-198

Health information-seeking behaviour of pregnant women at the University College Hospital, Ibadan, Nigeria

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Abstract

Background: Health information is a vital aspect of antenatal care. Health seeking behaviour is largely influenced by the availability, accessibility and reliability of such information. In resource-poor nations, there exist strong inclinations to informal sources of information which may pose a threat to accessing qualitative health care.

Methods: A descriptive cross sectional survey of pregnant women attending the ante-natal clinic of the University College Hospital, Ibadan between 1st of September, 2015 and 30th April, 2016. Data collection was via a structured questionnaire which was then analyzed. Descriptive statistics were generated and presented as frequency tables, bar and pie charts.

Results: One hundred and one pregnant women participated in the study. A significant proportion (95.1%) was literate. The mean age of the participants was 32.04 ± 2.34 years. Books and magazines such as "Baby Wise, and The Mama's Natural Guide to Pregnancy and Childbirth" were the most sought after sources of formal information (96 respondents) while the internet (65 respondents) was the more popular source for daily information. While information from health workers especially the physician was the most valuable, attitude of these health care givers was the most important limitation to seeking health information.

Conclusion: With the increasing availability of internet services in Nigeria, a paradigm shift has become inevitable with our findings of about 65% of patients visiting the internet on a daily basis. There is therefore a need to develop a friendly and accommodating atmosphere for seeking health information at various antenatal health posts in Nigeria.

Keywords: *Health information, Behaviour, Antenatal care, Nigeria*

Abstrait

Contexte **:** L'information sur la santé est un aspect essentiel des soins prénatals. Le comportement de recherche de santé est largement influencé par la disponibilité, l'accessibilité et la fiabilité de ces informations. Dans les pays pauvres en ressources, il existe une forte inclinaison aux sources d'informations informelles ce qui peut compromettre l'accès à des soins de santé de qualité.

Méthodes **:** Une étude transversale descriptive des femmes enceintes fréquentant la clinique anténatale du Collège Hospitalier Universitaire, Ibadan entre le 1er Septembre 2015 et le 30 Avril 2016. La collecte des données a été au moyen d'un questionnaire structuré qui a ensuite été analysé. Des statistiques descriptives ont été générées et présentées sous forme de tableaux de fréquences, de diagrammes à barres et à secteurs.

Résultats **:** Cent et une femmes enceintes ont participé à l'étude. Une proportion importante (95,1%) était alphabète. L'âge moyen des participants était de 32,0 ± 2,3 ans. Les livres et magazines tels que 'Sensation de Bébé, et le Guide naturel de la grossesse et de l'accouchement de Maman' étaient les sources d'informations officielles les plus recherchées (96 répondants), tandis que l'internet (65 répondants) était la source d'information quotidienne la plus populaire. Bien que les informations fournies par les agents de santé, en particulier le médecin, soient les plus utiles, l'attitude de ces prestataires de soins de santé était le principal obstacle à la recherche d'informations de santé.

Conclusion **:** Avec la disponibilité croissante des services internet au Nigéria, un changement de paradigme est devenu inévitable avec nos résultats concernant environ 65% des patients visitant l'internet de manière quotidienne. Il est donc nécessaire de créer une atmosphère amicale et accommodante pour rechercher des informations sur la santé dans divers postes de santé prénatals au Nigéria.

Mots-clés : *Information sur la santé, Comportement, Soins prénatals, Nigéria*

Introduction

Information is an important asset required for decision making in all areas of human endeavor. The quality of decision made by people may be related

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to the type of information available to them [1]. For individuals to make informed decision regarding their health; it is important for them to have access to adequate health information when in serious health situations [2].

Unfortunately, evidence has shown that women in developing countries have limited access to adequate health information sources, especially during and after pregnancy [3,4]. This usually limits their ability to make informed decision about their health, navigate complex health systems and can also result in poor maternal and child health outcomes [5].

Previous studies in Nigeria have also reported inadequate access to pregnancy-related health information by women. A survey by the Federal Ministry of Health and Johns Hopkins-Jhpiego revealed that over 60% of Nigerian mothers are not aware of available maternal health services, as well as safe practices to adopt for safe transition to motherhood [6-10]. As a result, they are unable to make informed choices about their health. They end up engaging in risky health behaviours that are based on myths, taboos and religious beliefs [4,9,11]. This health seeking behaviour poses a threat to the health of pregnant women in Nigeria.

To improve women's reproductive and infant health outcomes, an understanding of health information-seeking behaviours and barriers to accessing health information among pregnant women can possibly moderate the consistent negative correlations between health information poverty, and negative maternal and child health outcomes in Nigeria. Although there exist some research on the information sources consulted by pregnant women in Nigeria there has been limited exploration of pregnant women's health information seeking [1,4]. There is lack of comprehensive information on health information seeking behaviour of pregnant women as well as information sources they consult to meet their health information needs. Therefore, this study examined the information sources pregnant women registered at the first tertiary health facility in Nigeria, consult for their health information needs. This was with the intention to identify the most accessed, most reliable and preferred source of health information. This would provide important information on effective strategies for health information dissemination to mothers and to improve women's management of health issues in pregnancy.

Literature Review

Evidence from literature indicates that pregnant women seek information from both formal and informal sources [12,13]. Informal sources of information consulted by pregnant women for their health information needs are newspapers, friends and family. The formal sources of information consulted during pregnancy include doctors, midwives, antenatal classes to a number of sources such as book, and some health sites (WHO, BabyCenter, Mayo Clinic etc.) on the Internet.

A cohort study [14] on the preferences for sources of health information of first-time mothers-to-be in five public maternity hospitals in Australia revealed parents as the most frequently consulted source, followed by medical practitioners. By the time the children reached school age, 78% of the mothers reported consulting health professionals, while only 13% consulted the Internet for health information. Another study in the same country [12] indicated that a significant number of respondents (70%) involved in the survey accessed pregnancy-related information via personal communication with midwives. While less than half (44%) used the Internet for health information, only 28% reported the Internet as a useful source of health information. The most consulted source of health information was books and the least preferred was the group sessions normally organized for pregnant women during antenatal visits.

In Ghana, a survey [15] on health information seeking behaviour of young mothers, revealed informal sources of health information as the key source of pregnancy-related information consulted by the respondents. The qualitative study showed that young mothers registered at the antenatal clinic in Ejisu Government hospital relied mostly on informal sources such as family and neighbours when compared to more formal sources such as midwives, nurses or doctors. This was unlike a report [16] from Ethiopia, where mothers mostly sought pregnancy-related information from doctors and nurses. Factors limiting access to health information were illiteracy, attitude and perception towards information providers and cultural barriers. In line with the Ethiopian report, a study conducted by Onuoha *et al* in Ibadan Metropolis [17] noted that mothers mainly consult formal sources of health information. Doctors and nurses led the list of major sources of pregnancy-related information consulted by the study respondents in Ibadan, Oyo State, Nigeria. Findings from this study indicated that the mothers sought information on cleanliness and immunization.

Another study in the same area of the country [1] indicated that pregnant women sought health information from a number of sources. The sources consulted by the study respondent were health

workers/maternity centre (22.8%), community talk show (22%), radio (20%), primary health centre (21%) the Internet (21%), traditional birth attendant (20%), family (19.9%), posters (18%), chemist (16%), and others (5%). Findings from the study indicated a significant joint effect of information needs of pregnant women, sources of health information use and constraints to use of health information sources.

On the other hand, a survey [4] exploring the health information needs and sources consulted by women in South-west, Nigeria, observed a different trend in the health information seeking behaviour of women. The study revealed that women sought health information for themselves and their children. About 90% of the women reported that they obtained health information from the radio, followed by friends, family and patent medicine vendors. The most active health information seekers were women who were confronted with making major decisions about their health, that of their families and communities.

A similar study by Gambo *et al* in the Northern part of Nigeria [18] indicated that women mostly sought information from informal sources such as relatives, friends, market women, Government agencies and NGO (Non-Governmental Organisation). The respondents mostly sought information on antenatal and postnatal care, routine child immunization, vesico vaginal fistula (VVF) care and how to ensure safe delivery.

These studies suggested that women in Nigeria sought reproductive health information predominantly from sources such as the mass media and personal communication (friends and family). This pattern of health information seeking by pregnant women in Nigeria probably exists because the radio is about the most affordable information communication technology (ICT) channel, furthermore, a lot of people still prefer personal communication because it is perceived as the most reliable source of information, particularly in the rural areas [3] . It is therefore imperative to promote maternal health information using sources preferred by the women to ensure vital health information reach the targeted audience.

Theoretical framework

The study was guided by Longo's expanded model of health information seeking [19]. Longo's model is based on constructs such as personal and contextual factors, and the output of the information (active or passive information) seeking process. According to the model, personal factors that can affect information seeking include demographic and socio-economic factors, health history, genetics, anxiety, culture, language, attitudes, behaviours, current health status, cognitive abilities and interpersonal communication. The contextual factors comprise health situation, healthcare structure, delivery of healthcare, information environment, information seeking for self, family members or friend at risk or with current medical problems, interpersonal social supports and networks [20]. The output of information seeking is classified either as active information seeking or passive information seeking which is measured by its effect on the control of the disease, satisfaction in the patient, ease of everyday activities and finally better health status. Longo's model seems to be more comprehensive than this study, but it aptly captures the study. The model is key to this present study because it depicts the output process of information seeking for the patient which was absent in all previous models [21].

Pregnant women's health status or the need to take a decision about their health naturally prompts them to seek health information from different sources. Women's demographic healthcare structure, interpersonal communication, social supports and network will determine information seeking. This may lead to active or passive information seeking, resulting in improved patient/consumer outcomes (empowerment or control over disease, satisfaction in the patient, ease of everyday activities and finally better health status).

Methodology

This study is a descriptive cross sectional survey of pregnant women attending the ante-natal clinic of the University College Hospital, Ibadan. The University College Hospital (UCH), affiliated with the University of Ibadan was purposively selected for the study. Participants were enrolled after obtaining Ethical approval from the University of Ibadan /University College Hospital Ethics Committee.

The researchers informed the pregnant women about the study and voluntary participation of the respondents were obtained via written informed consent. All consenting women between 1st September, 2015 and 30th April, 2016 were enrolled in the study. Data collection was via a structured self-administered questionnaire which included sociodemograhic variables such as age, religion, occupation and educational level. Other information obtained included sources and frequency of use of health information along with barriers to health information. Descriptive statistics were used to summarize the results and presented as frequency tables, bar and pie charts.

Result

A total of 151 pregnant women were registered for antenatal care during the study period, however only 120 pregnant women were willing to participate in the study. One hundred and ten questionnaires out of the 120 copies distributed were returned and only 101 copies of the questionnaire were suitable for analysis.

Demographic information

Pregnant women who participated in the study were aged 20 - 49 years. The mean age of the study population was 32.0 ± 2.3 years. A significant proportion of them were literate (95.1%). One hundred respondents were married, while only 1 woman was single at the time the study was conducted. Table 1 provides further information on the profile of respondents.

Table 1: Demographic Characteristics of the respondents

S/N	Demographic Variables	N (%)
1	*Marital Status*	
	Single	1 (1)
	Married	100 (99)
2	Religion	
	Christianity	23 (23)
	Islam	72 (71)
	Others	6 (6)
3	*Education*	
	Literate (Diploma and above)	96 (95.1)
	Semi-illiterate	3 (2.9)
	Illiterate	2 (2.0)
4	*Income*	
	< N20,000	16 (15.8)
	N20,001 - N50,000	44 (43.6)
	>N50,001	41 (40.6)
5	*Age*	
	20-24	3 (3.0)
	25-29	21 (20.8)
	30-34	39 (38.6)
	35-39	32 (31.7)
	40-44	5 (4.9)
	45-49	1 (1.0)

N= 101 Mean age 32.04 ± 2.3 years

Important source of maternal health information

Books and magazines (96 respondents) especially "Baby Wise, and The Mama's Natural Guide to Pregnancy and Childbirth" topped the list of formal sources of information consulted by the respondents. Other popular formal information sources consulted were medical doctors (69 respondents), antenatal classes (55 respondents) and the Internet (53 respondents). Informal information sources mainly consulted were friends/family (47 respondents) and patent medicine vendors (77 respondents). Table 2 provides details on both formal and informal information sources of maternal health information consulted by the respondents.

Table 2: Sources of Maternal Health Information

Formal Sources	Responses N (Yes)	N (No)
Radio	28	73
Television	37	64
Doctor	69	32
Advert	17	84
Antenatal Classes	55	46
Brochure, Posters, Billboards	16	85
Internet(Mayo Clinic, Baby Centre)	54	47
Others (Books, Magazine)	96	5
Informal Sources	*Responses N(Yes)*	*N(No)*
Friends/Family	47	54
SMS service(MTN/Airtel)	6	95
Traditional Birth Attendant	11	90
Patent Medicine Vendors	77	24

N= 101

As presented in Table 3, the internet (64.4%) was the most frequently consulted source of information on a daily basis. This was closely followed by the television (52.5%) and radio (46.5%) sets.

Most preferred source of MH information

The result revealed that mothers preferred formal sources of maternal health information. The most preferred formal source of maternal health information reported by mothers was information obtained from medical doctors (26%). Other sources preferred by the respondents were books & magazines (21%) and the internet (15%). Figure 1 depicts the respondent's preferred sources of health information.

Maternal health information sought from these sources included information on foetal development, labour signs, how to care for the unborn baby, nutrition in pregnancy, medication in pregnancy, normal/abnormal symptoms and weight control in pregnancy. The most sought after information was on foetal development, labour signs and care for the unborn baby. Some of the respondents also sought information on child immunization and family planning. Figure 2 provides more information on the type of maternal health information accessed from the preferred sources.

Table 3: Frequency of use of information sources

Information Sources	Daily N (%)	Twice a week N (%)	Once a week N (%)	Once a month N (%)	Never N (%)
Radio	47(46.5)	10(9.9)	25(24.8)	8(7.9)	11(10.9)
Television	53(52.5)	18(18.2)	13(13.1)	10(10.1)	7(6.9)
Doctors	8(7.9)	8(7.9)	18 (17.9)	66(65.3)	1(1.0)
Advert	22(21.4)	5(4.8)	19(19)	22(21.4)	33(33.4)
Internet	65(64.4)	10(9.9)	7(6.9)	10(9.9)	9(8.9)
Family/Friends	45(45.2)	14(13.7)	18(17.6)	20(19.6)	4(3.9)
SMS	28(27.3)	12(11.4)	5(4.5)	16(15.9)	40(40.9)

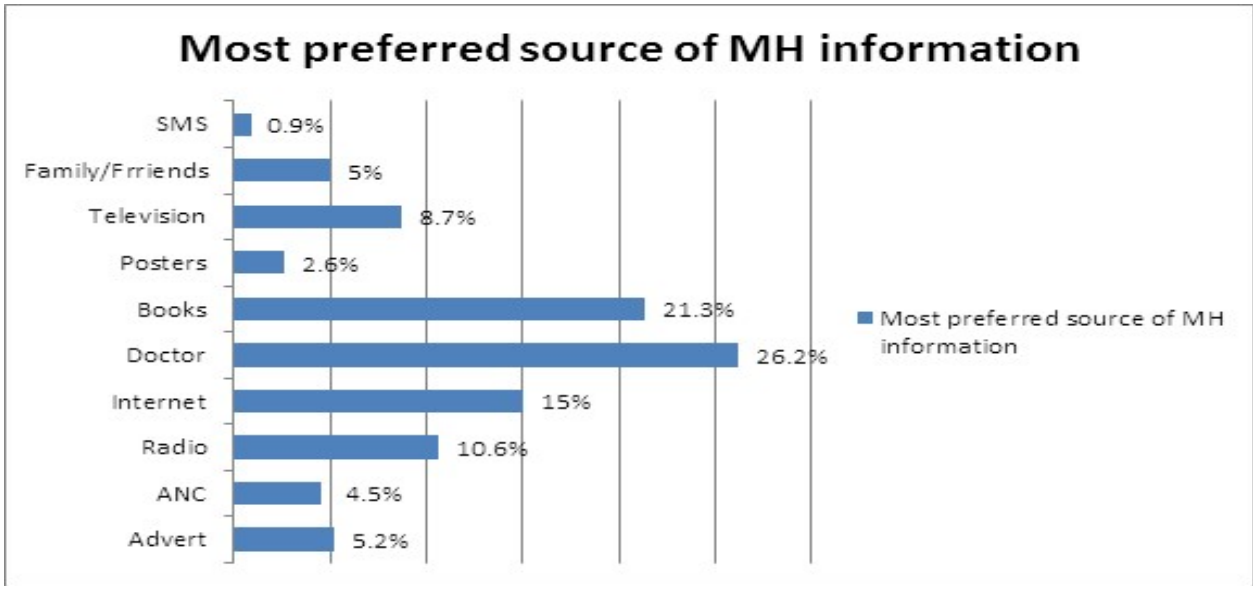

Fig. 1: Most preferred source of Maternal Health information

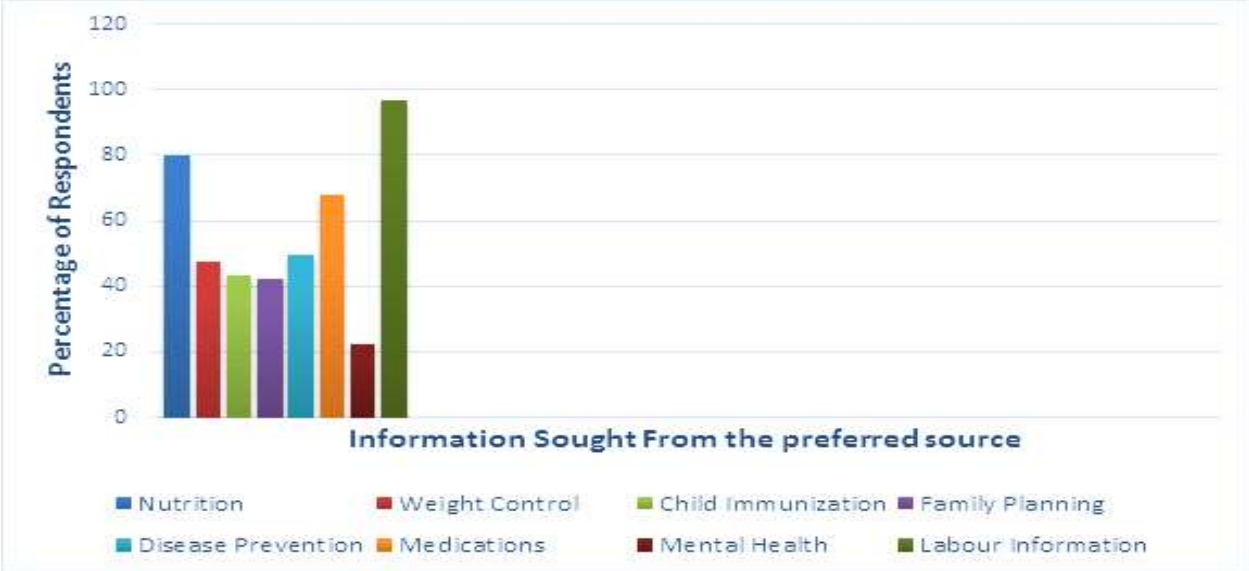

Fig. 2: Information sought from the preferred source

Barriers encountered when accessing health information

Fifty six (56) respondents encoutered barriers while seeking health information. The most encountered barrier by the respondents when accessing maternal health information was the attitude of the health workers (16 respondents). This was closely followed by irregular power supply. Figure 3 provides a summary of barriers encountered when accessing maternal health information.

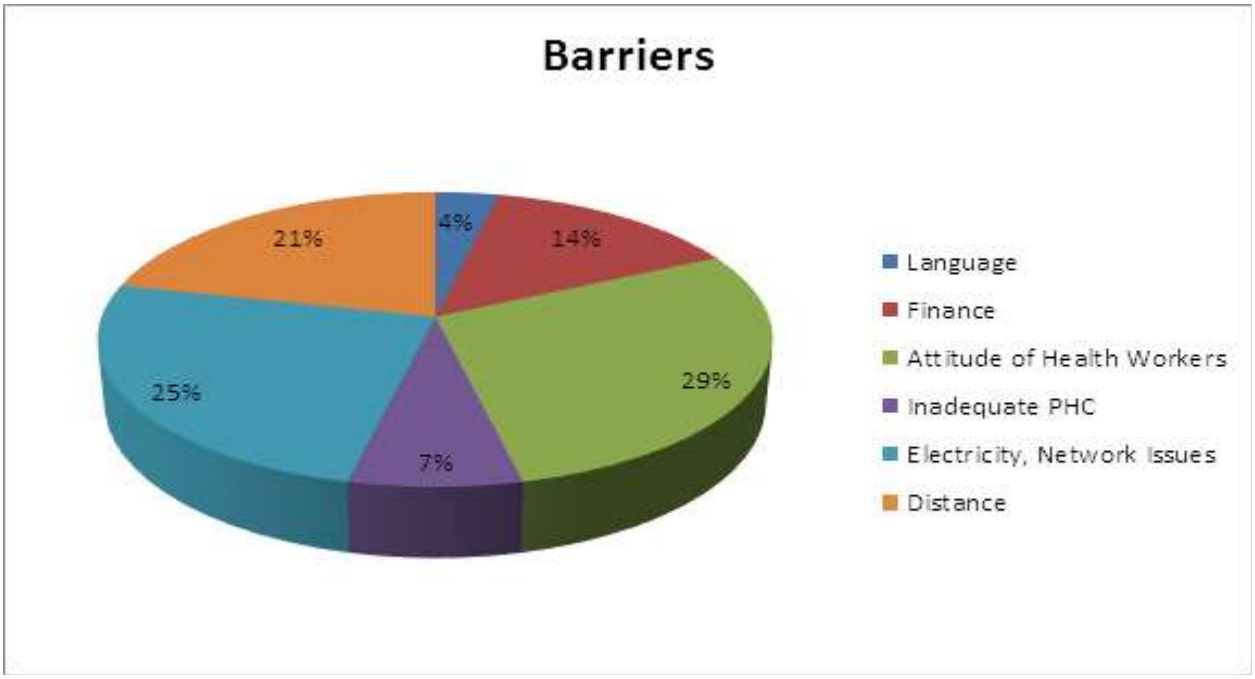

Fig.3: Barriers encountered when accessing information from the most reliable source

Discussion

The study participants were pregnant women registered at the antenatal clinic of the University College Hospital, Ibadan, Nigeria. The women who participated in this study were from different religious groups in Nigeria. Majority of them (91.1%) were within the age range of 25-39 years. The study revealed that the respondents were active information seekers; as most of them sought pregnancy-related information on a daily basis. This result was also corroborated in a study [22] in the US where they noted that women of reproductive age were high information seekers especially when pregnant. By inference, women within this age category are quite curious and tend to seek reproductive health information because they are at a critical stage of their lives.

This study further revealed that the respondents sought information from a variety of sources. The most consulted informal sources were the patent medicine vendors (77 respondents), friends and family (47 respondents). The study participants mostly sought health information from formal sources like books and magazines such as Baby Wise and The Mama's Natural Guide to Pregnancy and Childbirth. This pattern of health information seeking probably exists because of the high literacy level of the respondents and therefore not surprising that a significant proportion resorted to exploring books and magazines for their health information. This affirms the finding from a previous publication [23] that the mothers' level of education is a major moderating factor that influences the use of the print media as a source of health information.

However, with regards to the frequency of use of information sources, the result indicated that the respondents used the internet (64.4%) more frequently on a daily basis. This was followed by television (52.5%), radio (46.5%) and family (45.2%). This supports previous research which indicated reliance on the internet as a regular source of pregnancy-related information [12,24-,27]; but was at variance with a study amongst young Ghanaian women [15]. While the Internet led the list of regular information sources consulted in the developed countries, young women registered at the antenatal clinic in Ejisu Government hospital in Ghana most frequently consulted friends and family for their health information needs. The result suggested that pregnant women will consult several information sources for their health information needs and the pregnant women who participated in

this study engaged in convergent information seeking. Convergent information-seeking verifies and reinforces health information from various sources. Such information-seeking offsets any credibility or accessibility issue associated with different information sources [28]. According to some authors [22,29], in order to validate health information from multiple sources, it was imperative that the pregnant woman engaged in convergent health information-seeking.

This study revealed that medical doctors and print materials were the most preferred formal sources of pregnancy-related information while the most reliable informal source consulted by the women was the patent medicine vendor. The least preferred source was the SMS messaging service. Earlier reports [16,17] in Nigeria and Ethiopia substantiated this fact, as respondents in these studies frequently sought pregnancy-related information from health professionals. The inference that can be drawn from this result is that women will seek health information from formal sources like printed materials and health professionals or may alternatively seek informal sources like the patent medicine vendor for their health information needs.

The respondents indicated that they preferred information from medical doctors and print materials because of the reliability of information from these sources. Health information sought from these sources were mostly on foetal development, labour signs, care for the unborn baby and nutrition in pregnancy. This was unlike an earlier report in Ibadan, Nigeria, where pregnant women mainly sought information on cleanliness and immunization [17]. This study therefore, supports the assertion of previous authors that women sought various types of health information from different sources depending on their health information needs [4, 16].

