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Medicine and Medical Sciences beyond COVID-19

The novel Corona virus 2 tagged COVID-19 has caused widespread medical and economic damage globally. Literarily, the pandemic virtually brought the whole world to a standstill. The new world order is social distancing, hand cleanliness and lockdown. As at March 31, 2020, the World Health Organization Dashboard for Africa had over 4000 individuals affected with over 100 deaths. These figures are less frightening when one considered the number of cases infected and the case fatalities in other continents. The reasons why the disease is less severe in Africa will emerge with time. Unfortunately, community spread has led to massive increase in the number of individuals affected at the present time.

This issue of the journal publishes 17 manuscripts that are not related to COVID-19 infection which some readers would have expected. The key messages from these papers are highlighted. The six manuscripts from dental practitioners directed the attention of readers to the essence of obtaining consent before dental procedures like pulp therapy and fixed orthodontic surgery; the use of standard protocols and guidelines for tooth shade selection; high prevalence of poor oral health among the elderly in rural communities due to less frequent cleaning, and at the other extreme, the less than satisfactory tooth brushing skills and oral hygiene practices of school children. Ibiyemi pointed out the high fluoride concentration of ground water in rural communities which should necessitate defluoridation. Lastly, Opeodu and others reported that about 4% of extracted teeth had cervical enamel productions associated with caries and periodontal disease.

The pathogenesis of liver damage caused by ingestion of local gin was reported to be due to oxidative damage while another group of researchers reported that coconut water enhanced memory in mice through oxidative mechanism, coincidentally. Ojagbemi and Bello used meta-analysis of data from 38 studies on dementia in sub-Saharan Africa to arrive at a regional prevalence of 4.0% which was close to the Alzheimer Disease International figure of 4.7% published in 2017. Okeahialam and colleagues documented bendopnoea in 34% of heart failure patients in Jos which denoted severe disease that could require palliative care. Late presentation was reported as one of the reasons why diabetic patients developed diabetic foot ulcers. Akande and colleagues advised education of patients and health care workers for early presentation and referrals, respectively. Adeleye and colleagues did not support the idea of a cushioning effect of maxillofacial injury on the severity of head injury in their study.

Pain perception following Caesarean section which was satisfactorily managed in over 80% of cases was influenced by spousal and family support in a report, while 11% of women with pre-eclampsia developed kidney dysfunction. Adedeji and colleagues reported on high frequency of indiscriminate use of antibiotics due to ready availability which should necessitate legislative sanction. In patients with multidrug resistant tuberculosis, HIV co-infection and being female were associated with poor treatment outcome as reported by Bamgboye and others. Two cases of rare Axenfeld-Riegers syndrome associated with glaucoma completed the original papers. On a lighter note, Okeahialam reminisced on his undergraduate training in Ibadan.

It is anticipated that these papers would be interesting to our readers and stimulate mechanistic research followed by implementation. That would enhance the significance of the findings from observational studies; although COVID-19 is on the front burner now.

A. Ogunniyi
Editor-in-Chief

Contents

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Axenfeld-Riegers Syndrome in Nigeria: report of two cases with associated glaucoma

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Abstract
*Background:*Axenfeld Riegers syndrome denotes a spectrum of anterior segment dysgenesis. Patients with Axenfeld-Riegers syndrome share the same general features irrespective of the ocular manifestations. It is typically bilateral, has no sex predilection, often associated with glaucoma and most cases are diagnosed in infancy or childhood. We report two adults presenting for the first time with varying spectrum of anterior segment dysgenesis.
Case Presentations:Case 1: A49-year-old Nigerian male who presented for the first time with 2 years history of poor vision in both eyes. Ocular examination revealed posterior embryotoxon OU, iris atrophy OU and corectopia OU. His intraocular pressures (IOP) were 46mmHg OD and 48mmHg OS. His cup to disc ratio was 1.0 by 1.0. Systemic examination revealed dental anomalies, craniofacial anomalies and short stature.
Case 2: A 19-year-oldNigerian female with a history of poor vision since childhood. Ocular examination revealed a posterior embryotoxon OU. It extended 360 degrees OD and from 10 o'clock to 6 o'clock clockwise OS. There was extensive iris atrophy OU. Intraocular pressures were 42mmHg and 32mmHg OD and OS respectively. She had trabeculectomy with complete success 19 months post operatively OS.
Conclusion: An important component of ARS is glaucoma. Awareness and counseling is important to prevent irreversible visual loss from glaucoma.