Major factors limiting access to health information were the attitude of the health workers and technical issues such as lack of electricity and poor internet network. This corroborates another report [17] where women cited attitude and perception towards information providers as hindrances to health information seeking. This further substantiates the result from Ghana [15] where young mothers indicated poor attitude on the part of some midwives as one of the factors hindering access to health information.

Conclusion

The study revealed that pregnant women were active seekers of health information. Although books and magazines such as Baby Wise and The Mama's Natural Guide to Pregnancy and Childbirth were popular sources of health information; none of the respondent reported visiting the library or borrowing books from any information resource centre. This study further emphasized the role played by the internet as a popular health information source consulted by the respondents on a daily basis. To meet the health information needs of mothers, as well as improve health outcomes, it is imperative to place vital health information within their reach. Information resources such as pregnancy related books and magazines should be readily accessible at health centres, antenatal clinics and pharmacy shops. Initiatives such as e-doctor and websites containing pregnancy related information should be developed to improve access to health information.

Health policies should target subsidising as well as improving internet services for women within the reproductive age group at the various government owned health facilities by partnering with the private sector in order to improve access to health information as well as reproductive health.

This study, though hospital based, provides general information on health seeking behavior of pregnant women. Generalization may however be limited and further evaluation may be required to determine the health information seeking behavior and sources across different strata of the society.

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Afr. J. Med. Med. Sci. (2019) **48,** 207-215

Pregnancy outcome in Nigerians with systemic lupus erythematosus: case series and literature review

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Abstract

Background: Pregnancy has been reported to constitute a high risk in lupus patients. However, with the emergence of potent disease modifying antirheumatic drugs (DMARDs), pregnancy outcome has become more favorable in this group of patients. There is thus a need to report the Nigerian experience so as to add to the body of knowledge. There has been no report on pregnancy outcome among Nigerian lupus patients.

Objective: To describe the maternal and fetal outcomes among pregnant female systemic lupus erythematosus [SLE] patients attending Lagos State University Teaching Hospital (LASUTH), Lagos, Nigeria.

Methods: A retrospective case series of pregnancy outcome in systemic lupus erythematosus (SLE) patients between the years 2011 to 2015. Data about demography, symptoms during pregnancy, blood pressure, investigations, treatment, route of delivery and pregnancy outcome were collected from patients' case record files. Data was analyzed using descriptive statistics.

Results: The outcome of 15 pregnancies in 12 lupus patients were reported. The outcome of the pregnancies were eight live births from elective cesarean section (CS), three live births via spontaneous vaginal delivery, a stillborn following vaginal delivery, an intrauterine fetal death from intrauterine growth restriction, a spontaneous abortion, and a maternal mortality. Mean birth weight was 2.8kg (SD+/-0.5). Active disease and hypertension were observed in 2 pregnancies each, while lupus nephritis was present in 5 pregnancies. Only one of the patients was hospitalized before delivery due to a flare of lupus nephritis. Antiphospholipid syndrome occurred in 1 of the pregnancies. There was no occurrence of a flare post-delivery, neither was there any case of neonatal lupus syndrome nor congenital heart block.

Conclusion: Pregnancy in patients with SLE is still associated with a risk of poor outcome in Nigeria, but with the appropriate timing and management, it is possible to have a good outcome. Cooperation with an Obstetrician experienced in high risk pregnancies is also essential. A high index of suspicion is recommended in patients with recurrent spontaneous abortions and/or unexplained deterioration in renal function, even in the absence of typical skin lesions of lupus and/or arthritis.

Finally, since the management of SLE in pregnancy is cost intensive, the development of favorable health insurance policies by the government to enable the common man to benefit from standard health care will ease the burden of cost of management on patients.

Keywords: *Systemic lupus erythematosus, pregnancy, maternal outcome and fetal outcome.*

Abstrait

Contexte : La grossesse a été signalé à constituer un risque élevé chez les patientes atteintes de lupus. Cependant, avec l'émergence de médicaments antirhumatismaux (DMARD) puissants, l'issue de la grossesse est devenue plus favorable chez ce groupe de patientes. Il est donc nécessaire de rendre compte de l'expérience Nigériane afin de compléter le corpus de connaissances. Aucun résultat de grossesse n'a été signalé chez les patientes atteintes de lupus Nigérian.

Objectif : Pour décrire les résultats maternels et fœtaux chez les patientes enceintes atteintes de lupus érythémateux disséminé (LES) à l'Hôpital d'Enseignement Universitaire de l'État de Lagos (LASUTH) à Lagos, Nigéria.

Méthodes : Une série de cas rétrospectifs sur l'issue de la grossesse chez les patientes atteintes de lupus érythémateux systémique (LES) entre 2011 et 2015. Les données sur la démographie, les symptômes pendant la grossesse, la pression artérielle, les investigations, le traitement, la voie d'accouchement et l'issue de la grossesse ont été recueillies des dossiers des patientes. Les données ont été analysées à l'aide de statistiques descriptives.

Résultats : Les résultats de 15 grossesses chez 12 patientes atteintes de lupus ont été rapportés. Les résultats de la grossesse ont été huit naissances vivantes issues d'une césarienne élective (CS), trois naissances vivantes via un accouchement vaginal

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spontané, un mort-né après un accouchement vaginal, une mort fœtale intra-utérine due à une restriction de croissance intra-utérine, un avortement spontané et une mortalité maternelle. Le poids moyen à la naissance était de 2,8 kg (ET +/- 0,5). Une maladie active et une hypertension ont été observées dans 2 grossesses chacune, tandis que la néphrite lupique était présente dans 5 grossesses. Un seul des patients a été hospitalisé avant l'accouchement en raison d'une poussée de néphrite lupique. Le syndrome des anti-phospholipides est apparu dans une des grossesses. Aucune poussée n'a été constatée après l'accouchement, ni aucun syndrome de lupus néonatal ni aucun bloc cardiaque congénital.

Conclusion : La grossesse chez les patientes présentant un LES est toujours associée à un risque de résultats médiocres au Nigéria, mais avec un temps et une gestion appropriée, il est possible d'obtenir de bons résultats. La coopération avec un obstétricien expérimenté dans les grossesses à haut risque est également essentielle. Un indice de suspicion élevé est recommandé chez les patientes présentant des avortements spontanés récurrents et / ou une détérioration inexpliquée de la fonction rénale, même en l'absence de lésions cutanées typiques du lupus et / ou de l'arthrite.

Enfin, comme la gestion de LES pendant la grossesse est coûteuse, le développement de politiques d'assurance maladie favorables par le gouvernement permettant à l'homme du commun de bénéficier de soins de santé standard allégera le fardeau des coûts de la gestion pour les patientes.

Mots clés: *Lupus érythémateux disséminé , grossesse, évolution maternelle et évolution fœtale*

Introduction

Systemic lupus erythematosus (SLE) is a multisystemic autoimmune disease which predominantly affects females of child bearing age [1]. The disease has been uncommonly reported in African blacks unlike among African –Americans [1]. However, recent encounters with new cases show that it may not be rare. The frequency as reported by Adelowo *et al* in Nigeria was 5.28%of 1250 rheumatologic cases seen in a private rheumatology clinic over a period of 6 years [1]. Its aetiology is unknown. However, environmental factors, hormones, genetic composition and immunological aberrations have been implicated in its pathogenesis [2].

Pregnancy outcome in SLE refers to both maternal and fetal results of pregnancy in lupus patients. The frequency of pregnancy in lupus patients is similar to that of females without the condition [3], meaning that SLE has no negative effect on fertility.

The pathogenesis of complications in lupus pregnancies include clinical or subclinical inflammation, hormonal dysfunction (increased estrogen and prolactin), immune alterations (a shift to T helper 2 cell cytokines production) and the presence of autoantibodies [4]. There is thus impaired early placental development leading to poor vascularization, which then results in placental ischemia and endothelial damage. Known complications of pregnancy in SLE are preeclampsia, eclampsia, intrauterine growth restriction, small for gestational weight babies, premature delivery and increased pregnancy loss [5]. Factors that lead to poor pregnancy outcomes are lupus nephritis [6], secondary antiphospholipid syndrome [5,6], hospitalization or a lupus flare inpregnancy [5,7], thrombocytopenia [8,9] and high blood pressure [7]. It is thus important for SLE patients to delay pregnancy for at least 6 months after disease stability [10,11]. SLE does not affect fertility [12], neither is pregnancy contraindicated in lupus but there could be adverse fetal and maternal outcome if disease is not properly managed [13].

Maternal and fetal morbidities and mortalities have been documented among pregnant SLE patients in Western World [14]. However, there is paucity of reports of pregnancy outcomes among pregnant SLE patients in Africa. There is a considerable number of SLE patients in Nigeria [1,15] and we do not know the pregnancy outcome among our patients. Hence, we intend to study the pregnancy outcome in SLE patients in Lagos State University Teaching Hospital (LASUTH), Lagos, Nigeria.

Materials and methods.

This is a five year retrospective case series of pregnancy outcome in SLE patients in LASUTH between 2011and 2015. Patients were diagnosed as having SLE if they fulfilled at least 4 out of the 11 1982 revised ACR criteria [16]. All subjects had antenatal care, delivery and postnatal care in the obstetric department of LASUTH. They were collectively managed by the rheumatologist and the obstetrician.

Data about demography, symptoms during pregnancy, blood pressure, investigations, treatment, route of delivery, and pregnancy outcome were gathered from patients' case record files.

They had regular clinic follow ups, at least once monthly in most cases and serial monitoring of their full blood count, erythrocyte sedimentation rate [ESR], serum creatinine, urinalysis and microscopy, urine protein creatinine ratio and serology. Serial

obstetric ultrasound scans and doppler scan of the placental circulatory bed were also done if indicated and affordable. Hypertension was defined as blood pressure ≥140/90mmHg [17], preeclampsia as a new onset blood pressure of ≥140/90mmHg with proteinuria of >300mg/24hours after the 20th week of gestation [18], lupus nephritis as proteinuria >500mg/+++ or elevated serum creatinine or presence of casts in urine or decreased eGFR or biopsy proven renal disease [19].

A flare was defined as the occurrence of new symptoms and sign and/or laboratory results which necessitate an increase in the dose of therapy or a change or addition of an immunosuppressant or necessitating admission [20].

Intrauterine fetal death (IUFD) was defined as the death of a fetus in the uterus after the age of viability (28weeks) [21,22], intrauterine growth retardation (IUGR) as a fetal weight below the 10th percentile for a gestational age as determined by an ultrasound scan, preterm birth as birth before 37 completed weeks and low birth weight as that which is below 2.5kg [21].

Antiphospholipid syndrome was defined by Sapporo criteria as presence of at least one clinical and one laboratory (serologic) criteria. The serologic criteria is elevation in titer of any of the antiphospholipid antibodies done 12 weeks apart and the clinical criteria is any pregnancy morbidity or a history of thrombosis [23].

Results

A total of 15 pregnancies in 12 SLE patients were reviewed. One of the patients was pregnant on 3 occasions and another twice.

Demography and clinical features

The mean age of the subjects was 31.8years (SD=+/-2.04). Polyarthralgia (n-2), skin rash (n-1) and facial swelling (n-1) were the symptoms recorded during pregnancy. Blood pressure ranged between 110/60mmHg and 180/120mmHg. Five pregnancies were documented in patients with an active disease while the remaining had a quiescent disease for at least 6 months before conception.

Laboratory Investigations.

Erythrocyte sedimentation rate (ESR) was done during all pregnancies and was elevated in 14 pregnancies (mean=66.4±35.4). The least hemoglobin concentration was 8g/dl. Platelet count was normal in all patients. Elevated serum creatinine and reduced estimated glomerular filtration rate [eGFR] were documented in 3 pregnancies. None of the patients had casts in their urine but proteinuria was recorded in 11 pregnancies, ranging from trace to +++. Urine albumin creatinine ratio [UACR] was done in 4 of pregnancies and was elevated in half of them.

Results of serology show anti-nuclear antibody [ANA] had highest titer being 1: 640, while C_3 was low in both patients in whom it was assayed for. The table below shows the results of serology done in all pregnancies.

One patient had renal biopsy done before pregnancy which revealed class V lupus nephritis. None of the patients with positive anti Ro/SSA or anti La/SSB had fetal electrocardiogram and fetal echocardiography.

The disease was stable in 10 patients for at least 6months prior to pregnancy. Five patients had lupus nephritis, of whom the disease was quiescent in two. Antiphospholipid syndrome was present in 1 patient while2 patients had poorly controlled hypertension.

Treatment offered.

All the patients were placed on either prednisolone tablets or methyl prednisolone tablets and hydroxychloroquine before and during pregnancy. The maximum dose of prednisolone was 10mg, however majority (8 patients) had methyl prednisolone tablets instead. Intravenous methyl prednisolone was administered to one patient at an estimated gestational age of 20 weeks, when she had a flare. This was done on an outpatient basis. In-patient care was necessitated for a patient who had a flare of lupus nephritis in pregnancy. Four patients who had been on azathioprine before they got pregnant also continued throughout pregnancy. All patients were placed on low dose aspirin until 32weeks gestational age. One patient, who fulfilled the Sapporo criteria for antiphospholipid syndrome had daily subcutaneous low molecular weight heparin in addition to aspirin till an estimated gestational age of 32 weeks. Fetal electrocardiograph and echocardiography could not be done in these patients due to financial constraint. Only two patients were placed on blood pressure lowering drugs.

Pregnancy outcome

There were 10 term deliveries. One case of intrauterine growth restriction which later resulted in intrauterine fetal death was recorded while another pregnancy resulted in preterm delivery of a low birth weight neonate. Spontaneous abortion and still birth occurred in 1 pregnancy each.

Table 1: Demography and obstetric history.

Patient	Age (yrs)	Parity	Past medical History	Time of Diagnosis	Blood Pressure (mm/Hg)	Pregnancy Outcome	Outcome of Labour	Outcome of Care
1.	30	$G_1P_0^{+0}$non alive	Inactive disease for More than 6 months	3 years before pregnancy	110/60	Term delivery	Cesarean section	Mother alive and healthy
2a.	31	$G_1P_0^{+0}$non alive	Active disease	1 year before pregnancy	110/80	Term delivery	Cesarean Section	Mother alive
2b.	32	$G_2P_1^{+0}$1 alive	Active disease		130/90	Pregnancy loss at 6 weeks		Mother alive
2c.	33	$G_3P_1^{+1}$1 alive	Inactive disease for 6 months		120/90	Term delivery	Cesarean section	Mother alive
3	32	$G_1P_0^{+0}$non alive	Inactive disease for more than 6 months	10 years before pregnancy	130/84	Term delivery	Cesarean section	Mother alive
4a	31	$G_1P_0^{+0}$	Active disease	During pregnancy (10 weeks)	180/120	IUGR then IUFD at 32 weeks	Spontaneous vaginal delivery	Mother alive
4b	33	$G_2P_1^{+0}$non alive	Active disease		140/94	Pretem delivery at 28 weeks	Spontaneous vaginal delivery	Mother alive
5	32	$G_2P_1^{+0}$1 alive	Inactive disease for more than 6 months	1year before pregnancy	120/80	Term delivery	Cesarean section	Mother alive
6	37	$G_8P_2^{+5}$2 alive	5 pregnancy losses, each before 10 weeks within 2 years	1year before pregnancy	110/70	Term delivery	Cesarean section	Mother alive
7	31	$G_1P_0^{+0}$non alive	Inactive disease for more than 6 months	1year and 6 months before pregnancy	110/70	Term delivery	Spontaneous vaginal delivery	Mother alive
8	30	$G_3P_{02}^{+0}$2 alive	Inactive disease for more than 6 months	4 years before the index pregnancy	120/80	Term delivery	Spontaneous vaginal delivery	Post- delivery flare

9	34	$G_1P_0^{+0}$non alive	Inactive disease for more than 6 months	2 years before pregnancy	120/80	Term delivery	Cesarean section	Mother alive
10	31	$G_1P_0^{+0}$non alive	Inactive disease for more than 6 months	1year and 4 months pregnancy	110/70	Term delivery	Cesarean section	Mother alive.
11	29	$G_2P_1^{+0}$1 alive	Inactive disease for more than 6 months	6years before pregnancy	140/90	Still birth at term	Spontaneous vaginal delivery	Mother alive
12	32	$G_2P_1^{+1}$ non alive	Past pregnancy loss before 10 weeks	During pregnancy	150/100	Maternal death at 28 weeks		Maternal death

Table 1.1: Laboratory parameters

Serial No.	Hb (11.5-6.5g/dl)	Plt (150-450*10^9/1)	ESR(0-20mm/hr)	Urea (2.1-7.1mmol/1)	Creatinine (53-97µmol/l)	UACR (<0.5/g Cr)	Hematuria	Proteinuri	eGFR (ml/min)
1.	10.0	267	30	5.36	81.8	NA	No	No	NA
2a	10.4	189	130	1.1	50	NA	No	+	>89
2b.	10	NA	NA	NA	NA	NA	NA	NA	NA
2c.	10.7	176	66	1.2	48	NA	No	Trace	>89
3	13.9	292	34	3.2	104	1.66	No	+++	62
4a	9.0	288	90	3.5	101	NA	Yes	++	63
4b	9.0	312	78	3.1	97	1.8	Yes	++	65
5	11.3	253	66	4.5	72	NA	Yes	+	NA
6	10.6	222	55	NA	81.8	NA	Yes	Trace	NA
7	10.3	343	110	8.6	90.9	NA	No	Trace	NA
8	9.3	157	101	2.0	51	0.4	No	No	>89
9.	11.8	309	8	2.4	44	NA	No	No	>89
10	10.3	200	29	NA	40	0.2	No	Trace	>89
11	10.0	232	34	NA	NA	NA	Yes	Trace	>89
12	8.0	200	78	9	178	NA	No	+++	NA

Key: NA – Not available

Table 2: Results of serology

Serial . No	C_3	ANA	Anti dsDNA	Anti-Smith	AntiR_0 SSA	AntiL_a SSB	Lupus anti-coagulation	Anti-cardio-lipin	Anti β_2GP_1
1.	NA	1:640	Negative	NA	Positive	Positive	NA	Negative	Negative
2.	NA	1:640	Positive	NA	Positive	Negative	NA	Negative	Negative
3	NA	1:320	Positive	NA	-VE	Negative	Negative	Positive	Positive
4	NA	1:640	Positive	NA	NA	NA	NA	Negative	Negative
5	NA	1:160	Negative	NA	NA	NA	NA	NA	NA
6	Low	1:80	Negative	NA	Negative	Positive	Negative	Positive	Positive
7	NA	1:320	Negative	NA	Negative	Negative	Negative	Negative	Negative
8	Low	1:640	Negative	NA	Negative	Negative	Negative	Negative	Negative
9	NA	1:640	NA	NA	NA	NA	NA	NA	NA
10	NA	1:320	NA	NA	NA	NA	NA	NA	NA
11	NA	Negative	Negative	Positive	Positive	Positive	NA	NA	NA
12	NA	1:640	Positive	NA	NA	NA	NA	NA	NA

Key: NA – Not available

Maternal outcome

There was no flare post-delivery, while there was no hospitalization during puerperium. Maternal mortality occurred during one pregnancy at an estimated gestational age of 28 weeks.

Table 1.3 shows fetal and maternal outcomes in our pregnant lupus patients.

Table 1.3: Fetal and Maternal Outcome**.**

Outcome	Frequency
Live births	11
Abortion	1
Maternal mortality	1
Stillborn	1
IUFD	1
Hospitalization during pregnancy	1

Discussion

Our series, the first in Nigeria and second in West Africa, showed that adverse fetal and maternal outcomes are common in pregnant lupus patients. The observed maternal outcomes were one case of maternal death from active lupus nephritis in pregnancy and a case of secondary anti-phospholipid syndrome. Whilst we documented high frequency of live births, we observed a stillborn following vagina delivery; an intrauterine fetal death from preterm delivery; fetal death from maternal mortality; and a spontaneous abortion as adverse fetal outcomes.

Although, the frequency of fetal loss in the first South African series was 3 fetal deaths (42.9%) in 7 pregnancies in Korle bu Teaching Hospital, Ghana [24] , this report contrasts 4 fetal losses (26.6%) in 15 pregnancies documented in this series. Moreover, a controlled study by Georgiou *et al* in Greece found fetal loss of 22% in 59 pregnancies among 47 lupus patients [25] while fetal loss of 30.7%(n-17) was recorded in 52 pregnancies among Indian lupus patients [26]. In a prospective study in America, Clouse also reported a threefold increase in fetal loss in pregnant lupus patients [14].The differences in the frequency of fetal loss in various studies may be attributable to varying sample size and study design adopted by various authors.

Spontaneous abortion was one of the causes of fetal loss in this series and it was documented in one pregnancy (6.7%). However, it was reported in 15% of pregnancies in Middle East [7] and none was recorded in lupus pregnancies in South Africa [27] and Ghana [24]. Furthermore, in South Africa series, there were two cases (4.3%) of therapeutic abortions due to maternal request [27]. The major predisposing factor for spontaneous abortion identified in our study was the presence of an active disease in the index patient. A high disease activity has been linked to poor pregnancy outcome in studies from developed countries [14].

Intrauterine growth retardation with an eventual fetal demise was observed in one pregnancy (6.7%). In a population-based study by Chen *et al*, they observed that SLE patients were more prone to IUGR than pregnant non SLE patients (28.5% vs 17.5%) [5]. In addition, IUGR was recorded in 32% of lupus pregnancies by Aly *et al* [7] and in 14% of

South African lupus pregnancies by Whitelaw *et al* [27]. Hypertension, placental thrombosis and infarction have been shown to predispose to adverse fetal outcomes including IUGR [7]. The patient in our study was one of the two who had poorly controlled hypertension in addition to lupus nephritis. Aly *et al* also reported a preponderance of hypertensive subjects among their cohorts [7].

Still birth was observed in 6.7% (n=1) of the pregnancies in our study .In European patients, still birth was recorded in 2% of their pregnancies [25] while none was documented among Arab patients in the Middle East [7]. This could be explained by the fact that all patients in the Middle East study were in remission before onset of pregnancy. The index case here had positive anti Ro/SSA and anti La/SSB, markers of congenital heart blocks in fetus and neonates of lupus mothers. However, she defaulted from regular clinic visit and as such, never had fetal M mode echocardiography and fetal electrocardiography to monitor this complication.
Maternal death was documented in one pregnancy in this study. The reported case in this study had a flare of lupus nephritis in pregnancy which eventually led to her death at an estimated gestational age of 28weeks.Several reports have shown that active lupus nephritis during pregnancy is a major predictor of both fetal and maternal outcomes [28,29,25].

Term deliveries were observed in 66.7% (n=10) of pregnancies with a low proportion of preterm birth(n-1, 6.7%).Similarly, previous studies from developing countries have shown Higher frequency of term delivery in comparison with pre-term delivery [7,24].

Over half of our patients (52.7%) opted for elective caesarian section after being counseled on the risk of post-partum flare after the stress of spontaneous vaginal delivery. This was comparable to the 57.1% cesarean section rate reported by Dey *et al* in Ghana [24] and 53% by Aly *et al* in the Middle East [7], though for specific obstetric indications.

There was no record of neonatal lupus or confirmed congenital heart block in our study despite the positivity of the predisposing auto-antibodies in a quarter of the patients screened. This is not unexpected as the incidence of congenital heart block in the first affected pregnancy is 2% [30,31]. This increases to 16 -20% with subsequent pregnancies [30]. These auto-antibodies cross the placenta at around 16 to 26weeks gestational age and cause neonatal lupus syndrome which is characterized by skin, hepatic, hematologic and cardiac manifestations. All the organ affectations are reversible within 6 to 8 months of life with the clearance of maternal antibodies except the cardiac manifestations which result in congenital heart block, cardiomyopathy and congestive cardiac failure. The most feared cardiovascular manifestation is a complete heart block. This is usually preceded by low grade conduction defects such as a prolonged PR interval on fetal electrocardiogram. Cardiac manifestations occur when the conducting system of the heart is attacked by the implicated antibodies between weeks 18 and 24 of gestation. Treatment with fluorinated steroids could reverse the spectrum if commenced early at the stage of prolonged PR interval. Hydroxychloroquine has also been found to reduce the risk of occurrence of cardiac manifestation in neonates of mothers positive for anti Ro/SSA and anti La/SSB [32].

Antiphospholipid syndrome was diagnosed in one pregnancy while the antiphospholipid antibodies were elevated in 2 patients without APS. These antibodies can be found in 1-5% of the normal population and 12-30% of SLE patients [23]. Adelowo *et al* reported 5 cases of APS in 66 SLE patients in 2009 in Nigeria [33]. Another study outside Africa showed that 38% of lupus pregnancies in the Middle East were associated with APS [7]. This highlights the fact that secondary antiphospholipid syndrome may not be rare in SLE. Moreover; we might have under-estimated the frequency of APS due to our patients' inability to afford APS screening tests. The case in this study had aspirin and heparin in pregnancy and delivered a live baby at term after a previous history of 5 consecutive spontaneous abortions before diagnosis.

Conclusion

Fetal and maternal complications are common in Nigerian pregnant lupus patients but with an appropriate timing and management, it is possible to have a good outcome. Cooperation with an Obstetrician experienced in high risk pregnancies is also essential. A high index of suspicion is recommended in patients with recurrent spontaneous abortions and/or unexplained deterioration in renal function, even in the absence of typical skin lesions and/or arthritis.

Finally, since the management of SLE in pregnancy is cost intensive, the development of favorable health insurance policies by the government to enable the common man to benefit from standard health care will ease the burden of cost of management on patients.

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Afr. J. Med. Med. Sci. (2019) **48,** 225-231

Molecular detection of *Mycoplasma pneumoniae* virulent gene from sputum samples of subjects attending Nnamdi Azikiwe University Teaching Hospital, Nnewi, Anambra State, Nigeria.

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Abstract

Background: Mycoplasma pneumoniae is a bacterium whose role as a disease causing agent has been continuously reported especially with the highly sensitive detection methods currently available. It has been implicated in serious illnesses such as community-acquired pneumonia and other lung diseases.

Aim: This work investigated the presence of glycerophosphodiesterase (GLPQ) gene of *M. pneumoniae* in patients attending the chest clinic at Nnamdi Azikiwe University Teaching Hospital, Nnewi, Nigeria.

*Subjects and methods***:** A total of 263 sputum samples were collected, of which 188 were from test subjects while 75 were from the control subjects. Questionnaires were administered for all the subjects. The samples were examined molecularly for *M. pneumoniae* using specific primers in the polymerase chain reaction technique. The PCR positive samples were further tested for the presence of GLPQ gene using molecular technique.

*Results***:** The *Mycoplasma pneumoniae* overall prevalence of 7.98% was obtained. A breakdown of the result into the two groups studied showed that the prevalence rate of the organism was more among the test subjects 18(9.6%) compared with the control subjects 3(4.0%). The prevalence of *M. pneumoniae* virulent gene (GLPQ) among the 18-PCR positive subjects was 5(27.8%) and they were detected only in symptomatic female subjects ($P<0.05$). No virulent gene was detected from the 3 positive control subjects.

*Conclusion***:** This study reports the presence of *M. pneumoniae* in the sputum of symptomatic subjects and also the presence of the virulent gene (GLPQ gene) in some of the positive samples. This organism is thus an additional bacterium that may contribute to respiratory tract infections. It is recommended that the search for this organism be included in the routine analysis of samples of patients with respiratory tract infections using available diagnostic tools.

Keywords: *Mycoplasma pneumoniae*, *GLPQ gene, Prevalence.*

Abstrait

Contexte : Mycoplasma pneumoniae est une bactérie dont le rôle en tant qu'agent pathogène a été régulièrement rapporté, en particulier grâce aux méthodes de détection très sensibles actuellement disponibles. Elle a été impliquée dans des maladies graves telles que la pneumonie acquise dans la communauté et d'autres maladies pulmonaires.

But : Ce travail a examiné la présence du gène de la glycéro-phosphodiestérase (GLPQ) de *M. pneumoniae* chez des patients fréquentant la clinique de pneumologie de l'Hôpital d'Enseignement Universitaire Nnamdi Azikiwe, Nnewi, Nigeria.

Sujets et méthodes **:** Un total de 263 échantillons d'expectorations ont été recueillis, dont 188 provenaient de sujets à tester et 75 de sujets témoins. Des questionnaires ont été administrés pour tous les sujets. Les échantillons ont été examinés moléculairement pour *M. pneumoniae en* utilisant des amorces spécifiques dans la technique de la réaction en chaîne par polymérase. Les échantillons positifs à la PCR ont ensuite été testés pour la présence du gène GLPQ en utilisant une technique moléculaire.

Résultats **:** La prévalence totale de *Mycoplasma pneumoniae* de 7,98% a été obtenue. Une ventilation des résultats dans les deux groupes étudiés a montré que le taux de prévalence de l'organisme était plus fréquent chez les sujets testés 18 (9,6%) que chez les sujets témoins 3 (4,0%). La prévalence du gène virulent de *M. pneumoniae* (GLPQ) chez les 18 patients positifs pour la PCR était de 5 (27,8%) et ils ont été détectés uniquement chez les femmes

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symptomatiques (P <0,05). Aucun gène virulent n'a été détecté chez les 3 sujets témoins positifs.
Conclusion **:** Cette étude rapporte la présence de *M. pneumoniae* dans les expectorations de sujets symptomatiques ainsi que la présence du gène virulent (gène GLPQ) dans certains des échantillons positifs. Cet organisme est donc une bactérie supplémentaire pouvant contribuer aux infections des voies respiratoires. Il est recommandé d'inclure la recherche de cet organisme dans l'analyse de routine des échantillons de patients atteints d'infections des voies respiratoires à l'aide des outils de diagnostic disponibles.

Mots clés : *Mycoplasma pneumoniae*, gène GLPQ, Prévalence.

Introduction

Mycoplasmas belong to the family *Mycoplasmataceae* in the class of bacteria called Mollicutes. They are the smallest bacteria that are capable of growing on cell-free medium. Their characteristic cell wall-deficient nature made them highly pleomorphic in shape while conferring on them resistance to beta lactam and other antimicrobial agents that act on cell wall of bacteria and also prevent them from being stained by the Gram reagents. *Mycoplasma pneumoniae* is exclusively a human pathogen whose transmission is from person-to-person through air-borne droplets [1]. It is a pathogen of the respiratory tract and a common cause of community-acquired pneumonia (CAP). The infection, also called 'primary atypical pneumonia' usually has a prolonged, gradual onset [2] and may result in all degrees of respiratory involvement from in-apparent infection to pneumonia. Typical clinical features include an initial pharyngitis, sore throat and hoarseness, fever and cough [3].

Mycoplasma pneumoniae causes upper and lower respiratory tract infections in all age groups with the highest rate of infection found in the age group 5 to 20 years [4]. Children less than 5 years of age are less commonly affected [4]. The disease severity has been reported to be more in males than females [4]. Furthermore, it is observed that only 5 to 10% of infected individuals develop pneumonia while the larger percentages of infected persons remain asymptomatic [4].

Beside respiratory tract infection, extra-pulmonary infections caused by *M. pneumoniae* have been reported. They include acute hepatitis [5], immune thrombocytopenic purpura [6], severe autoimmune hemolytic anemia [7], Stevens-Johnson syndrome [8], arthritis [9], transverse myelitis [10] and dermatological manifestations [11] among others.

Pathogenic bacteria use different pathogenic mechanisms to achieve their aim and *M. pneumoniae* is not exempted. Several properties like adherence to cells (cytadherence), cytotoxic and inflammatory potential and the pathogenic role of community-acquired respiratory distress syndrome toxin (CARDS toxin) that activate the inflammatory agents and the genesis of extrapulmonary complications have been reported to play roles in the pathogenesis of *M. pneumoniae* [12]. Also two properties of *M. pneumoniae* seem to be responsible for its pathogenicity in humans. The first is its affinity for respiratory epithelial cells whereby it's remarkable gliding motility and specialized tip organelles allows it to burrow between cilia within the respiratory epithelium. The second is its ability to produce hydrogen peroxide (H_2O_2) which is believed to be the cause for most of the initial cell disruption in the respiratory tract [4]. Schmidl *et al*., [13] also reported H_2O_2 as the major virulence determinant of the organism. They observed that H_2O_2 is generated during the utilization of glycerol-3-phosphate. The enzyme that generates glycerol-3-phosphate from glycerophosphocholine is called glycerophospho diesterase (GLPQ) formerly known as *Mycoplasma pneumoniae* 420 (MPN 420), and has been reported to be essential for the formation of H_2O_2 when the bacteria are incubated with glycerophosphocholine. *Mycoplasma pneumoniae* is unable to cause any detectable damage to the host cells in the absence of GLPQ [13].

Unlike the genital tract mycoplasmas that have been studied extensively in Nigeria [14-16], only limited work had been done on respiratory *M. pneumoniae* in the country [17]. *Mycoplasma pneumoniae* is still not being routinely sought for in respiratory tract specimens from patients in this environment. Therefore, this study was carried out to screen patients for this bacterium and subsequently search for the presence of virulent genes (GLPQ) from the positive samples of patients attending the chest clinic of Nnamdi Azikiwe University Teaching Hospital, Nnewi, Nigeria.

Subjects and methods

Subjects

A total of 263 subject aged 5 years and above attending chest/DOTS clinics and 75 control subjects who were hospital patients from clinics other than chest as well as some medical students were enrolled into the study. The test subjects had productive cough associated with (a) signs of upper or lower

respiratory tract infection for at least 3 days or (b) a sore throat or chest pain. The sputum production in the control subjects was induced using 5% saline mist as a stimulant. Each of the control subjects inhaled the 5% saline mist which stimulated coughing up of alveolar mucus material.

Questionnaires were administered to the subjects and were used to collect the demographic data as well as the complaints of the subjects.

Ethical consideration

Ethical approval of the study protocol was obtained from the ethics committee of the Nnamdi Azikiwe University Teaching Hospital, Nnewi. Written informed consent was obtained from adults and parents of the children included in the study.

Inclusion criteria

- Subjects aged 5 years and above.
- Those having one or more of the following symptoms: A productive cough associated with (a) signs of upper or lower respiratory tract infection for at least 3 days or (b) a sore throat or chest pain.

Exclusion criteria

Any subject treated with antibiotics in the preceding 7 days.None consenting patients

Collection of samples

A wide mouthed sterile universal container was given to each subject to collect sputum. Early morning sputum were collected once from each subject.

Molecular studies

The standard polymerase chain reaction (PCR) method was used to detect *M. pneumoniae* and it comprised of the following stages: Genomic DNA extraction stage (Extraction of DNA from samples), preparation of master mix, preparation of primer mix, PCR protocol optimization, PCR set up proper, running the PCR products on the gel electrophoresis and visualization with ultra violet (UV) light.

Genomic DNA extraction was carried out as described by Agbakoba *et al*., (2008) using Gene JET Genomic DNA Kit.

Polymerase Chain Reaction was carried out using the thermal cycler (2720 Applied Biosystems). Briefly, two sets of primers used were MP88F (5^1 CAAGCCAAACACGACCTCCGGC3^1) and MP88R(5^1AGTGTCAGCTGGTTTGTC CTCCCC3^1). The PCR amplification of the extracted DNA was performed using a final volume of 20µl of the PCR mix. Accordingly, each well of the PCR plate contained 8µl of primer mix; 10µl of PCR master mix and 2 µl of extracted DNA. The amplification conditions were as follows: Initial denaturation was at 95°C for 5 minutes and was followed by denaturation at 95°C for 30 seconds, annealing at 62°C for 45 seconds and extension (elongation) at 72°C for 1 minute. These three steps were repeated for 35 cycles and followed by final extension at 72°C for 5 minutes. The PCR products were analyzed electrophoretically on 1.5% Agarose gel stained with 10µl ethidium bromide. The expected bands for positivity were 172bp (base pair).

Controls

DNA–free distilled water and ATCC 29342D *Mycoplasma pneumoniae* genomic DNA were used as negative and positive controls respectively. Both were loaded in the DNA ladder and included in each run.

Detection of *Mycoplasma pneumoniae* virulent gene (GLPQ gene):

The extracted DNAs of all the samples positive for *M. pneumoniae* were subjected to further PCR tests to detect whether they contain GLPQ gene which is the most virulent gene in *M. pneumoniae.* The PCR was run on the same thermal cycler with similar conditions as for the first tests but with different primer pair and the expected band for positivity was at 90bp.

Results

Mycoplasma pneumoniae overall prevalence rate of 7.98% for *M. pneumoniae* was observed from this study. A breakdown of this result showed that 18 out of 188 test subjects and 3 out of 75 control subjects were positive for *M. pneumonia*e, thus giving prevalence rates of 9.6% and 4.0% respectively. *Mycoplasma pneumoniae* was predominantly detected from the test group and this result is statistically significant ($P<0.05$).

Glycerophosphodiesterase (GLPQ) gene was detected in 5 samples out of the 21 PCR-positive *Mycoplasma pneumoniae*. All the 5 positives were from the test subjects. No GLPQ gene was detected from the 3 PCR positive *M. pneumoniae* obtained from the control subjects (Figure 1). It was observed that all the five patients that were positive for *Mycoplasma pneumoniae* GLPQ gene were females (Figure 2). This result shows a significant relationship between occurrence of GLPQ gene and gender ($P<0.05$).

Table 1 shows the distribution of the GLPQ gene among the age groups. The virulent gene

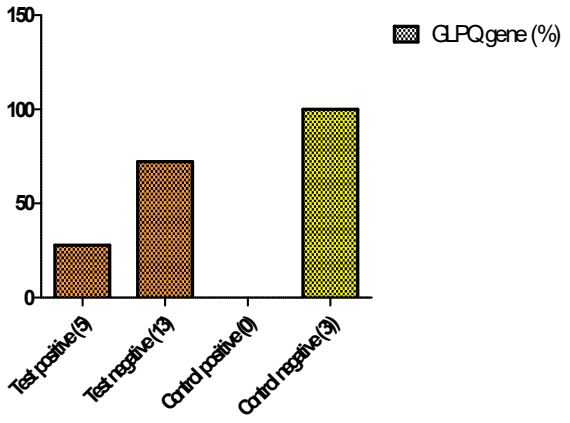

Fig. 1: Percentage occurrence of GLPQ virulent gene among the PCR positive *Mycoplasma pneumoniae.*

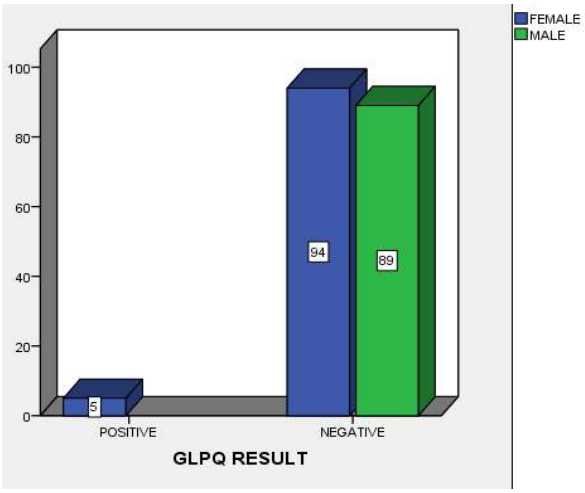

Fig. 2: Relationship between occurrence of GLPQ gene and gender.

Distribution of the five GLPQ genes according to patients' complaints showed that the virulent gene was detected more in patients with symptoms of cough, 2 (40%). One patient each with complaints of chest pain alone, chest pain and cough, and sore throat and cough had 1(20%) of the gene detected in them (Figure 3)\

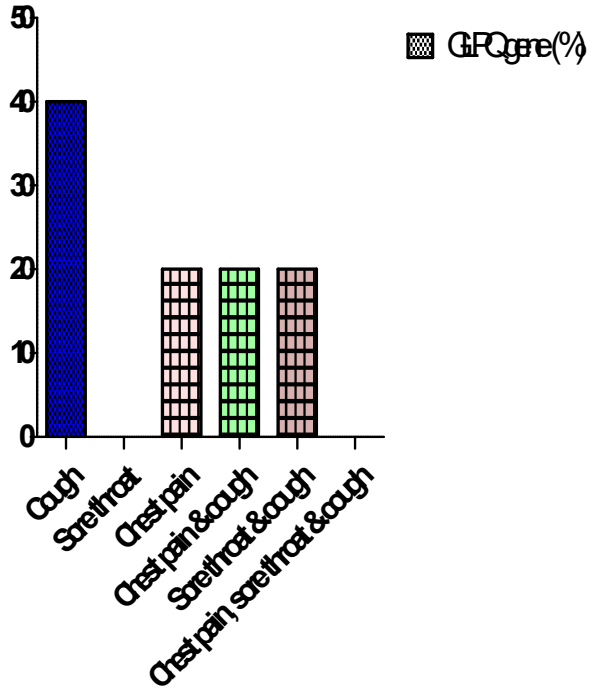

Fig. 3: Distribution of the GLPQ gene according to the patients' symptoms

Table 1: Distribution of the GLPQ gene among the age groups.

Age group (years)	No. of test subject	No. (%) of subjects positive for M. pneumoniae	No. positive for GPLQ gene	% positive for GLPQ
1-10	14	2 (11.1)	1	5.6
11-20	30	2 (11.1)	2	11.1
21-30	64	4 (22.2)	2	11.1
31-40	27	5 (27.8	0	0
41-50	27	2 (11.1)	0	0
50	26	3 (16.7)	0	0
Totatal	188	18 (100)	5	27.8

occurred more between the ages of 11 and 30 years with the rate of 40% each among age groups 11-20 years and 21-30 years followed by those less than 10 years with 20% rate. The virulent gene GLPQ was not found in age groups 31-40 years and above. The statistical analysis showed the result was not significant (P >0.05).

Discussion

The prevalence rate of *M. pneumoniae* (7.98%) obtained in this study is higher than that obtained by Ghotaslou *et al.* [18] who reported a rate of 6.15% from Iran. This rate is lower than that obtained in a study done in Zaria, Northern Nigeria which showed an overall prevalence of 16.2% [17]. The rate in this

result is also lower than the 16% reported by Bhattacharjee *et al.*[19], 19.5% by Tsutomu *et al.,*[20], 27% by Anna *et al*.[21], 32% by Fang-chang *et al.*[22] and 52% by Maczynska *et al.*[23]. However, the result from this study is comparable with the findings of Dorigo-Zetsma *et al*.[24] who reported 8% prevalence rate for *M. pneumoniae;* Csango *et al*. [25] with overall prevalence of 9.8% and Fang-Chang *et al,*[26] who reported an overall prevalence rate of 6.9% for *M. pneumoniae* infection in children in Taiwan Republic of China. These varying isolation/detection rates could be attributable to the differences in the categories of subjects studied, types of specimen collected and processed, detection methods employed and the overall sensitivities of the culture media and serological kits used by the various researchers.

A breakdown of the result into 2 groups of subjects studied (test and control) showed that the prevalence rate of *M. pneumoniae* was more among the test subjects 18(9.6%) than the control 3(4.0%) and this difference is statistically significant (P<0.05). This result contradicts that of Dorigo-Zetsma *et al*.[24], who reported that none of the 74 control subjects sampled were positive for *M. pneumoniae,* although throat swabs were used as against sputum samples used in our study. Sore throat subjects from our study did not yield *M. pneumoniae*.

The 27.8% prevalence rate of the virulent gene, GLPQ, detected from *M. pnemoniae* positive samples in this study though not statistically significant (p>0.05), indicates that not all the positive samples possess this enzyme. This enzyme was totally lacking in the control subjects that were *M. pneumoniae* positive. This fact probably shows the importance of the enzyme in disease causation. The finding is supported by the work of Schmidl *et al*, [13] who stated that GLPQ gene is the only active glycerophosphodiesterase in *M. pneumoniae* and the active glycerophosphodiesterase is required for full gliding velocity of the bacteria. These investigators also reported that *M. pneumoniae* is unable to cause any detectable damage to the host cells in the absence of GLPQ. They further observed that in addition to the enzymatic activity of GLPQ, it is also involved in the control of expression of several genes, among them the glycerol transporter. Consequently, they concluded that GLPQ is central to the normal physiology and pathogenicity of the pathogen, *M. pneumoniae.*

Distribution of *M. pneumoniae* by gender showed that the overall prevalence rate of the organism was more among the females 13 (9.4%) than males 8(6.5%). Ghotaslou *et al*.[18] also had similar findings of 55.5% for females and 44.5% for males. These results were not statistically significant (P>0.05) and the finding contradicts that of Bhattacharjee *et al*., [19] who reported 17.6% prevalence in males and 12.6% in females. However, the relationship between the presence of GLPQ gene and gender in this study was found to be statistically significant, as all the 5 GLPQ genes detected were from female subjects (P<0.05). This shows that the gene probably has an affinity for female gender thus suggesting that females could be more susceptible to the *M. pneumoniae* containing GLPQ gene than their male counterparts.

Age distribution of *Mycoplasma pneumoniae* in this study showed that *M. pneumoniae* was isolated more in adults than in children (P <0.05). This result is in agreement with the findings of Marston *et al*.[27] who reported that *M. pneumoniae* was responsible for 32.5% of 2,776 cases of community-acquired pneumonia in hospitalized adults in Ohio, USA. Interestingly, the virulent gene of *M. pneumoniae* detected in this study was in age groups less than 30 years, children less than 10years had 5.6% while 11.1% each was found in age groups 11-20years and 21-30years respectively. None was detected in patients above 30 years of age. Contrarily, other workers reported higher prevalence rates of *M. pneumoniae* among children, 24% by Shenoy *et al*.[28] and 27.4% by Chaudhry *et al*.[29]. Our low finding could be due to the low number of children enrolled in this study.

The *M. pneumoniae* detected from this study were observed to be more predominant from symptomatic subjects with various complaints (86%) than asymptomatic cases (14%). This result agrees with the findings of some other workers who reported that those infected with *M. pneumoniae* develop symptoms gradually over a period of several days, often persisting from weeks to months [30]. On the contrary, *M. pneumoniae* from the control subjects were observed from those without any complaints and the absence of the virulent gene (GLPQ) in any of the control samples helps in buttressing this fact. Dorigo-Zetsma *et al*. [30] also reported that 15% of asymptomatic house-hold contacts of 30 index cases with acute respiratory tract infection due to *M. pneumoniae* harboured the organism. When left undetected, it could result to serious disease sequelae such as: arthritis, transverse myelitis and dermatological manifestations.

The most common complaints (symptoms) observed among the patients who had respiratory tract infection due to *M. pneumoniae* in this study were cough, followed by chest pain and cough. Other

complaints included sore throat, sore throat and cough, chest-pain, sore-throat and cough concurrently. It was observed that *M. pneumoniae* respiratory tract infection in this study had relationship with symptoms as almost all those who were positive to *M. pneumoniae* had one symptom or more. This is statistically significant ($P < 0.05$) and agrees with the work of Steven *et al*.[31]; Ferwerda *et al*.[32] and Talkington *et al*.[33] who reported that most common manifestation of patients with *M. pneumoniae* respiratory tract infection include sore throat, hoarseness, fever, cough which is initially nonproductive but later may yield small to moderate amounts of non-bloody sputum, headache, chills, coryza, myalgias, ear ache and general malaise. The occurrence of the virulent gene, GLPQ, was more in those who complained of only cough while none was detected from those who had complaints of sore throat alone.

Conclusion

Detection of *Mycoplasma pneumoniae* from sputum samples and the further detection of the virulent gene, GPLQ, from only the test subjects show that this bacterium actually contributes to the etiology of respiratory tract infection. To the best of our knowledge, this is the first report of the detection of *M. pneumoniae* virulent gene (GLPQ gene) in Nigeria. *Mycoplasma pneumoniae* is not among the organisms being sought for in routine microbiological analysis of respiratory tract specimens. This is due to its fastidious nature and high cultural requirements. Thus, it is recommended that the search for this organism be included in the routine analysis of samples of patients with respiratory tract infections using available diagnostic tools.

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Afr. J. Med. Med. Sci. (2019) **48,** 233-242

Assessing knowledge and practice of cholera prevention and management procedures among primary health care workers in a Southwestern State, Nigeria

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Abstract

Introduction: Cholera outbreaks in Nigeria have been characterized by unusually high mortality (CFR>1%), indicating that systems presently in place for prevention, detection and management of cholera are weak. Given that inadequate health worker performance has been a problem in resource-limited settings and poor health worker knowledge has been implicated in poor health status in developing nations, it is imperative that the knowledge of primary health care (PHC) workers on cholera prevention and management procedures be assessed from time to time.

Methods: Using a cross-sectional study design, data collected from 286 PHC workers across four local government areas of Oyo State. Data were collected using a pre-tested self-administered questionnaire with sections eliciting responses to questions on general knowledge of cholera, prevention methods, knowledge and practice of safety procedures among health workers. Descriptive statistics and Chi-square tests were used to present the data and test for statistical associations between categorical variables at 5% level of significance respectively.

Results: Nurses (35.05%) constitute the highest proportion of health workers compared to doctors (8.7%). The mean age of respondents was 38.02 ± 9.48 years with the majority of respondents between 30-49 years. Majority (83.6%) do not know the cholera alert threshold. Overall, 45.1% of respondents demonstrated good knowledge of cholera prevention and management measures. Very few (28.0%) of the respondents had undergone any form of training on cholera outbreak in the past year. More workers aged 40 - 49years knew the cholera alert threshold compared to other age groups (p=0.033).

Conclusion: Results from this study show that health workers at the primary level in Oyo State still lack adequate knowledge of general cholera prevention and management procedures. More training and re-training of health workers with regards to management of cholera is desirable to reduce the mortality rates within the selected areas.

Keywords: *Cholera, health workers, primary health care, epidemic, fatality rates, personal protective equipment*

Abstrait

Introduction : Les épidémies de choléra au Nigeria ont été caractérisées par une mortalité inhabituellement élevée (PFC> 1%), ce qui indique que les systèmes actuellement en place pour la prévention, la détection et la gestion du choléra au Nigeria sont faibles. Étant donné que les performances insuffisantes des agents de santé ont été un problème dans les pays à ressources limitées et que les mauvaises connaissances des agents de santé ont été impliquées dans l'état de santé médiocre des pays en développement, il est impératif que la connaissance des agents de soins de santé primaires (SSP) sur les procédures de prévention et de gestion du choléra soient évaluées de temps en temps.