Keyword: *Axenfeld-Riegers Syndrome, Glaucoma, Posterior Embryotoxon, Trabeculectomy*

Résumé
Contexte : Le syndrome d'Axenfeld Riegers représente un spectre du segment antérieur de dysgénésie. Les patients atteints du syndrome d'Axenfeld Riegers partagent les mêmes caractéristiques générales quelles que soient les manifestations oculaires. Il est généralement bilatéral, sans prédilection sexuelle, souvent associé à un glaucome et la plupart des cas sont diagnostiqués dans l'enfance. Nous rapportons deux adultes présentant pour la première fois avecspectre variant du segment antérieur de dysgénésie.
Présentations de cas **:** Cas 1: Un Nigérian de 49 ans qui s'est présenté pour la première fois avec 2 ans d'histoire de mauvaise vision dans les deux yeux. L'examen oculaire a révélé un embryotoxon postérieur OU, une atrophie de l'iris OU et une corectopie OU. Ses pressions intraoculaires (PIO) étaient de 46 mmHg OD et 48 mmHg OS. Son rapport coupe àdisque était de 1,0 par 1,0. L'examen systémique a révélé des anomalies dentaires, des anomalies crâniofaciales et taille petite.
Cas 2: Une Nigériane de 19 ans ayant des antécédents de mauvaise vision depuis l'enfance. L'examen oculaire a révélé un embryotoxon postérieur OU. Il a étendu 360 degrés OD et de 10 heures à 6 heures dans le sens horaire OS. Il y avait une atrophie extensive de l'iris OU. Les pressions intraoculaires étaient de 42 mmHg et 32 mmHg OD et OSrespectivement. Elle a subi une trabéculectomie avec un succès complet 19 mois après la chirurgie.
Conclusion: Le glaucome est un composant important de l'ARS. La sensibilisation et le conseil sont importants pour prévenir la perte visuelle irréversible du glaucome.

Mot - clé: *Syndrome d'Axenfeld-Riegers , Glaucome, Embryotoxon postérieur , Trabéculectomie*

Introduction

Anterior segment dysgenesis refers to a failure of normal development of the anterior segment of the eye. They are a group of rare autosomal dominant conditions including posterior embryotoxon, Axenfield-Riegers syndrome, Peter's anomaly and aniridia [1]. These structural anomalies are often associated with increased risk of glaucoma and in Axenfeld-Riegers syndrome, this is seen in more than half of the cases [2]. The mechanism of glaucoma is a developmental arrest of anterior segment tissue derived from neural crest cells [3]. Several genes, including those at loci 4q25 (PITX2), 6p25 (FOXC1), and 13q14 (REIG2), have been identified [4,5].

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ARS is bilateral and has no sex predilection. Ocular manifestations include iris stromal hypoplasia, corectopia, severe iris atrophy, full thickness iris defect and extensive peripheral anterior synechiae (PAS). The main risk factor for the disease is a positive family history.

Samaila *et al,*had earlier reported three siblings from a consanguineous marriage in northern Nigeria with Peters' anomaly [6]. We report two adults with ARS which to our knowledge is the first report of ARS in Nigeria.

Case presentation

Case One: A 49-year-oldNigerian male trader presented with a two-year history of progressive deterioration in vision OUwith associated bumping into objects.There was no history of antecedent ocular trauma or ocular pain. He had no family history of glaucoma or other blinding eye diseases. This was his first presentation at an eye hospital. Systemic examination revealed craniofacial anomalies such as maxillary hypoplasia, telecanthus and midface flattening and broad nasal bridge (Fig 1), short stature and dental anomalies [microdontia] (Fig 2)

Fig 1: Features of Telecanthus, left strabismus, and broad nasal bridge in a patient with Axenfeld Riegers Syndrome