Méthodes : En utilisant une conception d'étude transversale, les données ont été recueillies auprès de 286 agents de SSP dans quatre communes de l'État d'Oyo. Les données ont été recueillies à l'aide d'un questionnaire autoadministré prétesté avec des sections permettant de recueillir des réponses aux questions sur les connaissances générales sur le choléra, les méthodes de prévention, les connaissances et la pratique des procédures de sécurité des agents de santé. Des statistiques descriptives et des tests du chi-carré ont été utilisés pour présenter les données et pour tester les associations statistiques entre les variables qualitatives à un niveau de signification de 5%.

Résultats : Les infirmiers (35,0%) étaient les cadres les plus populaires alors que les médecins (8,7%) étaient les moins populaires. L'âge moyen des répondants était de 38,02 ± 9,48 ans, la majorité d'entre eux ayant entre 30 et 49 ans. La majorité (83,6%) ne connaît pas le seuil d'alerte du choléra. Au total, 45,1% des répondants ont démontré une bonne connaissance des mesures de prévention et de gestion du choléra. Très peu de

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répondants (28,0%) avaient suivi une formation sur l'épidémie de choléra au cours de l'année écoulée. Un plus grand nombre de travailleurs âgés de 40 à 49 ans connaissaient le seuil d'alerte du choléra par rapport aux autres groupes d'âge (p = 0,033).

Conclusion : Les résultats de cette étude montrent que les agents de santé primaire dans l'État d'Oyo n'ont toujours pas une connaissance suffisante des procédures générales de prévention et de gestion du choléra. La formation et recyclage davantage des agents de santé en matière de gestion du choléra est souhaitable pour réduire les taux de mortalité dans les zones sélectionnées.

Mots-clés : *choléra, agents de santé, soins de santé primaires, épidémie, taux de mortalité, équipement de protection individuelle*

Introduction

Cholera is an acute enteric infection, resulting from the ingestion of Vibrio cholera, a bacterium found in fecal-contaminated water and food, and capable of killing healthy adults within hours from severe dehydration caused by acute watery diarrhea [1]. Escalating the deadliness of the disease is its very high virulence, which can result in majority of entire communities contracting the disease within a few days, causing a public health epidemic. While other continents have recorded significant improvements in the prevention and case management of cholera, the disease remains endemic in sub-Saharan Africa. In Asia, the case fatality ratio (CFR) has remained less than one percent while African countries have continued to record cholera outbreaks with CFRs of five percent and higher [2].

As a result of the high CFRS, several measures have been developed in order to prevent cholera outbreaks or contain its spread using appropriate control measures. For instance, at the international level, the World Health Organization (WHO) formed the Global Task Force on Cholera Control while other agencies such as the United Nations International Children's Emergency Fund (UNICEF) and the Physicians for Human Rights have played varying roles in preventing and managing cholera cases and outbreaks world over [1,3]. The guidelines and policy documents arising from these efforts have stipulated that preventive measures such as provision of clean, portable water, health education as well as effective disease surveillance and response systems should be prioritized [2]. However, in cases of outbreak, the aim should be to control the spread while limiting CFR to less than one percent [4]. Cholera outbreaks in which the CFR exceeds this threshold indicate a failure in the case management of those infected, poor provision of water and sanitation and a dearth of emergency response and preparedness to contain the epidemic [5,6].

The reasons for continued outbreaks with CFR of greater than five percents within the African context have been identified to include a reactive approach to cholera control which although may mitigate the associated mortality, fails to prevent cases of cholera [6]. This is exacerbated by weak surveillance systems manned by few and in many cases, under-trained staff within countries that are still yet to effectively control and contain cholera epidemics [5,7].

In Nigeria, the cholera outbreaks (with CFRs higher than the upper limit of one percent) mirrors the deplorable conditions of the country. For instance, the 2010 epidemic, considered to be one of the worst in recent years, was reported to affect over 40,000 Nigerians, resulting in more than 1500 deaths and a case fatality rate of more than 3.75%. Till date, the disease remains classified as endemic [6,8,9]. As identified earlier, the state of Human Resources for Health (HRH) in Nigeria remains a challenge that could be contributing to the high incidence and CFR of cholera in the country[2,10]. In addition, most of the human resource lack continued education and the necessary tools and infrastructure to carry out their jobs adequately [11,12]. According to the National Policy on Health, primary health care (PHC) workers are those responsible for health education and awareness among community members, front-line cholera surveillance and in many cases cholera control and case management. Hence, it is important that they are up-to-date in their knowledge and practice of standard procedures approved for cholera prevention and control.

While the recent past episode of cholera outbreak was concentrated in the Northern region of the country, several areas in Oyo State still exhibit heightened vulnerability to cholera outbreaks as a fallout of deplorable living conditions such as poor hygiene conditions, insufficient access to safe water and densely populated urban slums [8,9]. Based on Oyo State's history of recurrent cholera outbreaks in recent past within local government areas inhabited by migrants on the borders of the state [13], periodic assessment of knowledge and preparedness of primary health workers to manage cholera is deemed necessary. This study thus sought to assess cholera prevention and management preparedness levels among PHC workers in selected local government areas inhabited by immigrants in Oyo State. Estimating the severity and understanding the

deficiencies can improve preparedness for cholera outbreaks and management that will in turn reduce the incidence and CFR of cholera in the state and the country at large.

Methods

Using a cross-sectional study design, the knowledge and practice of cholera prevention and management procedures were assessed among PHC workers in selected local government areas of Oyo State. The State, one of the three States carved out of the former Western State of Nigeria in 1976, is bound in the north by Kwara State, in the west partially by Republic of Benin and partly by Ogun state, in the east by Osun State and in the south by Ogun State. The State is one of the six states in south western Nigeria; has an approximate land mass of 28,454 KM^2 and home to an estimated population size of about 5,591,598 people [14]. Oyo State consists of 33 local governments and 35 local council development areas. It is situated 78 miles inland from Lagos and is a prominent transit point between the coastal region and the areas to the north. The principal inhabitants of the city are the Yorubas [14]

Using a multistage sampling technique, four border LGAs out of 33 local government areas (Atisbo, Itesiwaju, Iwajowa and Saki) were purposively selected due to frequent cholera outbreaks in those areas. Thereafter, all the private (31) and public health facilities (105) in the LGAs were studied. With a provision of sampling frame of health workers in each facility by the Oyo State Ministry of Health, the calculated sample size for health workers was allocated proportionately to each of the cadre of health staff in each LGA based on their size. At the health facility level, participants were selected using simple random sampling where the number of staff in each cadre is more than the size allocated. This baseline health facility-based survey was conducted among 286 health workers between July and September 2016. The healthcare workers interviewed included doctors, nurses, laboratory scientists, community extension workers and hospital attendants. The PHC health workers only included those that had been working with the Local Government Civil Service Commission for at least one year in the selected LGAs. All visiting health workers or whose appointments had not been confirmed were excluded from the study.

Data was obtained using a pre-tested, validated, semi structured and self-administered questionnaire to interview health workers in the health facilities. The instrument was developed using questions adapted from standard instrument for the assessment of health workers knowledge and practice in health care services and cholera. The questionnaire was used to seek information such as socio-demographic characteristics of respondents, general knowledge on cholera prevention and management, safety practices among health workers, knowledge of cholera disease surveillance and notification procedures and others. Seven different variables were used to assess the knowledge of the respondents. Each question was allotted one mark for complete and correct answers, while a score of zero was allotted for incomplete and/or inaccurate answers. Based on this, respondents who scored four and above were classified as having good knowledge while those who scored less than four were classified as having poor knowledge. Data entry and analysis were carried out using Statistical Package for Social Sciences (SPSS) software version 21. Descriptive statistics such as frequencies and proportions were used to present the data. Test of association was done between categorical variables using Chi square and the level of significance was set at 5%.

The ethical approval for the study was obtained from Oyo State Ministry of Health Ethical Committee. The interview was limited to participants who voluntarily provided written informed consent. Data collected included no identifiers that could be used to link individual questionnaires to specific respondents. Information given by the respondents was kept confidential and stored in a restricted folder on a personal computer only accessible by the principal investigator.

Results

The mean age of respondents was 38.02 ± 9.48 years with the majority of respondents between 30-49 years (33.2%). About three out of every four respondents were female, indicating female dominance in the study population. Similar proportions of respondents were from rural locations (80.1%) and married (80.8%). The majority of respondents (71.6%) had some form of post-secondary education while six respondents did not have any form of education. Nurses (35.0%) were the most popular cadre while doctors (8.7%) were the least popular (Table 1).

All the respondents had heard about cholera but only 48.3% of them classified cholera as a diarrheal disease while 27.2% of them thought cholera was an epidemic–prone disease. Less than one-fifth (18.5%) of them classified cholera as a food-related disease. About a quarte classified contaminated food as a cause for cholera and a fifth (20.4%) classified contaminated water as a cause for cholera.

Table 1: Socio-demographic characteristics of respondents (N = 286)

	n	%
Gender		
Female	214	74.8
Male	72	25.2
Location		
Urban	57	19.9
Rural	229	80.1
Age Group		
20-29	60	21.0
30-39	95	33.2
40-49	93	32.5
50 and older	38	13.3
Marital Status		
Single	55	19.2
Married	231	80.8
Level of Education		
None	6	2.1
Primary	29	10.1
Secondary	46	16.1
Tertiary	176	61.5
Postgraduate	29	10.1
Religion		
Christianity	165	57.7
Islam	118	41.3
Others	3	1.0
Cadre		
Doctor	25	8.7
Nurse	100	35.0
CHO	31	10.8
CHEW	43	15.0
Others	87	30.4
LGA of Residence		
Atisbo	65	22.7
Itesiwaju	61	21.3
Iwajowa	57	19.9
Saki West	103	36.0

Table 2: General knowledge on cholera prevention and management

*Variable	n	%
Cholera (Type) (N=379)		
Diarrheal	183	48.3
Bone	5	1.3
Hemorrhagic	18	4.7
Food-related disease	70	18.5
Epidemic prone disease	103	27.2
Causes of cholera (N=636)		
Poor personal hygiene	207	32.5
Contaminated water	130	20.4
Contaminated food	155	24.4
Poor sanitation practices	131	20.6
Mosquito bite	13	2.1
Symptoms of cholera (N= 951)		
Coughing	286	30.1
Cold	9	0.9
Vomiting	196	20.6
Stooling	224	23.6
Headache	29	3.0
Stomach ache	82	8.6
Dehydration	125	13.2
Transmission Routes (N=396)		
Fecal-oral	217	54.8
Person to person	73	18.4
Blood transfusion	3	0.8
Sharing syringes and needles	9	2.3
Contact with body fluids of cholera patients	94	23.7
Cholera prevention strategies (N=434)		
Frequent hand washing	184	42.4
Good hygiene practices	213	49.1
Bathing three times daily	26	6.0
Use of insecticide	11	2.5
Cholera management safety practices (N=553)		
Washing of hands	210	38.0
Proper waste disposal	180	32.5
Regular drinking of water	26	4.7
Consumption of food	23	4.2
Using hand gloves	114	20.6

*All variables are multiple response questions

The most common responses among respondents as to the symptoms of cholera were coughing (30.1%), stooling (23.6%) and vomiting (20.6%). The least common symptoms recorded were cold (0.9%), headache (3.0%) and stomach ache (8.6%). About half (54.8%) of the respondents classified the fecal-oral route as the mode of transmission of cholera while only 23.7% believed that cholera can be transmitted by contacting body fluids of infected patients. As to ways of preventing cholera, less than half (42.4%) of the respondents thought that frequent hand washing could prevent cholera (Table 2)

Just a little more than half of the respondents (54.9%) had overall good knowledge of cholera prevention and management measures while 129 (45.1%) of them had poor knowledge of cholera prevention and management measures.

Washing of hands was selected as a safety procedure by 38.0% of the respondents while using hand gloves while managing cholera cases was selected by just about 1 in every 5 respondents. Exactly 78.0% affirmed that tap water should be used to wash hands. Only 6.6% of respondents did not

Table 3: Safety practices among health workers

	n	%
Possibility of health workers getting cholera (N=286)		
Possible	204	71.3
Not possible	72	25.2
I don't know	10	3.5
**Known safety practices (N=553)*		
Washing of hands	210	38.0
Proper waste disposal	180	32.5
Regular drinking of water	26	4.7
Consumption of food	23	4.2
Using hand gloves	114	20.6
**Known Hand washing methods (N=372)*		
Common container	108	29.0
Running water	264	71.0
Type of water used for hand washing (N=286)		
Tap water	223	78.0
Well water	57	19.9
Stream water	2	0.7
Others	4	1.4
Ingredients for hand washing (N=286)		
Liquid soap	237	82.9
Detergent	31	10.8
Bar soap	18	6.3
Use of PPE (N=286)		
Yes	264	92.3
No	22	7.7
***.Type of PPE used (N=264)*		
Hand gloves	247	93.6
Nose mask	15	5.6
Others	2	0.8
***.Frequency of PPE use (N=264)*		
Always	148	56.1
Frequently	91	34.5
Rarely	25	9.4
Method of waste disposal in health facility (N=286)		
Burning	122	42.7
Dumping in open pit	32	11.2
Burying	16	5.6
Burning and burying	116	40.6

**Multiple response variables; **.represent sub-responses to a previous question*

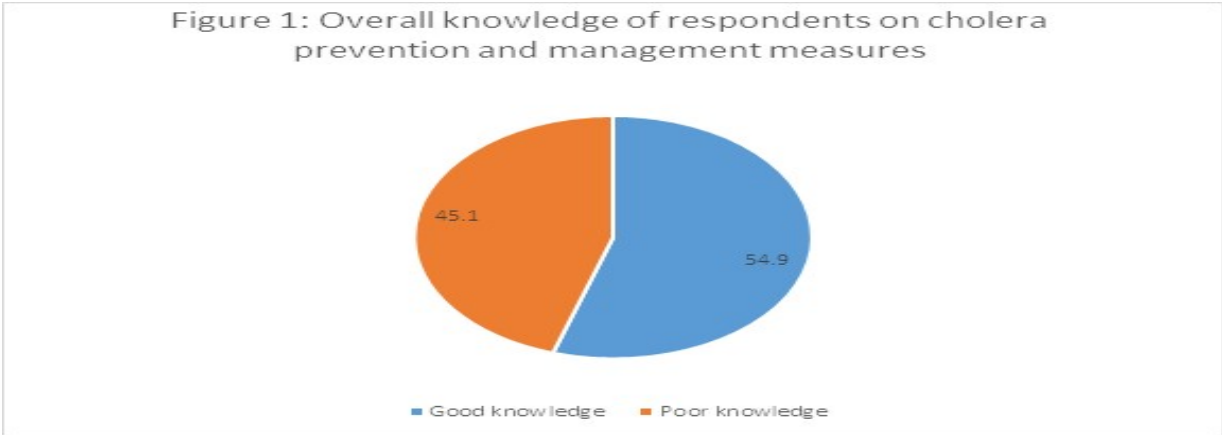

Table 4: Knowledge and practice of cholera disease surveillance and notification procedures

	n	%
Know the cholera alert threshold (N=286)		
Yes	47	16.4
No	239	83.6
Who to report an outbreak to (N=286)		
LGA DSNO	250	87.4
State DSNO	27	9.4
State epidemiologist	5	1.7
MOH	4	1.4
Standard Reporting route (N=286)		
HF-State-LGA-Federal	9	3.1
HF-LGA-State-Federal	273	95.5
HF-Federal-State-LGA	1	0.3
State-Federal-LGA-HF	3	1.0
Staff Responsible For reporting (N=286)		
Staff attending to patient	110	38.5
Data officer	69	24.1
DSNO	44	15.4
Focal person	19	6.6
Informant	2	0.7
Nurse	12	4.2
Doctor	30	10.5
Facility carried out surveillance in past 1 year (N=286)		
Yes	93	32.5
No	193	67.5
What kind of surveillance (N=93)		
Passive	17	18.3
Active	30	32.3
Passive and active	46	49.5
Frequency of surveillance (N=93)		
Weekly	36	38.7
Monthly	46	49.5
Quarterly	9	9.7
Yearly	2	2.2
Any training in the past year (N=286)		
Yes	134	46.9
No	152	53.1
Training on cholera outbreak (N=286)		
Yes	80	28.0
No	206	72.0

use PPE and the hand gloves were the most common PPE used (92.5%). More than half (56.1%) of the health workers interviewed used PPE always while managing cholera. Less than half of the respondents (40.6%) selected burning and burying as their method of waste disposal while 1 out of every 9 respondents used dumping in an open pit as their method of waste disposal in the health facility (Table 3)

Of all respondents, less than one in every five (16.4%) knew the alert threshold for cholera. The majority of respondents (87.4%) said the LGA DSNO is the first person to contact in the case of an outbreak while 95.5% of the respondents selected the Health facility-local government-state-federal route of reporting. Less than one-third (32.5%) of respondents reported carrying out any form of surveillance in their facility in the past one year while 18.3% of these reported the surveillance to be passive. About half (49.5%) of those who carried out surveillance said that it was done monthly while in most cases (63.4%), the DSNO was the staff responsible for carrying out the surveillance. Less than half (46.9%) of the respondents had undergone any form of training in the past year while only 28% of respondents had undergone any training on cholera outbreak (Table 4)

Table 5: Association between knowledge of cholera alert threshold and socio-demographic characteristics

	Know alert threshold for cholera outbreak			
	Yes	No	X^2	p-value
Gender (N=286)				
Female	36 (16.8)	178 (83.2)	0.094	0.760
Male	11 (15.3)	61 (84.7)		
Marital Status (N=286)				
Currently single	6 (10.9)	49 (89.1)	20.97	0.553
Currently married	41 (17.7)	190 (82.3)		
Age group (N=286)				
20-29	4 (6.7)	56 (93.3)	8.760	0.033*
30-39	15 (15.8)	80 (84.2)		
40-49	17 (18.3)	76 (81.7)		
50 and older	11 (28.9)	27 (71.1)		
Religion (N=286)				
Christianity	25 (15.2)	140 (84.8)	5.836	0.120
Islam	21 (17.8)	97 (82.2)		
Others	1 (33.3)	2 (66.7)		
Location (N=286)				
Urban	13 (22.8)	44 (77.2)	2.11	0.147
Rural	34 (14.8)	195 (85.2)		
Cadre (N=286)				
Doctor	2 (8.0)	23 (92.0)	2.73	0.604
Nurse	19 (16.0)	81 (81.0)		
CHO	6 (19.4)	25 (80.6)		
CHEW	5 (11.65)	38 (88.4)		
Others	15 (17.2)	72 (82.8)		
LGA (N=286)				
Atisbo	11 (16.9)	54 (53.4)	1.52	0.678
Itesiwaju	9 (14.8)	52 (85.2)		
Iwajowa	7 (12.3)	50 (87.7)		
Saki West	20 (19.4)	83 (80.6)		

* = Significant association

A higher proportion of married respondents (17.7%) than single respondents (10.9%) knew the cholera alert threshold. In addition, the proportion of respondents who knew the cholera alert threshold increased as respondent age increased, with the association between age group and knowledge of the cholera alert threshold being statistically significant (p=0.033). Only 8% of doctors interviewed knew the alert threshold for cholera while 19.4% of CHOs knew the alert threshold for cholera, indicating a general lack of knowledge of cholera alert threshold among the respondents. In addition, only 14.8% of respondents from rural areas knew the alert threshold for cholera as compared to 22.8% from urban areas. The difference in these proportions were however not statistically significant ($0.147 \leq p \leq 0.604$) (Table 5)

Discussion

This study assessed knowledge and practice of cholera prevention and management procedures among Primary Health Care (PHC) workers in Oyo State in order to measure their capacity to prevent and cope with cholera in the state. Most of the healthcare workers interviewed were residents in the rural areas. The socio-demographic information showed trends familiar among the country's Human Resources for Health (HRH) where the majority of lower cadre health workers are female, between 30 and 49 years old and have completed university education. However, when compared with other studies from the Northern part of Nigeria, the health worker mix differs significantly [6,15]. While in this study, the most common health worker group were nurses, Community Health Extension Workers (CHEWs) are usually the most common in the North. Similarly, the proportion of doctors in this study is at least 250% more than was recorded on studies in the North. These statistics tally with the disparities observed by the National Demographic and Health Surveys and the conclusion by many researchers that

the South has a higher number of high cadre staff than the North [16,17]. This could be associated with the less frequent outbreaks of cholera and better management of such outbreaks observed in the South [8].

Responses assessing the respondents' general knowledge on cholera prevention and management showed some grave misconceptions among health workers. For example, almost two-thirds of respondents still not know that cholera is epidemic-prone. Similarly, almost one-third of the respondents listed cough as a symptom of cholera, while a few even mentioned stomach ache and headache as symptoms of cholera. These misconceptions among health workers could lead to wrong diagnosis and in other cases, failure to detect true cholera cases promptly. In addition, since PHC workers are usually the primary source of health information for community members, especially in rural areas, having these misconceptions could lead to passage of wrong health education to the people and in turn, increase the rate of adverse health behavior and likelihood of disease outbreak. Misinformation by health workers has also been observed to be associated with lower use of health facilities and worse health seeking behavior [18].

The observation that almost three out of 10 health workers not know that it is possible for them to contract cholera from cases admitted in the health facility shows that the dearth of knowledge of safety procedures health workers need to follow. This study also observed that the health workers had fairly good knowledge of safety practices that they as health workers need to adhere to in order to prevent them from acquiring cholera. However, quite a few still had wrong ideas such as regular drinking of water as a method of safeguarding themselves from cholera infection. Other studies in Nigeria have also reported low to average knowledge of safety practices among health workers working in health facilities [19,20]. The same sub-optimal knowledge is reported in some countries in the West African sub-region such as Liberia and Ghana [21,22].

This has resulted in poor practice of safety measures as also observed in this study. For example, although more than nine out of 10 health workers had used PPE, only a little more than half (56.1%) use the PPE every time they handle cholera cases. This kind of risky behavior has been implicated in disease transmission to health workers who engage in case management of such epidemic-prone diseases [6,23].

Disease surveillance and notification (DSN) systems were designed as a public health tool for eradication and control of diseases and was introduced in Nigeria in 1989. The strength and effectiveness of the DSN system is usually measured by how promptly diseases such as cholera are identified and contained [24]. In Nigeria, the DSN has been noted to be inadequate, with structural weaknesses inhibiting its ability to promptly detect and control epidemics [25]. Results from this study show this trend has not improved as the majority of the health workers said no form of disease surveillance had taken place in the past one year at their facility. Among those who carried out disease surveillance, only a few carried it out regularly.

Cholera is one of the diseases on both the immediate notifiable disease list and the routine notifiable disease list in Nigeria and in other West African sub-regions [26]. The irregularity and in many cases, absence of disease surveillance could be a major reason why cholera outbreaks in the country are not identified quickly, leading to needless deaths and abnormally high CFR. Further aggravating the situation is the fact that most of the workers interviewed in this study do not know the alert threshold and are thus unlikely to report any outbreak quickly.

A good reason for the situation above could be the lack of training of the majority of health workers interviewed. Several studies, both within the country and in similar settings, have demonstrated that while health workers in low and middle income countries are those with the greatest need for continuous education due to the burden of disease and low health worker population, they are often times the most neglected in terms of training and continuous education programs [3,25,27]. However, it has been demonstrated, that conducting regular training for health workers have the capacity to improve health worker knowledge and performance significantly [4,6,18]. Another problem usually encountered within the Nigerian context is the blocking of the information flow cascading to the health facility workers. For instance, it was observed that most of the personnel training on DSN conducted at Federal and State levels were never stepped down to health workers at the Local Government and facility levels [25].

A limitation of this study is that it is not representative of the knowledge and practice of cholera prevention, detection and management practices among Nigerian health workers in general as the study population were PHC workers only. It is possible that the situation is different among secondary and tertiary health facility workers. Similarly, the results may differ across states and

geo-political zones. In addition, this study did not investigate the role other health system characteristics may play in determining the knowledge and practice of cholera prevention, detection and management practices among respondents. Lastly a qualitative component will be desirable in future studies to understand the deeper factors influencing safety practices in the health facilities.

Conclusion

In resource-limited settings such as in Nigeria, Primary Health Center (PHC) workers are essential for the delivery of health interventions. However, inadequate health-worker performance is a very widespread problem, with many health workers lacking the requisite knowledge and skills required to carry out their responsibilities effectively. This is even more important in prevention and management of diseases such as cholera which have been noted to spread quickly and could result in fatalities. Results from this study show that PHC in Oyo State still lack adequate knowledge of general cholera prevention and management procedures. This could be as a result of infrequent and skewed training of health workers also observed in this study. Thus, it becomes imperative that government and other national and international health institutions organize more training programs for these workers. In addition, steps should be taken to ensure that knowledge and information delivered at the top cascades promptly and accurately to health workers at PHCs.

Ethics approval and consent to participate

Ethical approval for the conduct of the study was obtained from the Department of Planning Research and Statistics, Ministry of Health, Oyo State Secretariat, Ibadan, Nigeria. Data collection process was performed according to standard ethical guidelines. Prior to questionnaire administration respondents' anonymity was protected by ensuring that no individual identifiers existed in the instrument or in the electronic data set. Written informed consents were sought and obtained from participants after thorough briefing on the objectives of the study.

Funding

The authors appreciate the funding support from World Health Organization. This investigation received technical and financial support from The African Regional Office of the World Health Organization (WHO/AFRO) and the Special Programme for Research and Training in Tropical Diseases (TDR): AFRO/TDR Small Grants Scheme for Implementation Research in Infectious Diseases of Poverty in Africa. The conduct of the study and findings are exclusively those of the authors and not in any way represent the views of the funders.

Acknowledgements

The authors would like to thank all the health workers that volunteered to participate in the study. The authors also appreciate Mrs. Olubukola Ojo and Mr. Olajimi Latunji for their support for data collection and analysis.

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Afr. J. Med. Med. Sci. (2019) **48,** 243-249

Reproductive and biochemical parameters of tramadol and vitamin E in acutely treated male Wistar rats

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Abstract
Objectives: Tramadol is a centrally acting analgesic widely abused as a male aphrodisiac. Long term use of tramadol has been reported to cause derangement of reproductive and biochemical parameters by inducing oxidative stress. We therefore investigated the effects of vitamin E on tramadol-induced alterations in these parameters.
Methodology: Male Wistar rats (210-250 g) were randomly grouped (n=5) and treated orally for 3 days. Group 1 served as control, Group 2 and 3 received tramadol (1.43 mg/kg) while Group 4 and 5 also received tramadol (50 mg/kg). Group 3 and 5 were co-administered with vitamin E (200 mg/kg). Animals were thereafter sacrificed by cervical dislocation. Sperm profile was determined microscopically while testosterone, luteinizing hormone (LH) and follicle stimulating hormone (FSH) were analysed using ELISA technique from serum obtained. Lipid profile and liver function biomarkers were examined spectrophotometrically
Results: Tramadol (50 mg/kg) caused a significant decrease in LH and FSH, decreased weight of testes and seminal vesicles when compared with the control. Sperm motility, sperm count and testosterone decreased by tramadol (1.43 and 50 mg/kg) treatment while total cholesterol, total bilirubin, conjugated bilirubin and ALT were significantly increased. Co-administration with vitamin E prevented tramadol-induced increase in serum cholesterol and bilirubin. A transient protective effect of vitamin E was also observed on the sex hormones.
Conclusion: Short term tramadol use adversely affects male reproductive and biochemical parameters and this may be ameliorated by vitamin E.

Keywords: *Tramadol, vitamin E, sperm profile, sex hormones*

Abstrait
Contexte : Le tramadol est un analgésique à action centrale largement utilisé comme aphrodisiaque masculin. Il a été rapporté que l'utilisation à long terme du tramadol provoquait une perturbation des paramètres de reproduction et biochimiques en induisant un stress oxydatif. Nous avons donc étudié les effets de la vitamine E sur les altérations de ces paramètres induites par le tramadol.
Méthodologie : Des rats Wistar mâles (210-250 g) ont été regroupés au hasard (n = 5) et traités par voie orale pendant 3 jours. Le groupe 1 a servi de groupe témoin, les groupes 2 et 3 ont reçu du tramadol (1,43 mg / kg), tandis que les groupes 4 et 5 ont également reçu du tramadol (50 mg / kg). Les groupes 3 et 5 ont été coadministrés avec de la vitamine E (200 mg / kg). Les animaux ont ensuite été sacrifiés par dislocation cervicale. Le profil du sperme a été déterminé au microscope tandis que la testostérone, l'hormone lutéinisante (LH) et l'hormone stimulant le follicule (FSH) ont été analysées en utilisant la technique ELISA à partir du sérum obtenu. Les biomarqueurs du profil lipidique et de la fonction hépatique ont été examinés par spectrophotométrie
Résultats : Le tramadol (50 mg / kg) a entraîné une diminution significative de LH et de FSH, une diminution du poids des testicules et des vésicules séminales par rapport au contrôle. La motilité des spermatozoïdes, la numération des spermatozoïdes et la testostérone diminuent avec le traitement au tramadol (1,43 et 50 mg / kg), tandis que le cholestérol total, la bilirubine totale, la bilirubine conjuguée et l'ALT ont augmenté de manière significative. L'administration concomitante de vitamine E a empêché l'augmentation du cholestérol sérique et de la bilirubine induite par le tramadol. Un effet protecteur transitoire de la vitamine E a également été observé sur les hormones sexuelles.
Conclusion: L'utilisation à court terme du tramadol a des effets néfastes sur les paramètres de reproduction et biochimiques de l'homme, ce qui pourrait être amélioré par la vitamine E.

Mots - clés : *tramadol, vitamine E, profil du sperme, hormones sexuelles*

Introduction

Tramadol is a synthetic centrally active opioid analgesic used to manage moderate to severe pain. It has dual mechanism of action. It works by binding to μ-opioid receptors in the brain and spinal cord. These receptors are responsible for both the pain-relieving effects and at higher doses, the euphoric effects that abusers seek. In addition, it works as a

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serotonin-norepinephrine reuptake inhibitor, thereby increasing brain levels of serotonin and norepinephrine [1].

There have been several reports of abuse and toxicity of tramadol in recent times especially by young adult males [2]. This abuse includes the use of tramadol as an aphrodisiac for men with premature ejaculation and the use of tramadol and alcohol to ease the effects of manual labour. The main symptoms of tramadol toxicity include central nervous system depression, nausea, vomiting, seizures and tachycardia [3]. There are also reports of tramadol abuse that resulted in death due to cardiopulmonary arrest, hypoglycemia and liver failure [4, 5]. The dependence on tramadol could be due to the euphoria and mood elevation caused by increased brain levels of serotonin and norepinephrine [5]. Ahmed and Kurkar [6] reported the debilitating effects of chronic tramadol administration on testicular functions of male rats, and they concluded that the effects might be mediated through oxidative stress induced by the drug.

Vitamin E is an antioxidant which protects cell membranes from oxidative damage. It helps to protect the sperm and egg cell integrity. The role of vitamin E on reproductive health is widely studied and it has been demonstrated that vitamin E enhances reproductive function and health. In males, vitamin E aids sperm motility and quality, and also positively affects the accessory sex organs [7]. Vitamin E deficiency can therefore negatively affect male fertility by causing testicular abnormalities and defective spermatogenesis [8].

Reports in literature indicate that long term tramadol abuse cause decreased levels of testosterone, luteinizing hormone (LH) and follicle stimulating hormone (FSH), and increase in aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP) and serum bilirubin [9]. In addition to these, histological damage to the testicular seminiferous tubules, sertoli and leydig cells have been reported [10]. Tramadol is a widely abused drug, especially among the youthful population, for alleged purpose of sexual enhancement. However, there is dearth of information on the effects of its short term use on male reproduction. In this study, we therefore sought to determine the effects of acute tramadol (therapeutic dose and overdose) use on male reproductive and some biochemical parameters and to determine if vitamin E can prevent or ameliorate the tramadol-induced damage.

Materials and method

Drugs

All drugs used in this study were analytical grade and were purchased from Sigma Chemical Co. (St. Louis, MO, USA). Tramadol (Tramadol HCL salt) is a white crystalline powder and its chemical name is (±)-cis-2-[(dimethylamino) methyl]-1-(-3-methoxyphenyl) cyclohexanol. The recommended therapeutic daily dose of tramadol is in the range of 100-400 mg daily, but not above 400 mg per day, titrated to the severity of pain [11]. Tramadol dose used in this study was 1.43 and 50 mg/kg. The former is equivalent to therapeutic dose of 100 mg while the latter is as earlier reported in literature [12]. Also, vitamin E (200 mg/kg) dose used is as earlier reported in literature [13, 14].

Experimental animals

Twenty-five male Wistar rats (210 – 250 g) were procured and kept in well aerated cages with solid floors covered with wood shavings in the animal house of the College of Health Sciences, Osun State University, Osogbo, with a constant 12 hour light 12 hour dark cycle. The rats were fed with standard pellets purchased from Ladokun livestock feeds, Ibadan, which contained 21 % protein, 35 % fat, 30 % carbohydrate, 0.8 % phosphorus and 0.8 % calcium and had access to water *ad libitum*. All procedures in this study conformed to the guiding principles for research involving animals as recommended by the Declaration of Helsinki and the Guiding principles in the care and Use of animals as amended [15]**.** The rats were acclimatized for two weeks before onset of experiment.

Experimental design

After acclimatization, rats were randomly assigned to five groups (n=5). Group 1 served as control and received the vehicle (distilled water). Group 2 and 3 received tramadol (1.43 mg/kg) while Group 4 and 5 also received tramadol (50 mg/kg). Groups 3 and 5 in addition received vitamin E (200mg/kg) concurrently. All treatment was administered twice daily (12 hourly) by oral gavage for three days. At the end of the experiment, the animals were sacrificed by cervical dislocation under sodium pentobarbital (30 mg/kg i.p) anesthesia and blood was obtained by cardiac puncture. The sex organs and visceral organs were excised, cleared of adhering tissues and weighed. After two hours, blood was centrifuged at 3000 rpm for 5minutes and serum obtained was stored at -20 ÚC.

Sperm analysis

The left caudal epididymis was excised and lacerated. The sperm obtained was analyzed microscopically. The sperm was categorized as belonging to one of three motility categories -

progressive, non-progressive and immotile, according to World Health Organisation guidelines [15]. Sperm viability was assessed by using the improved one step eosin-nigrosin staining technique. A fraction of each suspension of the sperm samples was mixed with equal volume of eosin-nigrosin stain and air dried smears were prepared on glass slides for each samples according to Bjorndahl *et al* [16]. Normal live sperm cells exuded the eosin-nigrosin while dead sperm cells took up the stain. Sperm count was done according to Ekaluo *et al* [17].

Hormonal assay

Serum levels of testosterone, LH and FSH were assayed using ELISA technique according the manufacturer (CalbiotechInc, California, USA) protocols. Testosterone kit used (Cat No. TE187S) had a sensitivity of 0.075 ng/ml, with intra and inter assay variations of 3.9 and 4.3 % respectively. Respectively, LH and FSH kits (Cat No. LH231F and FS232F) had sensitivity of 0.12 and 0.353 mIU/ml with intra assay variation of 7.60 and 5.6 % while inter assay variation was 10.83 and 6.4 %.

Serum Lipid Profile and Liver function Biomarkers

Total cholesterol, triglyceride, high-density lipoproteins (HDL) and low-density lipoprotein (LDL) in serum obtained were determined by enzymatic colorimetric method as described by Rifai *et al[18]*. The determination was based on the formation of colour after enzymatic hydrolysis and oxidation. The indicator quinoneimine used was formed from H_20_2 and 4-amino-antipyrine in presence of phenol. All the biochemical parameters were assayed using the respective commercial diagnostic kits obtained from Diasys Diagnostic systems (Istanbul, Turkey) on a Statfax Diasys 1904 plus Biochemical Analyzer.

The serum levels of ALP, ALT and AST were assayed by the method of Moss and Henderson [19], using commercial test kits with automated A15 spectrophotometer (Biosystem S.A, Barcelona, Spain).

Statistical analysis

Data were expressed as Mean ± Standard Error of Mean (SEM) and analyzed by Student's t-test and one way analysis of variance (ANOVA) using SPSS version 16 (SPSS Inc., Chicago, IL) for comparing means of two groups. $P<0.05$ was considered as significant.

Results

Effect of tramadol and vitamin E on organ weights

Acute tramadol administration had no significant effect on the total body weight, weights of visceral organs, epididymis and prostate gland of treated rats when compared with the control (Table 1). Tramadol overdose (50 mg/kg) caused a significant decrease in the weight of testes and seminal vesicle. However, co-administration of tramadol with vitamin E prevented this tramadol-induced weight decline in testes and seminal vesicle.

Table 1: Effect of tramadol and vitamin E on relative organ weights

	Control	1.43mg/kg Tramadol	1.43mg/kg Tramadol + vit E	50 mg/kg Tramadol+	50 mg/kg Tramadol+ vit E
Total Body Weight (g)	225.7± 4.33	254.0± 18.80	221.8 ± 8.41	220.6 ± 10.40	240.4 ± 10.40
Heart (g)	0.72±0.03	0.79±0.07	0.67±0.02	0.69±0.03	0.78±0.03
Kidney (g)	0.59±0.01	0.67±0.04	0.57±0.01	0.57±0,03	0.66±0.04
Liver (g)	4.82±1.13	7.41±0.86	6.37±0.17	5.39±0.16	6.05±0.35
Lungs (g)	2.51±0.93	1.68±0.17	1.50±0.13	1.51±0.02	1.73±0.11
Brain (g)	1.63±0.04	1.77±0.05	1.69±0.04	1.35±0.12	1.53±0.07
Spleen (g)	0.89±0.07	1.02±0.07	0.74±0.05	0.74±0.07	0.78±0.06
Testes (g)	1.33 ± 0.06	1.27 ± 0.14	1.01 ± 0.09	1.07 ± 0.07*	1.24 ± 0.08
Epididymis (g)	0.71 ± 0.06	1.27 ± 0.05	0.67 ± 0.02	0.60 ± 0.03	0.66 ± 0.04
Prostate (g)	0.43 ± 0.03	0.47 ± 0.06	0.40 ± 0.02	0.35 ± 0.05	0.46 ± 0.08
Seminal vesicles (g)	1.57 ± 0.19	1.61 ± 0.10	1.34 ± 0.18	0.84 ± 0.17*	1.34 ± 0.06#

Values of Mean ± S.E.M, n=5 p<0.05.

** indicate significant difference with control*

#indicate significant difference with corresponding tramadol only

Effect of tramadol and vitamin E on sperm parameters

There was a significant decrease in sperm motility and sperm count when rats were administered with either therapeutic dose (1.43 mg/kg) or overdose (50 mg/kg) of tramadol (Table 2). Also, tramadol (50 mg/kg) caused a significant increase in the number of sperm cells with defective morphology when compared with the control. However, co-administration with vitamin E (200 mg/kg) failed to prevent these observed declines in sperm profile.

Effect of tramadol and vitamin E on biochemical parameters

There was a significant increase in the total cholesterol of tramadol (1.43 and 50 mg/kg) only treated rats (Figure 2). However, co-administration with vitamin E prevented this increase in serum total cholesterol level. Tramadol (1.43 and 50 mg/kg) also significantly increased the serum total bilirubin and conjugated bilirubin when compared with control (Table 3). Co-administration of tramadol with vitamin E prevented the tramadol-induced increase in total bilirubin level. Vitamin E also ameliorated tramadol (1.43 mg/kg) induced increase in conjugated bilirubin level, but not when treated with drug overdose (50 mg/kg). At therapeutic dose, tramadol (1.43 mg/kg) caused an increase in serum ALT and this was ameliorated by vitamin E. Serum albumin, AST and ALP were not affected by tramadol (Table 3). Also, no significant effect was observed

Table 2: Effect of tramadol and vitamin E on sperm profile

	Control	1.43mg/kg Tramadol	1.43mg/kg Tramadol + vit E	50 mg/kg Tramadol	50 mg/kg Tramadol + vit E
Sperm motility (%)	87.0 ±3.0	76.0 ± 2.5*	76.0 ± 2.4*	68.0 ± 2*	72.0 ± 2.0*
Sperm viability (%)	96.8 ± 0.7	96.2 ± 0.9	96.8 ± 0.7	96.8 ± 0.7	96.2 ± 0.7
Sperm volume (ml)	5.18 ± 0.02	5.18 ± 0.03	5.18 ± 0.02	5.18 ± 0.02	5.16 ± 0.02
Sperm count (million/ml)	128.4 ± 7.0	109.8 ± 6.0*	106.8 ± 6.6	101.2 ± 4.8*	100.6 ± 4.9*
Abnormal sperm (%)	11.0 ± 0.2	11.8 ± 0.9	12.5 ± 0.3*	12.5 ± 0.4*	12.6 ± 0.5*

*Values are Mean ±SEM, n=5, *p<0.05 indicate significant difference compared to control*

Effect of tramadol and vitamin E on sex hormones

Administration of tramadol caused a dose dependent decrease in serum testosterone, LH and FSH levels when compared with the control (Figure 1). Vitamin E ameliorated the tramadol-induced decrease in sex hormones but failed to absolutely restore the hormone levels.

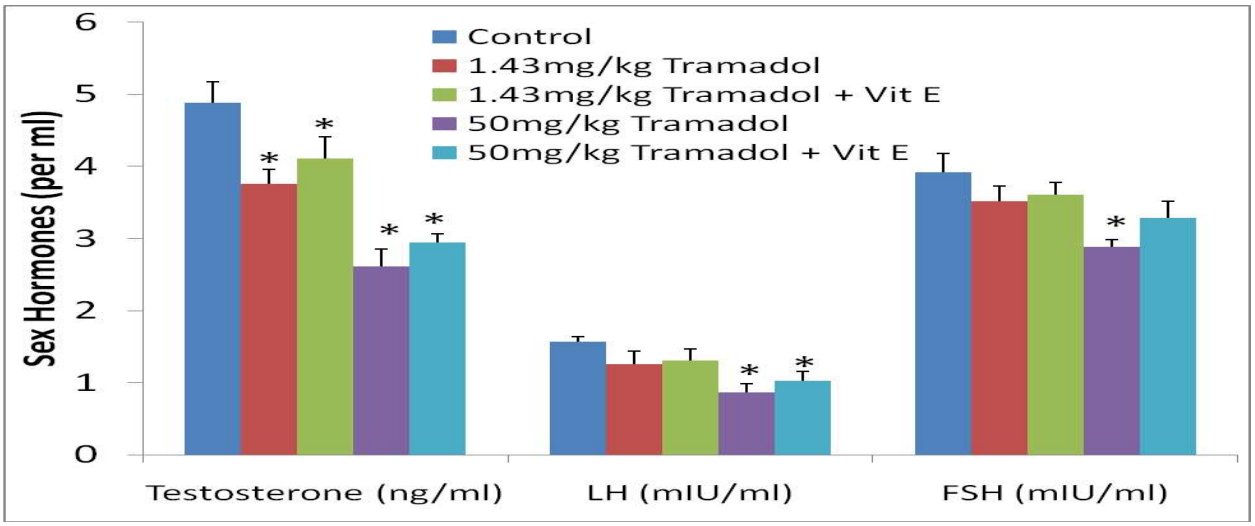

Fig. 1: Sex hormones of tramadol and vitamin E treated rats.Values are expressed as Mean±SEM, n=5. *p<0.05 indicates significant difference from control

on serum levels of triglyceride, LDL and HDL (Figure 2).

Table 3: Effect of tramadol and vitamin E on serum protein and liver function biomarkers

	Control	1.43mg/kg Tramadol	1.43mg/kg Tramadol + vit E	50 mg/kg Tramadol	50 mg/kg Tramadol + vit E
Total bilirubin (mg/dl)	1.28 ± 0.12	1.64 ± 0.05*	1.34 ± 0.10#	1.84 ± 0.06*	1.46 ± 0.11#
Conjugated bilirubin (mg/dl)	0.24 ± 0.05	0.42 ± 0.04*	0.32 ± 0.03	0.48 ± 0.08*	0.42 ± 0.03*
Albumin (mg/dl)	25.6 ± 2.76	26.8 ± 2.88	27.8 ± 4.29	26.0 ±4.02	26.6±1.04
ALT (U/L)	10.2 ± 0.96	16.4 ± 1.98*	13.4 ± 1.02	19.4 ± 2.94	14.8 ± 1.49
AST (U/L)	18.0 ± 1.51	19.2 ± 1.49	22.6 ± 1.20	27.0 ± 2.30	21.2 ± 1.98
ALP (U/L)	94.0 ± 7.76	104 ± 5.49	104.6 ± 7.27	111.2 ± 8.80	113.2 ± 8.95

Values are Mean ± S.E.M, n=5, p<0.05
** indicate significant difference from control and*
#significant difference with corresponding tramadol only

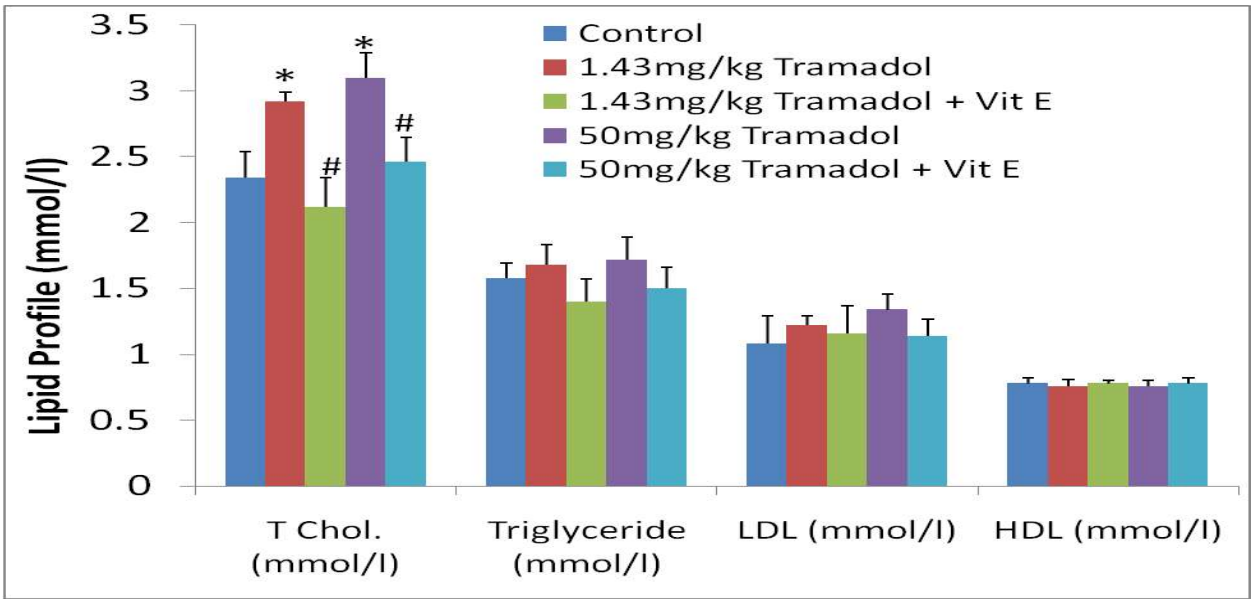

Fig.2: Effect of tramadol and vitamin E on lipid profile
Values are Mean ± S.E.M, n=5 and p<0.05; T. chol – total cholesterol
* indicate significant difference from control
#indicate significant difference with corresponding tramadol only

Discussion and conclusion

The rise in the dependence on tramadol, a centrally acting analgesic within young male adults is alarming. It is commonly abused as a male aphrodisiac. Martyn-St James *et al [20]* reported that tramadol is more effective in the treatment of premature ejaculation than behavioral therapy. Earlier reports from literature have established reproductive toxicity of this drug, decreasing the sex hormones and inducing histopathological derangement of the testicular seminiferous tubules, sertoli cells and leydig cells [6, 10]. Its increasing short term abuse as a sexual stimulant calls for concern. To the best of our knowledge, there is no scientific information till date on its short term effect on male reproductive physiology.

Results from this study indicate that acute overdose of tramadol (50 mg/kg) caused a significant decrease in the weight of testes and seminal vesicle of rats.The weight of reproductive organs is well documented to provide useful reproductive risk

assessment in experimental studies [21]. It may be inferred from the reduction in weight of testis and seminal vesicle that acute overdose of tramadol could have anti-spermatogenic and anti-androgenic effects. This corroborates the work of El Fatoh *et al [22]* who reported that tramadol caused testicular degeneration and arrest of spermatogenesis. Vitamin E, an antioxidant known to protect sperm integrity prevented tramadol-induced decrease in testicular and seminal vesicle weight. The basic semen analysis of sperm parameters serves as a diagnosis of male fertility [23]. The observed decline in testicular weight was accompanied by a significant decrease in the sperm motility and sperm count of rats administered with tramadol (1.43 and 50 mg/kg) and an increase in percentage of sperm cells with abnormal morphology. This further corroborates the anti-spermatogenic effect of this drug, even when used for short term at therapeutic dose. The observed decrease in sperm count and the increased number of morphological abnormal sperm suggests interference with testicular spermatogenesis by this drug [24].

Testosterone, LH and FSH are vital hormones required for the gametogenic functions of the testis. Acute tramadol administration caused a dose dependent decrease in these hormones (Figure 1). Ahmed and Kurkar [6] earlier reported a decrease in testosterone, LH and FSH of rats that received subcutaneous injections of tramadol (40 mg/kg) for 8 weeks. The hormonal dysfunction could imply that tramadol probably induced toxicity by blocking the release of gonadotropins from the anterior pituitary gland which in turn results in decreased stimulation of testicular leydig cells and decrease in testosterone secretion. These adversely affect spermatogenesis and probably culminated in the observed decline in sperm profile of tramadol treated rats. Vitamin E is a non enzymatic antioxidant which acts against production of reactive oxygen species. It helps to prevent lipid peroxidation in the sperm plasma membrane and maintain normal sperm function [25]. It is worth noting that vitamin E prevented tramadol-induced decrease in testicular weight and ameliorated tramadol-induced decline in androgen and gonadotropins. Ahmed and Kurkar [6] earlier reported that long term tramadol administration resulted in increased testicular nitric oxide and oxidative stress. Overproduction of nitric oxide and consequent excessive exposure to oxidative conditions has a potential implication in the reduction of sperm motility [26]. Further ongoing studies in our laboratory will investigate if vitamin E will prevent or ameliorate tramadol-induced increase in testicular nitric oxide and oxidative stress.