Ocular examination revealed a visual acuity of 1/60 in each eye. There was no improvement with refraction OU. Examination showed a nasal pterygium extending about 2 mm into the cornea OD. There was also a left strabismus (hypertropia). There was no other remarkable finding. Slit lamp examination revealed a posterior embrytoxon (prominent anteriorly displaced Schwalbes line) OU. It extended from 8 o' clock to 9o' clock OD (Fig 3) and 3 o'clock to 11 o clock clockwise OS (Fig 4). There were no corneal opacities OU. The anterior chambers were shallow OU. There was extensive iris atrophy OD which was more marked temporally with hole formation at 8 o' clock (Fig 3).There was also PAS OD. The pupil was drawn to one o' clock and corectopic with complete loss of the pupillary ruff OD (Fig 3). There was mild iris atrophy OS. The pupils were sluggish and poorly reactive OU.Early lenticular opacities were present OU. Intraocular pressures (IOP) using the Goldmann applanation tonometer was 46mmHg OD and 48mmHg OS. Dark room gonioscopy revealed Shaffer's grade 0in all quadrants with skip peripheral anterior synechiae inferiorly, and convex iris configuration in both eyes. He was commenced on gutt timolol bd OU and tablet acetazolamide 250mg tds which was affordable for the patient. At a subsequent follow up visit 4 weeks later, his IOP was 08mmHg OU. Dilated examination at this visit revealed no change in the post dilation IOP OU. Fundoscopy with the 78D lens showed a cup to disc ratio (CDR) of 1.0 by 1.0 with marked peripapillary atrophy OU. There was no disc hemorrhage OU. Peripheral retinal examination was unremarkable OU. He could not perform achromatic visual field test even with a stimulus V because his visual acuity was poor in both eyes. An Impression of Axenfeld-

Fig 2: Microdontia in the same patient

Rieger syndrome with bilateral advanced angle-closure glaucoma was made. He was scheduled for bilateral trabeculectomy with Mitomycin-C (MMC).

Case two: A 19-year-old Nigerian female student who presented with a history of poor vision since childhood. She complained of occasional redness that resolved spontaneously. She was given spectacle