An increase in serum total cholesterol, total bilirubin and conjugated bilirubin was observed in the tramadol treated rats, therapeutic dose inclusive. Increase in blood total cholesterol levels predisposes to atherosclerosis [27] and is a risk factor for mycardial infarction and stroke [28]. Bilirubin is formed as a result of the breakdown of hemoglobin. The excretion of bilirubin is done by the liver via the bile. The observed increase in total and conjugate bilirubin may infer that tramadol at both doses administered, may induce abnormality in liver function and could also be a risk factor for jaundice. However, co-administration of treated rats with vitamin E prevented tramadol-induced increase in serum cholesterol level and total bilirubin levels. Tramadol had no effect on triglycerides, high and low density lipoproteins. Except the observed increase in ALT in tramadol (1.43 mg/kg) treated rats, no significant effect was observed on other liver function biomarkers in all other treatment groups.

From the forgoing, it is evident that tramadol abuse as a sexual stimulant mediates its action not by stimulating sex hormones, as it is obviously debilitating to these hormones and the testes, even at therapeutic dose. Its toxicity to the testes appears to be due to its effect on the gonadotropes of the anterior pituitary. Vitamin E treatment ameliorated tramadol-induced damage to the reproductive physiology of male rats.

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Afr. J. Med. Med. Sci. (2019) **48,** 251-256

Use of immunohistochemistry in the differential diagnosis of nasopharyngeal tumours in resource limited-settings: defining a cost-effective approach

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Abstract

*Background***:** Squamous cell carcinomas (SCC) are the most common nasopharyngeal tumors (NP) subtypes, however other tumors particularly Non-Hodgkin's lymphomas (NHL), occur in the nasopharynx and require different treatment approach. Therefore identifying and distinguishing these tumors from carcinomas is crucial for appropriate patient management. This study reviews the diagnostic accuracy of NP with and without the use of immunohistochemistry (IHC) and attempts to define meaningful, cost-effective immunohisto-chemical approach in low-resource setting.

*Materials and methods***:** Nasopharyngeal tumours (52 cases) identified in the database of Department of Pathology, University College Hospital, Ibadan, Nigeria in the period January 2007 to December 2012 were reviewed. The diagnosis based on haematoxylin and eosin stained sections were Nasopharyngeal carcinomas (41 cases), Poor differentiated tumour (2 cases), Non-Hodgkin's lymphomas (7 cases), Adenoid cytic carcinoma (1case) and Small blue cell tumour (1 case). A limited IHC antibody panel consisting of Cytokeratin cocktail (AE1/AE3/CAM5.2), CD20 and CD3 were performed on all cases and subtyping T-cell NHL using CD30 and Desmin for the small blue cell tumour typing. The previous morphologic diagnosis and post IHC diagnosis were compared to determine accuracy/error rate.

Results: Reviewed post-IHC classification of available 52 cases includes: NPC (39), NHL (11), adenoid cystic carcinoma (1) and Rhabdomyosarcoma (1), 2 cases of NHL were misclassified as carcinoma based on morphology alone. Therefore, Lymphomas included: B-cell NHL (9 cases); Anaplastic Large Cell Lymphoma (2 cases which were the poorly differentiated tumours on H&E); Error rate post IHC studies was approximately 5% (2/41) for NPC. The diagnosis of Anaplastic Large Cell Lymphoma and Rhadomyosarcoma could only be made definitively with IHC. Overall, error rate for all tumours post IHC was 11.5% (6/52)

Conclusion: Small panel of antibodies (cytokeratin, CD20, CD3) combined with good H&E stained sections is useful and cost effective in distinguishing undifferentiated nasopharyngeal carcinoma from lymphomas and for minimally subtyping NHL in resource-limited regions and crucial for better patient management.

Keywords: *Nasopharyngeal carcinoma, immunohistochemistry, Non Hodgkins, lymphoma. Cytokeratin, CD45*

Abstrait

Contexte **:** Les carcinomes épidermoïdes (SCC) sont les sous-types de tumeurs nasopharyngées (NP) les plus courants. Cependant, d'autres tumeurs, en particulier les lymphomes non hodgkiniens (LNH), apparaissent dans le nasopharynx et nécessitent une approche thérapeutique différente. Par conséquent, l'identification et la distinction de ces tumeurs des carcinomes sont cruciales pour la gestion appropriée du patient. Cette étude examine l'exactitude du diagnostique des NP avec et sans utilisation de l'immunohistochimie (IHC) et tente de définir une approche immunohistochimique significative et rentable dans un environnement à faibles ressources.

Matériels et méthodes **:** Les tumeurs nasopharyngées (52 cas) identifiées dans la base de données du département de pathologie du Collège Hospitalier Universitaire d'Ibadan, Nigéria entre janvier 2007 et décembre 2012 ont été passées en revue. Les diagnostics basés sur les coupes colorées à l'hématoxyline et à l'éosine étaient les suivants : carcinomes du nasopharynx (41 cas), tumeur mal différenciée (2 cas), lymphomes non hodgkiniens (7 cas), carcinome adénoïde

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cystique (1 cas) et tumeur à petites cellules bleues (1 cas). Un panel limité d'anticorps IHC consistant en un cocktail de cytokératine (AE1 / AE3 / CAM5.2), CD20 et CD3 ont été réalisés sur tous les cas et sous-typage de LNH des cellules T en utilisant CD30 et Desmin pour le typage de tumeur à petites cellules bleues. Diagnostic morphologique précédent et le diagnostic post-IHC ont été comparés pour déterminer le taux d'exactitude / erreur.

Résultats : La classification révisée postérieure à l'IHC des 52 cas disponibles comprend : NPC (39), LNH (11), carcinome adénoïde cystique (1) et du sarcome Rhabdomyome (1). Deux cas de LNH ont été classés à tort comme des carcinomes basés sur la morphologie seule. Par conséquent, les lymphomes comprenaient : LNH à cellules B (9 cas) ; Lymphome anaplasique à grandes cellules (2 cas, qui étaient les tumeurs mal différenciées sur H&E); Le taux d'erreur après les études IHC est d'environ 5% (2/41) pour les NPC. Le diagnostic de lymphome à grandes cellules anaplasique et de sarcome Rhabdomyome ne peut être posé de manière définitive qu'avec l'IHC. Dans l'ensemble, le taux d'erreur pour toutes les tumeurs après l'IHC était de 11,5% (6/52)

Conclusion : Un petit groupe d'anticorps (cytokératine, CD20, CD3) associé à de bonnes sections colorées H&E est utile et économique pour distinguer le carcinome nasopharyngé indifférencié des lymphomes et pour sous-caractériser de manière minimale l'LNH dans les régions limitées en ressources et crucial pour une meilleure gestion des patients.

Mots-clés : *carcinome* du *nasopharynx, immunohistochimie, non hodgkinien, lymphome, Cytokératine, CD45*

Introduction

Nasopharyngeal Carcinomas (NPC) especially squamous cell carcinomas (SCC) are the most common malignant neoplasm subtype that occur in the nasopharynx in most parts of the world. Other tumors, particularly Non-Hodgkin's lymphomas (NHL) do occur in the nasopharynx and require different treatment approach.[1-5] The differentiation between B-cell and T-cell type NHL, becomes critical and important because of the more aggressive nature of the Tcell tumours compared to B cell type tumours.[2,3,6] Furthermore identifying Natural Killer (NK) cell/Tcell Non- Hodgkins lymphoma as distinct from T cell lymphoma is important because of the markedly different prognosis in the two tumour types [3,6]. Therefore, identifying and distinguishing these tumors from SCC with immunohistochemical staining by the characteristic antibody marker is crucial for appropriate patient management.

In many parts of Nigeria and sub-Saharan Africa, immunohistochemistry is not part of routine histopathology service mainly because of high cost of antibodies and consumables, poor supply chain, lack of steady electric power and lack of technical-know how.

The use of Haematoxylin and Eosin (H and E) stained sections only in diagnosis of Nasopharyngeal Tumours (NPT) is fraught with likelihood of misdiagnosis because diffuse cellular infiltrate of non-cohesive cells admixed with lymphoplasmacytic infiltrate (Schminke pattern) may resemble NHL in many cases. This is in contrast to syncytial pattern of arrangement of cohesive tumour cells with indistinct cell margins (Regaud pattern) which are much easier to diagnose as NPC on H& E stained sections.

The fact that lymphomas are amenable to chemotherapy, radiotherapy and monoclonal antibody treatment makes it imperative that a precise diagnosis is made.

The aim of this study was to review the diagnostic accuracy of nasopharyngeal tumors with and without the use of immunohistochemistry (IHC) and attempts to define meaningful, cost-effective immunohistochemical approach that will assist in distinguishing these tumors.

Material and methods

Nasopharyngeal tumours identified in the database of Department of Pathology University College Hospital, Ibadan, Nigeria in the period January 2007 to December 2012 were reviewed. Only 54 cases fulfilled the inclusion criteria as only cases where nasopharngeal tissue were biopsied directly were included in the study. All lymph nodes biopsied in relation to the primary nasopharngeal tumours were excluded. The 52 cases in this study (based on initial Haematoxylin and Eosin diagnosis) included the following - 1. Nasopharyngeal carcinomas-NPC (41 cases) 2. Poorly differentiated tumour (2 cases) 3. Non-Hodgkin's lymphomas -NHL (7 cases) 4. Small blue cell tumour (1 case) and 5. Adenoid cystic carcinoma (1 case)

Limited IHC using antibody panel that consists of cytokeratin cocktail (AE1/AE3/CAM 5.2), CD20 and CD3 were performed on all cases and to subtype NHL. Further subtyping of NHL using CD 30 and typing the Small blue cell was done using Desmin. The previous morphologic/ histological diagnosis and post IHC diagnosis were compared to determine accuracy rate.

Table 1: The classification of the 52 cases with only Haematoxylin and stained sections and post immunohistochemical studies.

	Nasopharyngeal tumour	Number of cases with Haematoxylin and eosin diagnosis only	Diagnosis/Number of cases after application of IHC makers	IHC Makers used
1	Nasopharyngeal Carcinoma(NPC)	41	NPC- 39 NHL(B-cell)-2	AE1/AE 3, CD3, CD20
2	Poorly differentiated tumour	2	ALCL-2	CD3,CD30, AE1/AE3
3	NHL	7	NHL (B-cell)-7	CD3,CD20,
4	Small blue cell tumour	1	Rhadomyosarcoma	AE1/AE3, DESMIN
5	Adenoid cytic carcinoma	1	Adenoid cystic carcinoma	AE1/AE3

ALCL - Anaplastic large cell lymphoma, NHL - Non Hodgkin' lymphoma

The FFPE tumour tissue for each case was sectioned into 4µm thick sections. The slides were deparaffinized, rehydrated and the protocol specified for each antibody by the manufacturer was used for antigen retrieval, primary antibody dilution and staining. The slides were then washed with a buffer solution twice for five minutes. The bound antibody was visualized using a DAB-chromogen substrate. The sections were then stained with hematoxylin and mounted with a cover-slip. Negative control cases were obtained by omission of the primary antibody in the staining protocol. A suitable tissue was used as the positive control and stained along with all the sections.

This study was conducted in compliance with the guidelines of the Helsinki declaration on biomedical research in human subjects. Confidentiality of the identity of the patients and personal health information was maintained.

Results

Table 1 shows the reviewed classification of the 52 cases after immunohistochemical studies. These included: NPC (39 cases), NHL [11], adenoid cystic carcinoma [1] and Rhabdomyosarcoma [1]. Two cases of NHL were originally misclassified as carcinoma based on H&E stained sections alone. These were thereafter reclassified. Table 1 also shows details of the cases pre and post-IHC staining. Overall, Lymphomas included: B-cell NHL (9 cases); T-Cell NHL (2 cases), both cases were anaplastic large cell lymphoma-(ALCL)- (These were the 2 cases with H&E diagnosis of poorly differentiated tumour probably carcinoma). The error rate post-IHC studieswais approximately 5% (2/41) for NPC. The diagnosis of ALCL and rhadomyosarcoma could only be made definitively with IHC. Therefore, the error rate for all tumours post- IHC, which will affect

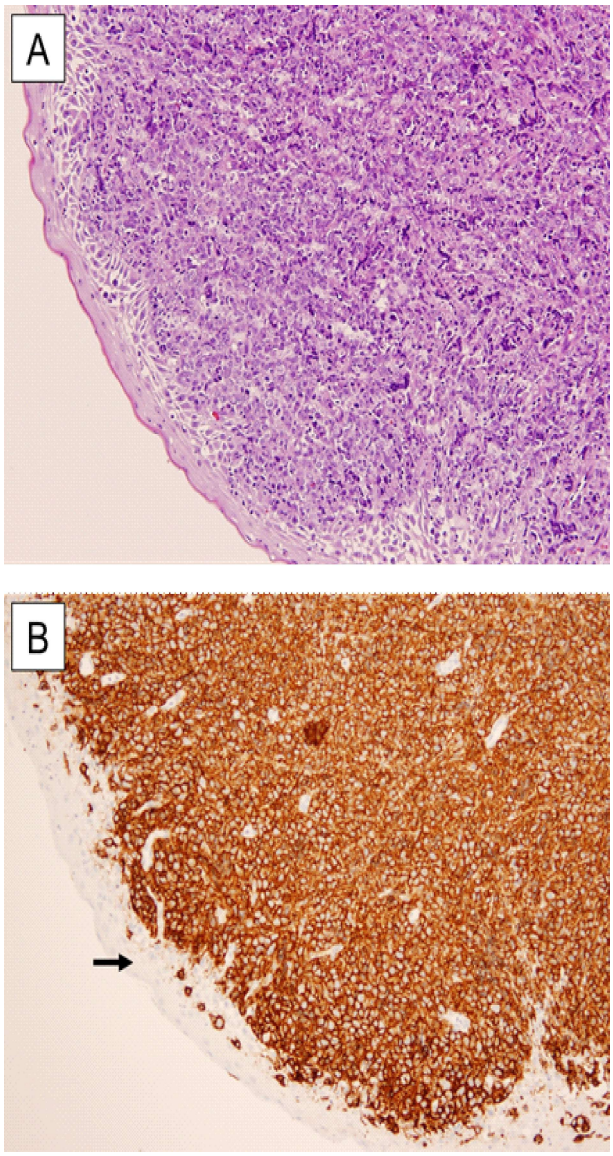

***Fig. 1**: (A) H&E stained section of submucosal nasopharyngeal tumor with sheets of tumor cells.*
***(B)** The same tumor stained with CD20 with strong diffuse membrane staining of the tumor cells and the unstained negative superficial epithelial mucosa (arrow).*

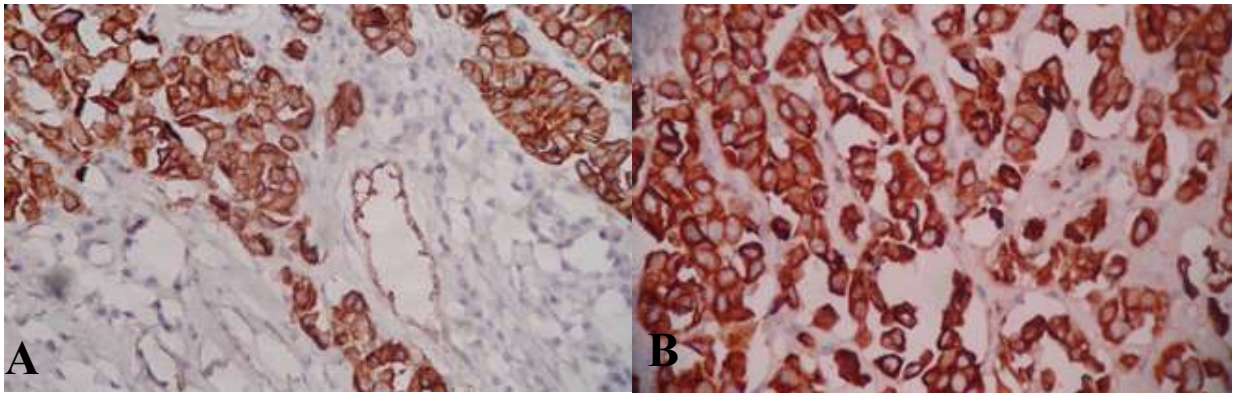

Fig. 2 (A) Cytokeratin stained section with the unstained lymphoid cells in the background in a Nasopharyngeal carcinoma. (B) Higher magnification of the stained in Fig. 2 (A)

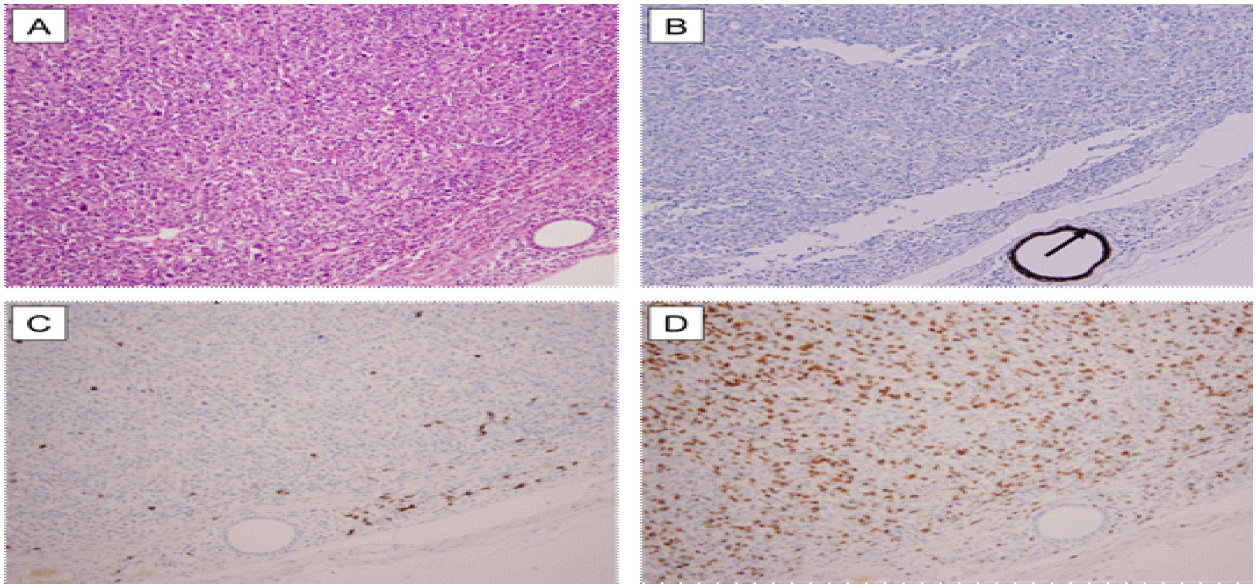

Fig.3: (A) H&E section of pleomorphic submucosal nasopharyngeal tumour with scattered large cells. (B) Cytokeratin immunostained section with negative staining tumour cells; small mucosa gland staining as internal positive control (arrow). (C) Scattered B-lymphocytes stained with CD20 but tumour cells are negative. (D) CD3immunostain shows predominance of CD3-positive atypical small and intermediate sized T lymphoid cells.

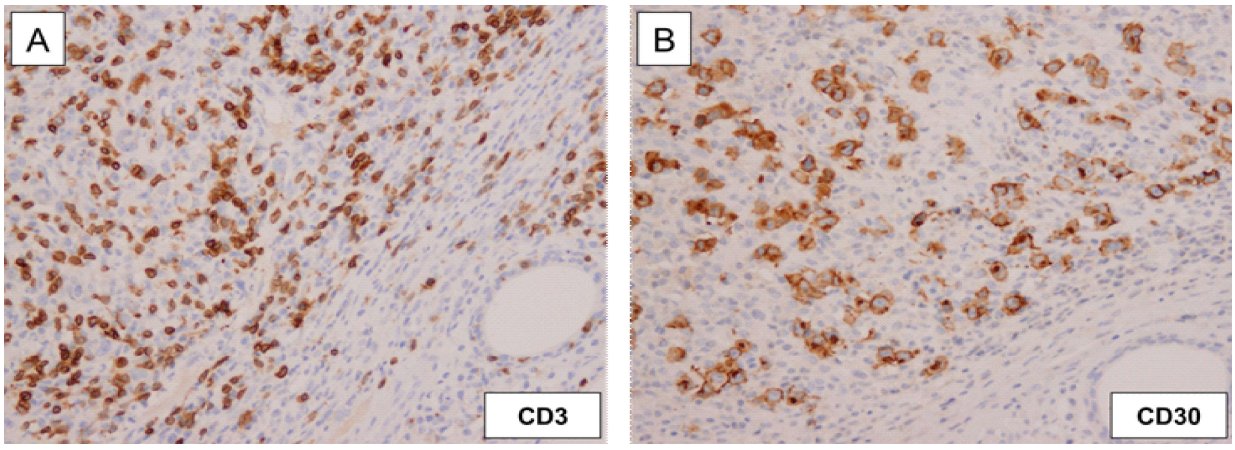

Fig. 4: (A) Higher magnification of CD3 immunostained section in Fig 3(D) with scattered unstained large cells amongst the atypical small and intermediate-sized T-lymphoid cells. (B) Additional CD30 immunostain was performed which shows scattered CD30 positive large cells, supporting the diagnosis of ALCL

treatment plan of the patients was 11.5% (6/52). Figure 1 illustrates the usefulness of CD20 in confirmation and subtyping NHL. Figure 2 illustrates a poorly differentiated nasopharyngeal carcinoma.

Figures 3 and 4 illustrate a case of anaplastic large cell lymphoma (ALCL) misdiagnosed as poorly differentiated tumour.

Discussion

Immunohistochemistry (IHC) is indispensable in modern practice of histopathology. In resource-limited setting, low income countries (LIC) and low middle income countries (LMIC) like Nigeria, IHC is not routinely carried out in practice. The reasons commonly adduced for this include cost consideration in setting up immunohistochemistry service, poor supply chain and issues of infrastructural challenges like electrical power to preserve the reagents used in the IHC procedure including the antibodies which are temperature sensitive.

This study illustrates that a good section of haemtoxylin and eosin can still be used to arrive at a good diagnosis in 88 % of nasopharyngeal tumours. However, there were 11.5% of cases that could be misdiagnosed based only on H&E sections alone. This will definitely have changed treatment plans for these patients. Therefore, IHC as addition helps in making precise diagnosis and offering a better prognosis.

The panel of IHC markers that is useful in arriving at a specific diagnosis of a NPT can essentially be applied only after a detailed examination of a good Haemtoxylin and eosin stained sections. Broad linage makers for epithelia (AE1/AE3) and lymphoid (CD3 and CD 20) can be applied as first line IHC markers. As illustrated from this study only 3 cases needed further makers to diagnose the ALCL (Figures 3 and 4) and the Desmin needed to diagnose the case of Rhabdomyosarcoma. Therefore 49 out of the 52 cases (94% of the cases) were diagnosed easily with an H&E stained sections and the 3 first line markers (AE1/AE3, CD3 and CD 20) used.

In a study by Sugimoto *et al*, 74 cases of nasopharyngeal malignant neoplasms were analyzed immunohistochemically and classified into 16 lymphomas and 58 carcinomas. Eight lymphomas were of T-cell origin and eight were of B-cell origin. [6] With immunophenotyping, the ratio of carcinomas to other malignant tumours in the nasopharynx from the study by Sugimoto et al was 78% which is similar to 75% we got in the current study. Similarly, the ratio of carcinomas to lymphomas was similar to the study by Sugimoto *et al*. [6]. However the ratio of B-Cell to T-cell was equal in that study but was about 4:1 in this study. This observation may be related to the high incidence of endemic type NPC which is mainly driven by Epstein Barr Virus (EBV) in the part of the world where that study was carried out. A high percentage T-cell type lymphomas in the head and neck region are Natural Killer (NK) cell/Tcell Non- Hodgkins lymphoma which are EBV driven as distinct from T cell lymphomas which are not EBV driven [3,6]. It is therefore important for this discrimination because of the markedly different prognosis in these two distinct tumour types [3,6].

Our current study was able to identify ALCL which are usually EBV driven based on a systematic and stepwise of use of IHC as illustrated in figures 3 and 4.

Futhermore, the importance of the use of IHC in discriminating between different types of lymphomas and NPC is critical when the only tissue submitted from a patient is a lymph node that is biopsied for definitive diagnosis. This is more critical as IHC can help discriminate from the possible differential diagnosis on H&E stained sections as illustrated in the case reported by Jabbour *et al* where metastatic NPC, a NHL and HL were considered [8]

The challenge of cost of treatment of a nasopharyngeal tumour which is daunting in resource limited setting therefore makes precise diagnosis of a specific tumour more important. This is because a misdiagnosis as illustrated from this study when no IHC was applied towards arriving at a diagnosis could lead to wrong treatment making the prognosis in patients worse [5].

It must be emphasized that a good clinical history and detailed physical examination of the patient - the traditional pathway of arriving at diagnosis are still very crucial in resource limited settings where cost of health care is still borne with out of pocket payment. Therefore, the Pathologist has to take note of this challenge when ordering IHC panel. This study reinforces and illustrates the need for judicious use of IHC markers in the practice of histopathology and this can be used to arrive at very specific diagnosis to enable precise treatment in about 94 % of cases of NPT.

In conclusion, a small panel of antibodies (cytokeratin, CD20, CD3) combined with good H&E section is useful and cost effective in distinguishing

undifferentiated nasopharyngeal carcinoma from lymphomas and for minimally subtyping NHL in limited resource areas and crucial for better patient management.

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Congenital transverse vaginal septum - a cause of primary infertility

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Abstract

Congenital transverse vaginal septum is a malformation of the lower genital tract resulting from failure of canalization of the vagina during the development of an embryo. It is a common congenital abnormality of the lower female genital tract that usually presents with cryptomenorrhea. The location, extent of the vaginal septum and clinical presentation vary by case. It commonly presents as obstruction of menstrual flow with associated haematometria.

We described a case of a 24 year old woman with congenital transverse vaginal septum, regular menstrual flow presenting with primary infertility of 3 years, in her second marriage and eventually had a successful pregnancy after surgical resection of the septum.

Keywords: *Transverse vaginal septum, congenital anormaly vagina, congenital anomaly infertility, primary infertility*

Abstrait

Le septum vaginal transversal congénital est une malformation du tractus génital inférieur résultant de l'échec de la canalisation du vagin lors du développement d'un embryon. C'est une anomalie congénitale commune du tractus génital inférieur de la femme qui se présente généralement avec une crypto-ménorrhée. L'emplacement, l'étendue du septum vaginal et la présentation clinique varient selon les cas. Il se présente généralement comme une obstruction du flux menstruel avec une hémato-métrie associée.

Nous avons décrit le cas d'une femme de 24 ans présentant un septum vaginal transversal congénital, un flux menstruel régulier présentant une stérilité primaire de 3 ans, lors de son deuxième mariage et ayant eu une grossesse réussie après une résection chirurgicale du septum.

Mots – clés : *septum vaginal Transverse, anomalie congénitale du vagin, anomalie d'infécondité congénitale, l'infécondité primaire*

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Introduction

Infertility is the inability of a couple to achieve pregnancy despite regular unprotected sexual intercourse at a frequency of least two to three times a week for more than 12months[1]. Primary infertility occurs when pregnancy has never been achieved. For pregnancy to occur, it is imperative for the reproductive tract of both the male and female to develop and function optimally. The causes of infertility may be due to male or female factors or a combination of both [2]. The female factor infertility may be due to hormonal imbalance, ovulatory factors, tubal factor, uterine, cervical and vaginal causes including structural abnormalities [2].

Congenital abnormalities of the genital tract occur as a result of a developmental malformation of the genital tract during intrauterine life arising from failure of Mmullerian fusion. A lower Mullerian fusion defect may result in a longitudinal or a transverse vaginal septum. The transverse vaginal septum as a structural abnormality of the vaginal may be partial or complete; and may cause varying degrees of obstruction of the lower genital outflow tract. Abnormalities of the genital tract may co-exist with other abnormalities of the urogenital system and other organ systems [3].

This case report showcases the rare presentation of transverse vaginal septum with primary infertility; demonstrates the importance of prompt detailed evaluation and intervention in the management of this patient with infertility-associated transverse vaginal septum.

Case report

Mrs. S. B. is a 24 year old married patent medicine seller who presented with a history of inability to conceive of 3 years duration despite adequate unprotected sexual intercourse 2-3 times per week. There was no history of galactorrhea, headache, blurring of vision, neck swelling, heat or cold intolerance. There was no history of abdominal pain, abdominal swelling, vaginal surgery, instrumentation, trauma, vaginal infection or history of insertion of caustic or corrosive substance.

She attained menarche at the age of 15 years and menstruates for 4 days in a regular cycle of 29 days; there was no menorrhagia or dysmenorrhea. She attained coitarche at the age of 17 years and there was a history of dyspareunia.

She is in her second marriage in a polygamous family setting. She is the second of two wives of a 41 year old automobile mechanic. Her current husband had children from the first wife. The first marriage was disrupted over the challenge of inability to conceive and was divorced by the first husband.

The physical examination revealed a healthy looking young woman, not pale, anicteric, acyanosed and no pedal oedema. The abdominal findings were normal. The speculum vaginal examination revealed a normal vulva, blind ending vagina with a transverse band of tissue occluding the upper vagina, vaginal fornices and cervix. There were two oval-shaped recesses at 9 and 12' o clock, measuring about 2cm each, a lax vaginal septum and posterior vaginal wall tissue; and there was no vaginal discharge. A bimanual digital vaginal examination showed a cervix palpable proximal to the vaginal septum, normal sized uterus and adnexae. An assessment of primary infertility due to a congenital transverse vaginal septum was made.

An examination under anaesthesia was done during her menstrual period. There was egress of menstrual blood from the aperture at 9'0clock position suggesting possible connection with the cervix. An abdominopelvic ultrasound revealed normal findings, bilateral normal kidneys with normal cortico-medullary differentiation and no evidence of hydro-nephrosis or hydro-ureters; and normal smooth walled bladder, no debris. The uterus was normal sized, retroflexed and both ovaries were normal.

The intravenous urogram revealed normal findings. Urinalysis was normal and Urine microscopy, culture and sensitivity yielded no growth of pathogens. The complete blood count was normal.

She had a surgical resection of transverse vaginal septum and vaginoplasty under regional anaesthesia. The intraoperative findings were vaginal length of about 8cm with a high transverse septum with two oval-shaped recesses (apertures) at 9 and 12' o clock position as shown in figure 1; redundant posterior vaginal wall mucosa, retroverted uterus of 10 weeks size and a nulliparous anterior cervix as shown in figure 2. We achieved complete resection of the septum and repair of the vaginal wall. The cervix was examined and the cervical os was patent.

She had a satisfactory post-operative period; she had antibiotics for five days, analgesics and daily vaginal dressing with vaginal mold. She healed satisfactorily. She commenced self vaginal dilation with vaginal dilator and was discharged on the 14th post-operative day.

She had two successful menstrual flows which were described as normal and lasted 4 days. She missed her menstrual period in the third month and a pregnancy test by serum B-hCG at five weeks was positive. The pelvic ultrasonography confirmed a viable intrauterine pregnancy at a gestational age of 6 weeks gestational age.

The pregnancy progressed normally with no complication and there was no contraindication to vaginal delivery. An obstetric ultrasound done at a gestational age of 38weeks revealed a live fetus with estimated fetal weight of 3.5kg in longitudinal lie and cephalic presentation. The vaginal examination revealed a capacious vagina with vaginal length of 8 cm, normal mucosa, supple and no vaginal scarring. The cervix was central, smooth, firm and uneffaced.

She fell into labour at a gestational age of 41weeks and 1 day and it lasted 8 hours. She was delivered of a live male neonate with a birth weight of 3.8kg.

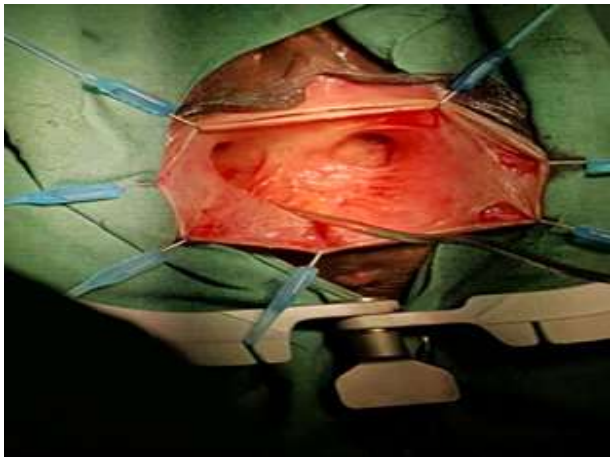

Fig.1: Transverse vaginal septum with two apertures and a stretchable vaginal septum

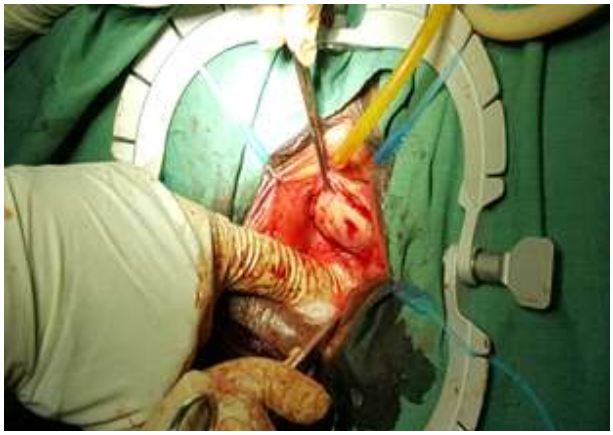

Fig. 2: Normal urethral opening with catheter in situ. Cervix with a patent cervical os after the excision of the transverse vaginal septum

Discussion

Mullerian duct anomalies are a spectrum of embryological defects affecting the genital tract. A vaginal septum is one of such defects and it occurs following a mullerian duct fusion defect or failure of recanalization during development. It may present as a longitudinal vaginal septum in the case of lateral fusion defect or a transverse vaginal septum in the case of a horizontal fusion defect or failure of recanalization of the tissue [4]. Transverse vaginal septum results from failure of fusion of the lower mullerian duct with the urogenital sinus or due to failure of recanalization of the tract after fusion [4].

The incidence of transverse vaginal septum varies from about 1:2,100 to 1:72,000 females [5, 6, 7]. The transverse vaginal septum presents as a tissue plane of varying thickness separating the upper and lower vagina. The thickness of septum ranges from 0.5 – 6 cm; thin septum is <1cm, thick septum $\geq$ 1cm. A septum may be located in the upper (46%), middle (40%) or lower vagina (14%) [7]. A septum in the vagina located <3cm from the vaginal introitus is low, 3-6cm is middle and >6cm from the vaginal introitus is a high transverse vaginal septum [8]. In this case, the septum was located in the upper third of the vagina, occluding the cervix and with two apertures; one located centrally and the other right lateral. The transverse vaginal septum as a structural abnormality of the vaginal may be partial or complete; causing varying degrees of obstruction of the lower genital outflow tract. A previous study documented imperforate septum in 61% of cases in the series and perforate septum in 39% of cases [8].

The common presenting complaints include amenorrhea, hydrometrocolpos, cyclical lower abdominal pain, swelling, haematocolpos and bulging vaginal mass in cases of complete obstruction of the outflow tract. In the case of partial obstruction, the condition may be asymptomatic and present as an incidental finding during antenatal care, labour/delivery [9, 10] and gynaecological vaginal examinations or during pelvic imaging. It may also present with symptoms such as dyspareunia, inability to have sexual intercourse or to insert tampons, primary infertility. The presentation of transverse vaginal septum with primary infertility is quite rare and has been documented by only a previous report. [11]

In the index case, the presentation was primary infertility of 3 years duration and a transverse vaginal septum was an incidental finding during vaginal examination on the first visit. The primary infertility complicated and disrupted the first marriage with the attending stigma of infertility and its sociocultural consequences on the affected women. [12, 13]

The presence of a perforate transverse vaginal septum and its location in the upper vagina, contributed to the late presentation of this patient and the absence of symptoms such as amenorrhea, cryptomenorrhea, inability to achieve sexual intercourse which may have necessitated earlier presentation in the hospital for evaluation.

Other abnormalities of the genital tract may co-exist with other abnormalities of the uro-genital system in cases of transverse vaginal septum [3]. Anomalies of the uterus, cervix, and renal anomaly have been found to co-exist with transverse vaginal septum. Others include coarctation of the aorta and atrial septal defect [3, 10, 14, 15]. There was no other congenital anomaly identified in this case.

The options of management depend on the location/ extent of the septum, size, and other associated anomalies. The vaginal, abdomino-perineal and laparoscopic approaches are options for the route of repair. [4]

This case was managed by successful resection of the transverse vaginal septum via a vaginal approach. Surgical resection of the septum healed satisfactorily and was followed by successful vaginal dilation using vaginal dilator. She resumed sexual intercourse; achieved a spontaneous conception two months after surgery and vaginal delivery of a healthy baby.

The role of a detailed clinical history and physical examination in routine clinical practice cannot be overemphasized. A thorough examination and investigation of all cases of infertility and other medical condition is important. The ordeal of primary infertility was terminated by a detailed vaginal examination that revealed a transverse vaginal septum which posed obstruction to influx of seminal fluid despite its being perforate.

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Afr. J. Med. Med. Sci. (2019) **48,** 169-174

Modified Pont's index for a Nigerian population

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Abstract
*Objective***:** Pont's index is a tool that is of great value in clinical orthodontic treatment planning especially in ethnic and racial groups where its applicability in predicting arch width (interpremolar and intermolar) is excellent. Thus in ethnicities and races where its use has not being beneficial, a modification of the index in such populations might be necessary.
Materials and methods: Samples of 132 consenting and consecutive patients dental casts with normal occlusion (well aligned arches) who had not previously received any form of arch alignment treatment were assessed using a digital sharpened beaks callipers' which measured the cast tooth sizes and arch width. All data was entered into a spread sheet and analysis was done with SPSS version19 computer software. The level of confidence was set at $p < 0.05$.
Result: The mean mesiodistal width of the right central incisor was found to be 8.76 ± 0.61mm and 8.73 ± 0.59mm on the left. Mesiodistal width of right lateral incisor was 7.10 ± 0.55mm while that of the left was 7.04 ± 0.58mm. Mean maxillary arch widths observed for the studied population were 41.87 ± 2.70mm and 51.47 ± 2.69mm for inter-premolar width and inter-molar width respectively. Pont's ratio for inter premolar and inter molar widths was 0.76 and 0.61 respectively.
*Conclusion***:** Pont's ratio for inter premolar and inter molar (0.80 and 0.64) is different from that gotten for the present population studied. With a modified index for this population; maxillary inter premolar and inter molar ratio equals 0.76 and 0.61 respectively.

Key words: *Pont's index, Arch width, inter-premolar and inter-molar*.

Abstrait
Objectif **:** L'indice de Pont est un outil précieux pour la planification du traitement orthodontique clinique, en particulier dans les groupes ethniques et raciaux, où son applicabilité dans la prédiction de la largeur de l'arcade (inter-prémolaire et inter-molaire) est excellente. Ainsi, dans les ethnies et les races où son utilisation n'a pas été bénéfique, une modification de l'indice dans de telles populations pourrait être nécessaire.
Matériaux et méthodes : Des échantillons de 132 modèles dentaires de patients consentants et consécutifs avec occlusion normale (arcades bien alignées) qui n'avaient auparavant reçu aucun traitement d'alignement des arcades ont été évalués à l'aide d'un compas digital à bec effilé qui mesurait la taille des dents coulées et la largeur de l'arcade. Toutes les données ont été entrées dans un tableur et l'analyse a été réalisée avec le logiciel informatique SPSS version 19. Le niveau de confiance a été fixé à $p < 0,05$.
Résultat : La largeur méso-distale moyenne de l'incisive centrale droite était de 8,76 ± 0,61 mm et de 8,73 ± 0,59 mm à gauche. La largeur méso-distale de l'incisive latérale droite était de 7,10 ± 0,55 mm alors que celle de la gauche était de 7,04 ± 0,58 mm. Les largeurs moyennes des arcades maxillaires observées pour la population étudiée étaient de 41,87 ± 2,70 mm et de 51,47 ± 2,69 mm pour la largeur inter-prémolaire et la largeur inter-molaire, respectivement. Le rapport de Pont pour les largeurs inter-prémolaires et inter-molaires était de 0,76 et 0,61 respectivement.
Conclusion **:** Le rapport de Pont inter-prémolaire et inter-molaire (0,80 et 0,64) est différent de celui obtenu pour la population actuelle étudiée. Avec un index modifié pour cette population ; Le rapport maxillaire inter-prémolaire et inter molaire est égal à 0,76 et 0,61 respectivement.

Mots clés : *Index de Pont, largeur de l'arche, inter-prémolaire et inter-molaire*.

Introduction

Tooth size arch length discrepancy is a form of malocclusion that presents when there is insufficient space on the dental arch to accommodate all the teeth present, leading to a displacement of the contact point of teeth. This problem is frequently encountered in clinical orthodontics and has a prevalence of up to 36% among Nigerian populations [1-3]. Precise tooth size arch length discrepancy analysis, especially in the mixed dentition stage is a panacea for appropriate treatment planning. The clinical options to get arch

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space that is open to an orthodontist in the treatment of a crowded arch may include interdental stripping, expansion of the arches, and or tooth extraction [4]. One or a combination of these methods will serve as adjunct for solving the tooth size arch length discrepancies.

Non-extraction of tooth or teeth in unravelling crowding is gradually gaining preference and being emphasized [5] therefore, this has resulted in a reduction of teeth extracted for orthodontic reasons [6]. Arch expansion an alternative to extraction of teeth has been used for treating class I malocclusion crowding cases satisfactorily, though, this depends on the level of severity of the crowding [6]. In treating these cases, the amount of arch expansion required to produce a stable post treatment result has been an issue of controversy [7] and to solve this controversy different indices have been brought to the fore to guide the clinician in predicting the ideal arch width an individual requires to produce a stable arch [8]. One of these indices is the Pont's index. Pont described a method which predetermines the maxillary arch width in the premolar and molar region using the mesiodistal widths of maxillary incisors, and it has been proven by authors [8-12] to have underestimated ideal arch widths in many populations. Thus, the aim of this study was to modify the Pont's index to accurately predict ideal arch widths in a Nigerian population having been found to be inaccurate in its prediction in this same population [13].

Materials and methods

This was a cross sectional and descriptive study of 132 consenting consecutive individuals of age 18years and 25years. The study was conducted at dental and general out-patient clinics of a tertiary health care facility in the south west region of Nigeria. Ethical approval was sought and obtained from University of Ibadan/University College Hospital Ethics Committee (UI/EC/13/0235).

The following inclusion criteria were used for participant's selection;

- Subjects of Yoruba decent in Nigeria (at least of two generation)
- Subjects aged 18years – 25years old.
- Subjects with full complement of the permanent dentition.
- Subjects with normal skeletal and dental anteroposterior and vertical relationships.
- Subjects with normal tooth-bone ratio.
- Normal maxillary first premolar and molar inclination shape and sizes.
- No missing teeth and no presence of supernumerary teeth.
- No history of previous orthodontic treatment
- No history of major jaw surgeries
- No history of sickle cell disease and cleft palate
- Absence of obvious transverse jaw discrepancy
- No history of sucking habits
- Subjects with no peg shaped lateral incisors.
- No dental caries or teeth fracture related to the maxillary incisors, first premolars and first permanent molars.
- No dental restoration related to the maxillary incisors, first premolars and first permanent molars.

All participants that met the inclusion criteria had their maxillary and mandibular arches impression made in alginate impressions material (elastic cromo by spofa dental a.s). Cast models were made from the alginate impression using dental stone (Kerr orthodontic model mix stone type) following disinfection of the impression with Cidex (2% glutaraldehyde). The set cast model was then carefully retrieved to avoid damages in any form. Each model was then serialized and kept in a safe place.

The landmarks for measurements of the arch width as demonstrated by Pont [9] were located manually as stated below and the measurements were done using electronic calliper with sharpened beaks (CB Mitutoyo corp. Tokyo Japan, accuracy of 0.01mm).

- Mesiodistal width of the maxillary incisors (MIMDW) – mesiodistal width of the maxillary central incisors and the lateral incisors were measured from one anatomical contact point (mesial) to the other (distal) at a level of the widest portion of the tooth [9].
- Maxillary Interpremolar Width (MIPW) – measured from the distal pit of the maxillary right first premolar to the distal pit of the maxillary left first premolar [9].
- Maxillary Intermolar Width (MIMW) – measured from the depth of the central fossa of the maxillary right first molar to the central fossa on the maxillary left first molar [9].

In cases of mild attrition, the landmark for the measurement was determined using the middle of the wear facet on the tooth [9].

Intra-observer reliability associated with measurements was determined by randomly selecting 20 cast models of the sample subject. These casts were measured using a sharpened beak digital calliper and they were re-measured at 2 weeks

interval by the same observer. The mean differences between the first and repeated measurements were not significantly different from zero. The error margin using Dahlberg's equation (14) ranges from 0.08mm to 0.15mm for tooth size width measurements and 0.11mm to 0.34mm for arch width dimensions. These findings indicated that experimental errors were generally small and unlikely to cause bias in the result.

The predicted arch widths were calculated for each subject and also entered into the spread sheet

Results

The gender distribution of the sample was 66 males and 66 females with a mean age of 21.62 ± 1.67 years and 22.86 ± 1.60 years respectively. The mean age of the study population was found to be 22.24 ± 1.74 years.

Table 1: Mesiodistal widths of maxillary incisors of subjects in the study population

Tooth	Right				Left			
	Range (mm)	Mean (mm)	*SD (mm)	*CV (%)	Range (mm)	Mean (mm)	*SD (mm)	*CV (%)
Central incisor	7.33 - 11.01	8.76	0.61	6.96	7.50 - 10.44	8.73	0.59	6.76
Lateral incisor	5.78 - 8.37	7.10	0.55	7.75	5.78 - 8.37	7.04	0.58	8.24

*SD: Standard deviation, *CV: Coefficient of variation.

Table 2: Mesiodistal widths of teeth measured in male and female subjects.

Tooth	Male		Female		Gender difference		
	Mean (mm)	*SD (mm)	Mean (mm)	*SD (mm)	Mean (mm)	*SD (mm)	PValue
RCI	8.81	0.57	8.71	0.65	0.10	0.01	0.165
LCI	8.80	0.56	8.67	0.62	0.13	0.01	0.297
RLI	7.15	0.58	7.05	0.52	0.10	0.01	0.135
LLI	7.12	0.57	6.96	0.60	0.16	0.01	0.241

**SD-Standard deviation. RCI – Right Central Incisor, LCI – Left Central Incisor, RLI – Right Lateral Incisor, LLI – Left Lateral Incisor*

All measurements were entered into a spread sheet and statistical analyses were performed using the Statistical Package for Social Sciences software (Windows version 19; SPSS Inc., Chicago, IL, USA). Level of significance was set at 5%. Independent t-test was used to compare means of measured inter-premolar and inter-molar arch widths between males and females subjects and dependent t-test was used to compare measured and predicted means of arch widths (inter-premolar and inter-molar) among the total sample, males and females.

Prediction of arch width by Pont [9];

Inter-premolar arch width = SI × 100/80

Inter-molar arch width = SI × 100/64

Where SI is the sum of the mesio-distal widths of the maxillary incisors

The mean mesiodistal width of the right central incisor was found to be 8.76 ± 0.61mm and 8.73 ± 0.59mm on the left. Mesiodistal width of right lateral incisor found was 7.10 ± 0.55mm and 7.04 ± 0.58mm on the left (Table 1).

Generally, the mean mesiodistal widths of the maxillary central and lateral incisors were observed to be larger in males than females (Table 2). The difference in mean mesiodistal widths of central incisors between male and female was observed to be 0.10 ± 0.01mm on the right side (p= 0.165), while it was found to be 0.13 ± 0.01mm on the left side (P=0.297). For lateral incisors, the difference in mean mesiodistal width between the two gender groups was found to be 0.10 ± 0.01mm on the right side (p=0.135) and 0.16 ± 0.01mm on

Table 3: Mean arch widths and comparison of gender arch widths

Arch width	Mean maxillary Arch widths Total sample(mm)	Male mean maxillary arch width (mm)	female mean maxillary arch width (mm)	Mean difference (male and female) (mm)	P value
Inter-Premolar	41.87 ± 2.70	42.48 ± 2.62	41.26 ± 2.67	1.22 ± 0.46	0.009*
Inter-molar	51.47 ± 2.69	52.14 ± 2.27	50.79 ± 2.93	1.35 ± 0.46	0.004*

Table 4: Modified Pont's index for the study population.

Arch widths (mm)	Mean value (mm)	Mean sum of incisors (mm)	Ratio of sum of maxillary incisors to maxillary arch widths
Interpremolar	41.87 ± 2.70	31.64 ± 2.06	0.76
Intermolar	51.47 ± 2.69	31.64 ± 2.06	0.61

the left side (p=0.241). All these differences were statistically insignificant (Table 2)

Mean maxillary arch widths observed for the studied population were 41.87 ± 2.70mm and 51.47 ± 2.69mm for inter-premolar width and inter-molar width respectively. In relation to gender, the mean maxillary widths observed for males were 42.48± 2.62mm and 52.14 ± 2.27mm for inter-premolar width and inter-molar width respectively. While that for females were 41.26 ± 2.67mm and 50.79 ±2.93mm for inter-premolar width and inter-molar width respectively. Statistically significant differences of 1.22 ± 0.46mm (p = 0.009) and 1.34 ± 0.46mm (p = 0.004) were observed for interpremolar and intermolar widths respectively between males and females subjects (Table 3).

Table 5: Pont's ratio for different populations.

Study	Sample size	Population	Findings	Verdict
Pont (1909)	Not available	French	Premolar index 80 Molar index 64	
Joondeph (1970)	30	Germans	Premolar index 84 Molar index 65	Disagree with Pont.
Gupta *et al*.(1979)	100	North Indians	Premolar index 81.66 Molar index 65.44	Agree with Pont
Prasad, Valiathan (1994)	100	Indian (50)	Premolar index 83.86 Molar index 66.36	Agree with Pont
		Chinese (50)	Premolar index 80.27 Molar index 63.97	
Karanth, Jayade (1998)	50	Tibetan	Premolar index 79.56 Molar index 61.64	Agree with Pont
Kim, Lee (2000)	119	Korean	Premolar index 81.96 Molar index 62.55	Disagree with Pont
Shrestha, Pradhan (2006)	100	Nepalese	Premolar index 79.60 Molar index 63.36	Agree with Pont
Agnihotri, Gulati (2008)	100	North Indians	Premolar index 81 Molar index 65	Agree with Pont
Dhakal, Shrestha (2014)	100	Nepalese	Premolar index 80.51 Molar index 63.65	Agree with Pont
Agneska, Dalia (2015)	52	Lithuanians	Premolar index 85.57 Molar index 66.24	Disagree with Pont
Present Study	132	Nigerians	Premolar index 76 Molar index 61	Disagree with Pont

Pont ratio, which is the ratio of sum of maxillary incisors to maxillary arch width, was calculated and found to be 0.76 for interpremolar arch width as opposed to 0.80 observed by Pont among a French population. For intermolar arch width, a ratio of 0.61 was observed as opposed to 0.64 observed by Pont among his own population (Table 4).

Discussion

The relationship between the sum of maxillary incisors and maxillary arch widths were used by Pont to generate a mathematical expression [9]. In this study, the ratio of mean sum of maxillary incisors to the mean arch widths (interpremolar and intermolar) recorded an index value of 0.76 and 0.61 respectively. These index values are different from that proposed by Pont. Pont proposed an index value of 0.80 for interpremolar arch width and 0.64 for intermolar arch width from a French population. Hence, there is an overestimation of the inter premolar and inter molar width by Pont by an index difference of 0.04 and 0.03 respectively. The difference in the index values between the present study and that reported by Pont could be due to racial variation in mesiodistal tooth widths and dental arch width across populations [13, 15].

Since no literature on the modified Pont's index among Nigerians exists, thus no mathematical expression of the relationship of the sum of maxillary incisors and maxillary arch widths has been reported and also there was no mathematical expression within similar racial group to compare with. Though, the index values reported in this study was different from those that have been reported in literature. These includes; Gupta *et al.* [16] among Indians who reported 0.82 and 0.65 as values for predicting inter premolar and inter molar arch width prediction respectively, Kim and Lee [17] reported 0.82 and 0.63 for a Korean population, Agnihotri and Gulati (18) reported 0.81 and 0.65 for northern Indian population, and more recently, Rathi and Fida [15] reported 0.85 and 0.66 among Karachi subjects, as index values for predicting inter premolar and inter molar widths respectively. Therefore the index values observed from the various studies [15-18] is greater in both the inter premolar and inter molar arch width when compared to the current study. The interpretation of this is that the ratio of the tooth width size of the maxillary incisors compared to the arch width in Nigerians is smaller when compared to that of other races [15-18]. The difference in these values reported by other studies and that found in this study corroborate the mesiodistal tooth width and dental arch width variation across races and ethnic groups [19]. In the current study, there is a statistically significant difference between gender in relation to the inter premolar and inter molar width. This difference in arch width has been reported by many authors where they observed males as having a larger inter premolar and inter molar width as compared to females which is also the case in this present study (Table 3). The difference in inter premolar and inter molar width is due to established significant gender dimorphism of human teeth [20]. Therefore, using the sum of the four maxillary incisors teeth width to predict the maxillary dental arch width according to Pont is bound to produce a difference in arch width size. The various studies in the literature over time have shown different verdict of Pont's ratio among different population as reported in Table 5.

Conclusion

Having found that Pont's index (1909) underestimated ideal arch widths in a Nigerian population, it was necessary to modify the index so as to accurately predict arch widths in this same population.

Modified index for this population were; maxillary interpremolar width equals sum of maxillary incisors divided by 0.76, as opposed to 0.80 in the real Pont's index, and maxillary intermolar width equals sum of maxillary incisors divided by 0.61 as opposed to 0.64 observed by Pont.

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Afr. J. Med. Med. Sci. (2019) **48,** 257-263

Resident doctors' perception and practice of resin-bonded bridges

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Abstract
Background: Resin bonded bridges (RBB) was introduced as an alternative to conventional bridges for tooth replacement under certain clinical conditions. It was designed as a temporary restoration which is reversible and the clinicians' major concern has been its longevity. The major cause of failure was attributed to de-bonding caused by complex multi- directional inter-abutment stresses associated with the 3-unit bridge that challenges the retainer and adhesive bond. The study aimed to assess the attitude, knowledge and practice of resident doctors on the performance factors of RBB.
Methods: A cross-sectional study conducted amongst residents at an update course using self –administered questionnaires. The first part of the questionnaire consisted of questions related to participants' socio-demographics, intended area of expertise, years of experience and percentage of RBBs performed in their clinical prosthodontic / restorative practice. The second part of the questionnaire comprised close-ended multiple-choice questions which were designed to extract the opinion and understanding of the respondents regarding performance factor for RBBs. The questions were related to clinical indications, prosthesis design etc
Results: Eighty percent of the participants indicated that had <10% tooth replacement service was done with RBB, 44.7% of the respondents considered RBB as a provisional restoration while 28 (36.8%) regarded RBB as both provisional and permanent restoration. About 76% of the respondents believe that perforated retainers were associated with clinical success of RBBs. 70% considered anterior maxilla as the most favorable location while class 1 jaw relation was preferred by 60% of participants
Conclusion: With less than 10% of teeth replacement done using RBBs, there is a need for continuing education opportunities for practicing dentists and better exposure of undergraduate and postgraduate students to clinical application of RBBs.

Keywords: *Perception, practice, resident doctors, resin bonded, bridges*

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Abstrait
Contexte : Ponts liant à résine (RBB) a été présenté comme une alternative aux ponts conventionnels pour le remplacement des dents dans certaines conditions cliniques. Il a été conçu comme une restauration provisoire réversible et la principale préoccupation des cliniciens est sa longévité. La principale cause de défaillance a été attribuée au décollement provoqué par des stresses complexes multidirectionnels inter-piliers associées au pont à 3 unités qui met au défi le dispositif de retenue et la liaison adhésive. L'étude visait à évaluer l'attitude, la connaissance et la pratique des médecins résidents en ce qui concerne les facteurs de performance de RBB.
Méthodes : Une étude transversale menée auprès des résidents lors d'un cours de mise à jour à l'aide de questionnaires auto-administrés. La première partie du questionnaire comportait des questions liées au développement sociodémographiques des participants, domaine d'expertise destiné, années d'expérience et le pourcentage de RBB effectuées dans leur clinique prothétiques / pratique réparatrice. La deuxième partie du questionnaire comporte des questions à choix multiples à extrémité fermée qui ont été conçus pour extraire l'opinion et la compréhension du répondant en ce qui concerne le facteur de performance pour RBB. Les questions portaient sur les indications cliniques, la conception de la prothèse, etc.
Résultats : Quatre-vingts pourcent des participants ont indiqué que <10% de service de remplacement de dent a été fait avec RBB, 44,7% des répondants considèrent RBB comme une restauration provisoire tandis que 28 (36,8%) ont considéré RBB comme la restauration provisoire et permanente à la fois. Environ 76% des répondants croient que les dispositifs de retenue perforés ont été associés à la réussite clinique de RBB. 70% considéraient le maxillaire antérieur comme l'emplacement le plus favorable, tandis que 60% des participants préféraient une relation de la mâchoire de classe 1
Conclusion : Avec moins de 10% des remplacements de dents effectués à l'aide de RBB, il est nécessaire que les dentistes praticiens puissent poursuivre leurs études et de mieux exposer les étudiants en licence et en maitrise à l'application clinique de RBB.

Mots clés : *Perception et pratique des ponts liés en résine*

Introduction

Resin-bonded bridge (RBB) was first introduced in 1970's by Rochette as a replacement option for missing tooth/teeth instead of the conventional bridge. These restorations were originally retained through adhesion, but now minimal preparations of the abutment may be done to optimize mechanical resistance and retention forms. [1] Preparation designs for RBBs are limited to enamel and may comprise of palatal/ lingual veneer preparations, proximal boxes, vertical grooves, guide planes, or pinholes in the cingulum area.

The advantages of RBB include conservation of the tooth structure, can be reversible when used as a temporary or provisional restoration, pulp vitality is preserved, there is minimal interaction with soft tissue and can be retrieved easily [3-6]. However, since the introduction of RBBs, the clinicians' major concern has been its longevity. The major cause of failure was attributed to de-bonding caused by complex multi- directional inter-abutment stresses associated with the 3-unit bridge that challenges the retainer and adhesive bond. The abutment however should be restoration free or minimally restored, and the retainer should ideally cover any existing restoration completely. Any variation in the quality or quantity of enamel will have a significant effect on the bond strength [6]

All the design options that can be used for conventional bridge are possible for the RBB, cantilever, fixed-fixed, fixed –movable and hybrid. For the cantilever RBB, A 20% debond has been reported over a 27 month period highlighting its clinical potential [8]. In a study by Djemal et al, median survival of fixed-fixed designs was given as 7.8 years which is shorter than 9.8years for the cantilever design [11]. The higher rate of failure in the fixed-fixed design was thought to be due to differential abutment movement resulting in debonding of one retainer [11].

The clinical performance of RBBs depends on factors that can be classified as patient-related (e.g saddle span, location, remaining enamel, and parafunctional habit) design related (e.g retainer type, thickness, and connector height) and technique-related (e.g cement, retainer treatment and isolation method). In addition, a minimum retainer thickness of 0.7mm and a minimum connector height of 2mm have been recommended[12]. Appropriate teaching training and exposure of undergraduates as well as postgraduate students to RBBs will improve their clinical attitude and consequently the application of these restorations. In our environment, there is a dearth of study assessing RBBs performance factors. The aim of this study therefore was to assess the attitude, knowledge and practice of resident doctors on the performance factors of RBB.

Methodology

This cross-sectional study was conducted among postgraduate students during an update /revision course organized by the West African College of Surgeons at the University College Hospital Ibadan. Ethical approval was obtained from University of Ibadan/ University College Hospital ethical Review Committee.

A structured, self – administered questionnaires attached to the study description was used. The questionnaires were handed over to the class representative to eliminate bias to give to consenting participants and to be returned back to the class representative.

The first part of the questionnaire consisted of questions related to participants socio-demographics, intended area of expertise, years of experience and percentage of RBBs performed in their clinical prosthodontic or restorative practice. The second part of the questionnaire comprises of close-ended multiple-choice questions which were designed to extract the opinion and understanding of the respondent regarding the indications and basic requirements for RBBs. The questions were related to clinical indications, prosthesis design, retainer type and dimensions, retainer surfaces, tooth preparation, desired cements and clinical technique.

The last part of the questionnaire contained simple table and grid questions that was designed to identify the participants opinions regarding the significance level of vital factors related to the clinical success. These factors included; remaining abutment enamel, area of mouth where RBB is placed, number of missing teeth to be replaced, RBB design, type of retainer, retainer surface treatment, connector height, retainer thickness etc. The respondents could provide scores ranging from one to five (using a Likert scale), with a score of one indicating a factor was very insignificant, and a score of five Indicating a factor was very significant. Factors designated as insignificant, neutral and significant received scores of 2-4 respectively. Average significance was determined to identify the frequency, pattern and significance of the response variables identified. Data generated was entered into the computer using SPSS version 20.0 (Chicago, Illinois, USA). Chi-square tests were used to

compare categorical variables and p value less than 0.05 was considered statistically significant.

Results

One hundred questionnaires were sent to the residents attending the update lectures. Eighty questions were returned out of which seventy six correctly filled questionnaires were entered into the computer. Participants age ranged from 30 to 50 years with a mean of 36.5± 5.8 (SD). There were 52 females and 24 males giving a male to female ratio of 1:2.2. A high majority (93.4%) were Christians, 63(82.9%) were married, and 47 (61.8%) have been practicing for 5-10 years, and 27(35.5%) for more than 10 years. About a third (31.6%) of the participants were undergoing residency training in Oral and Maxillofacial Surgery, followed by 10, 9 and 8 in Paediatric Dentistry, General Dental Practice and Conservative Dentistry respectively.

Table 1: Socio - demographs of Participants

Socio-demographs of Participants	Number (n)	Percentages (%)
Age Range	30 - 50	
Mean Age	36.5±5.8(SD)	
Sex		
Male	52	68.4
Female	24	31.6
Religion		
Christianity	71	93.4
Islam	5	6.6
Marital Status		
Single	12	15.8
Married	63	82.9
Widow	1	1.3
Year of Dental Practice		
< 5 years	2	2.6
5– 10 years	47	61.8
> 10 years	27	35.5
Proposed Specialty		
Oral Surgery	24	31.6
Pedodontics	10	13.2
GDP	9	11.8
Conservative Dentistry	8	10.8
Orthodontics	7	9.2
Community Dentistry	6	7.9
Periodontology	6	7.9
Oral pathology	5	6.6
Prosthodontis	1	1.3

Knowledge

Eighty percent of participants indicated that <10% replacement service was done with RBB. About 45% (44.7%) of the respondents considered RBB as a provisional restoration while 28 (36.8%) regarded RBB as both provisional and permanent restoration (Table 2).

Regarding design and mechanical factors associated with RBBs, 85.5% selected fixed- fixed as the most successful RBB design while 13.2% opted for cantilevers. For 58(76.3%) respondents, perforated retainers were associated with clinical success of RBBs. However, almost all (94.7%) respondents agreed that retainer surface treatment improves longevity. The optimum connector height selected by 53.9% of respondents was 2mm followed by 3mm (31.6%). For optimum retainer thickness, 0.5mm, was the most common (39.5%) choice followed by 0.7mm (14.5%) while 25 (32.9%) participants did not know the retainer thickness required.

However, 15 (19.7%) respondents did not consider retainer a factor that influences RBB longevity (Table 1). Thirty seven (48.7%) participants preferred that two teeth should be replaced by a RBB while 35.5% favored the use of one tooth. With regard to patient and technique

Table 2: Participants responses to survey questions

RBBS	Number (n)	Percentages (%)
What % of your tooth replacement services have employed RBBs?		
< 10%	61	80.3
10 – 20 %	9	11.8
> 20%	6	7.8
What type of restoration you do consider RBB provide?		
Permanent	14	18.4
Provisional	34	44.7
Both	28	36.8
Does the amount of remaining enamel affect the success of RBBs?		
Yes	70	92.1
No	6	7.9
In which of the mouth are RBBs most successful?		
Ant Maxilla	53	69.7
Anti-Mandible	20	26.3
Post Maxilla	1	1.3
Post Mandible	1	1.3
No effect	1	1.3
How many missing teeth should be replaced for maximum longevity?		
One	27	
Two	37	
Three	10	
Four	2	
Which RBB design provides maximum longevity?		
Fixed	65	85.5
Cantilever	10	13.2
Which RBB retainer produces maximum longevity?		
Perforated	58	76.3
Non-perforated	13	17.1
Both are equal	5	1.6
Does retainer surface test increase RBB longevity?		
Yes	72	94.7
No	4	5.3
Does connector height affect longevity?		
Yes	65	85.5
No	11	14.5
What is the optimum height for a connector?		
1mm	6	7.9
2mm	41	53.9
3mm	24	31.6
4mm	5	6.6
Does preparing teeth for retentive features improve longevity?		
Yes	67	88.2
No	9	11.8
Which cement provides maximum longevity?		
RBC	65	72.4
GIC	21	27.6
Does use of rubber dam affect longevity?		
Yes	67	88.2
No	9	11.8
Does thickness of a retainer affect longevity?		
Yes	61	80.3
No	15	19.7

What is the optimum thickness of retainer?		
0.3mm	4	5.3
0.5mm	30	39.5
0.7mm	11	14.5
1.0mm	6	7.9
Don't know	25	32.9
What type occlusion are RBB most successful?		
Class I	46	60.5
Class II	11	14.5
Class III	7	9.2
Have no effect	12	15.8

Table 3: Participants response related to significance of RBB performance factors

Factors	Very Insignificant (n %)	Insignificant (n%)	Neutral (n%)	Significant (n%)	Very Significant (n%)
Remaining abut enamel	8 (10.5)	-	2(2.6)	28 (36.8)	38 (50)
Area of the mouth where RBB is placed	5 (6.6)	3 (3.9)	1 (1.3)	34 (44.7)	33 (43)
Number of missing teeth to be replaced	5 (6.6)	-	**1 (1.3)**	25 (32.9)	45 (59.2)
RBB Design	4 (5.3)	-	3(3.9)	41 (53.9)	28 (36.8)
Type of Retainer	5 (6.6)	3 (3.9)	3 (3.9)	40 (52.6)	23 (32.9
Retainer Surface Treatment	5 (6.6)	1 (1.3)	10 (13.2)	40 (52.6)	20 26.3)
Connector height	4 (5.3)	3 (3.9)	11 (14.5)	43 (56.6)	15 (19.7)
Retainer thickness	2 (2.6)	3 (3.9)	16 (21.1)	42 (52.3)	13 (17.1)
Tooth preparation	7 (9.2)	1 (1.3)	11 (14.5)	34 (44.7)	23 (30.3)
Cement type	7 (9.2)	1 (1.3)	7 (9.2)	34 (44.7	27(35.5)
Use of RD during Cementation	5 (6.6)	2 (2.6)	11 (14.5)	33 (43.4	23 (32.9)

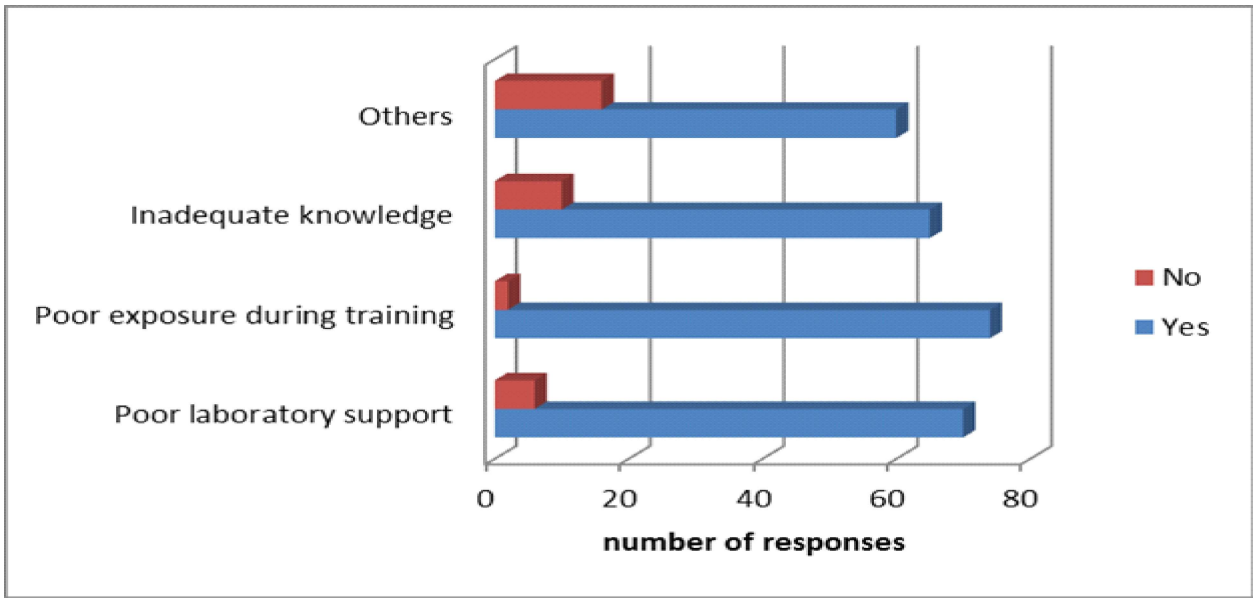

Fig 1: A bar chart
Participants' reasons for limited usage of RBBs in their practice

related factors, a high majority (92.1%) accepted that remaining enamel structure influences the performance of RBBs. Aboout 53(69.7%) of participants considered the anterior maxilla the most favourable location for achieving a successful RBB followed by anterior mandible in 20 (26.3%) participants. Class I jaw relation was also the most preferred in 46 (60.5%) respondents, although 15.8% believed that occlusal classification does influence RBB performance. Sixty five respondents selected Resin bonded cement (RBC) as the first choice for RBB cementation. Considering the use of rubber dam (RD) in RBB, 67 respondents agreed that the use of RD increase the longevity of RBB (Table 2). Overall, the factors considered significant as affecting the success of RBB include connector height which ranked the highest proportion (43, 56.6%) followed by retainer thickness (42, 55.3%), RBB design (41, 53.9%) and equal proportion for type of retainer and retainer surface treatment (40, 52.6%). Forty- five respondents considered number of missing teeth to be replaced and very significant in the success of RBB.

Practice

About 80% of respondents employed RBB for less than 10% of teeth replacement. Each participants gave more than one reason for limited usage. Reasons given included, poor exposure during undergraduate as well as postgraduate trainings accounting for 97.3% of the cases followed by poor laboratory support in 92.1%. Other reasons given included poor retention, technique sensitive and compromised aesthetics.

Discussion

The response rate in this study was 76% which compares favourably with 78% recorded in the Saudia Arabia study [13] and lower than 100% reported in Yemen [14]. The fact that only (61.8%) of the participants in this study had practiced for 5 – 10 years is due to the fact that they are resident doctors training to become specialists. This is higher than 49.3% and 46.9% reported in a study in Saudi Arabia among specialists and General Dental Practitioners who have more than 10 years of clinical practice .[13]

Most of the respondents (80%) indicated that RBBs were employed in less than 10% of tooth replacement services provided. Various reasons given for limited use of RBB include poor laboratory support, poor exposure during both undergraduate and postgraduate trainings, inadequate knowledge and concern regarding their longevity etc. which also account for why 44.7% of respondents consider RBB as a temporary restoration. It has been widely reported that RBBs are successful as cantilevers than as fixed restorations [15-18], even though a high number of dentists use fixed-fixed designs and double abutments [19].

The cantilevers, is usually preferred due to the avoidance of different movement of the abutment teeth when fixed-fixed designs are used [20]. In this study 85.5% selected fixed-fixed as the design of choice. This is far higher than 38% reported in a study in Bristol Dental hospital where the survival characteristics of 771 resins- retained bridges was considered. The reason for considering fixed-fixed design in this study may be due to concerns over stability of tooth position and also due to the nature of Nigerian diets which are mainly fibers which translates to more occlusal load on the retainers. The original resin bonded fixed partial denture (RBFPD) frameworks were perforated to enhance mechanical retention of the cement to the framework. The disadvantage of this design however that is the perforation weakens the framework strength and the resin is exposed to potential abrasion/leakage through exposure to the oral cavity. Slightly over three quarter (76.3%) of the respondents in this study were of the opinion that perforated retainers is associated with clinical success of RBBs. The low level of respondents' knowledge in this regard may be due to inadequate exposure to the use of RBBs.

However, a high majority (94.7%) of the respondents know that retainer surface treatment improves longevity. Treatment of retainers fitting surface has evolved over the years beginning from electrolytic etching introduced by Livaditis and Thompson. [21] to airborne abrasion with aluminium oxide and eventually to coating the metal fitting surface with silane [1]. Considering connector height, about 85% of respondents indicated a height of 2-3mm to be adequate which is consistent with previous studies [22,23] while only about forty five percent selected < 0.7mm as the optimum thickness for the retainer, which is close to what was reported by Vohra and Al-Qahlani [13]. The need for tooth preparation for RBB is controversial. An earlier research advocate the use of the more extensive preparations to enhance retention [22].

However, most studies now advocate minimal preparation within enamel [11] or no preparation at all. [2] Preparation involves irreversible damage to abutment teeth for what is reported to be only a limited benefit, and even when minimal preparation is to be done, dentine exposure may occur with resultant dental hypersensitivity.

Moreso, bond strength to dentine is lower than to enamel to achieve maximum retention. In this study, almost all except 7.9% accepted that remaining enamel structure were important for RBB success longevity. Creugers *et al* reported that anterior resin bonded prosthesis have higher durability. In the present study, about 70% of respondents considered anterior maxilla as the most favourable location for achieving a successful RBB. This is similar to what was reported by previous studies [4,13]. This however is at variance with some studies that reported that resin bonded prostheses placed in the maxilla are more likely to fail compared with those in the mandible [22,24].

Development in resin cements have helped to increase restoration longevity. Panavia (Karrary Co. Ltd. Osaka, Japan), a RBC demonstrated prolonged high bond strengths due to the formation of chemical bond between phosphate group of the cement monomer and the oxide layer of the mental retainer [24]. It is therefore not surprising that almost three quarter of the respondents selected RBC as the first choice for cementation of RBB. Moisture control is essential to optimal bonding.

Application of rubber dam is the most predictable method of preventing contamination during cementation. In this study, about 88% considered rubber dam (RD) use to increase longevity. This is in agreement with previous studies [13,25,26] where the use of RD was considered the gold standard as it provides the best possible chance of survival. However, King *et al* [20] in their study reported that RBB bridges cemented under rubber dam were almost twice as likely to fail compared with those that were not. This was because undergraduate dental students with limited clinical experience provided majority of the bridges.

In this study, connector height was rated the highest as being the significant factor affecting RBB success followed by RBB design, type of retainer, retainer surface treatment, and retainer thickness in descending order were considered as significant factors affecting success of RBB. This is at variance with the study by Djemal *et al* [11] where patient selection, design, mechanical features and clinical techniques were considered important performance factors for RBB.

Conclusion

The inadequate knowledge of the respondents and other factors relating to performance of RBBs may be responsible for the negative perception and low rate of utilization in our environment. Therefore, there is a need for continuing education opportunities for practicing dentists and better exposure of undergraduate and postgraduate students to clinical application of RBBs

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