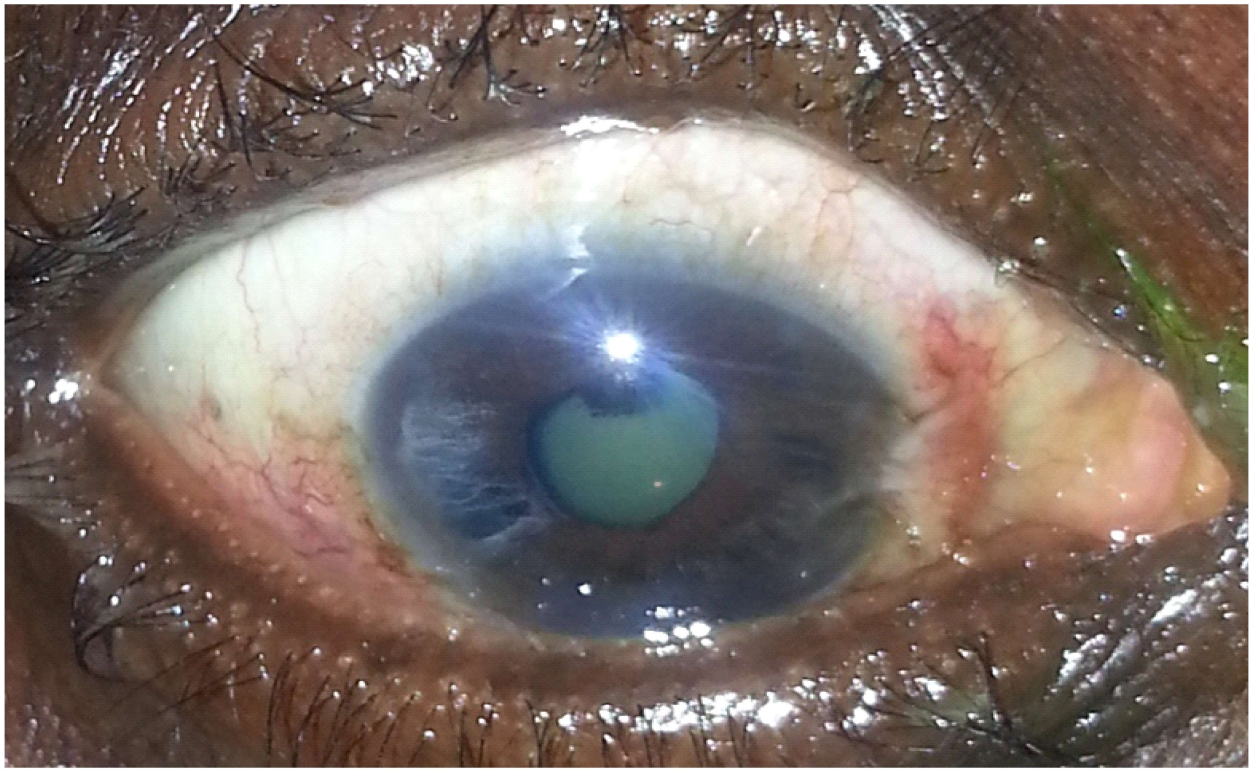

Fig 3: Right Eye showing posterior embryotoxon, marked iris atrophy, corectopia and nasal pterygium

Fig 4: Left eye showing posterior embyotoxon and marked Peripheral anterior synechiae

at an optical facility five years ago which did not improve her vision. Systemic examination revealed no significant findings.

reveal any other remarkable finding. Slit lamp examination revealed a posterior embryotoxon (prominent anteriorly displaced Schwalbes line) OU.

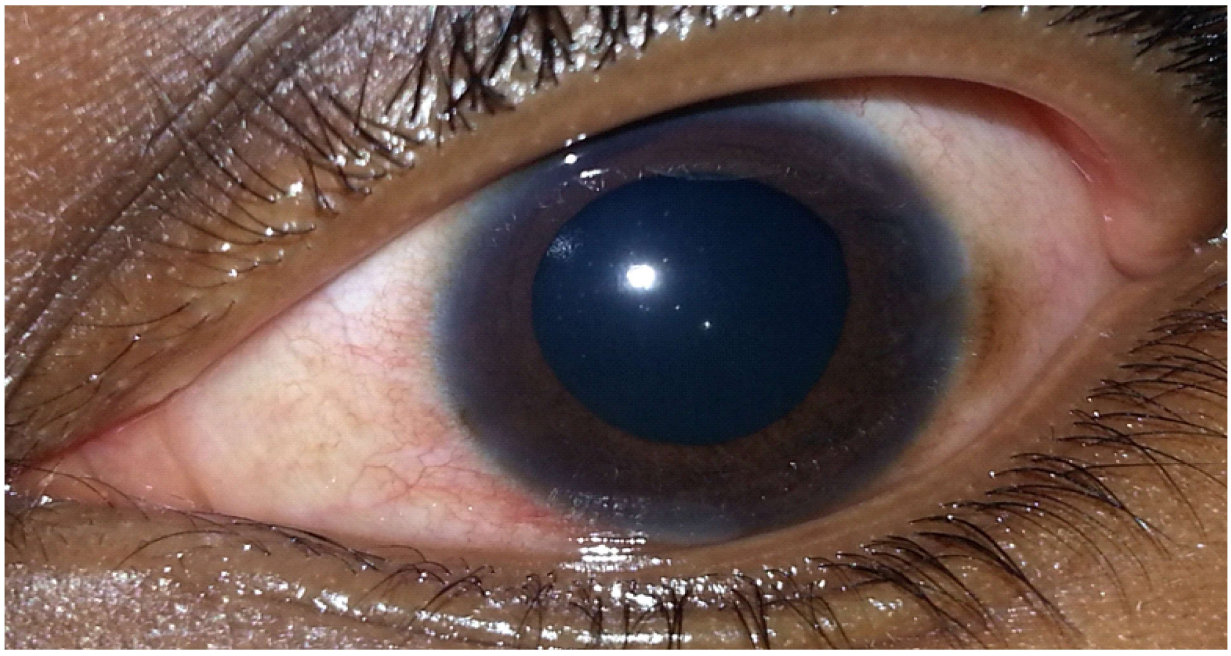

Fig 5: Right eye of case 2 showing posterior embryotoxon

Ocular examination revealed a visual acuity of counting fingers in both eyes which improved to 6/36 OD and 6/60 OS. She had an intermittent alternating exotropia. External examination did not

It extended from 1 o clock to 3 o clock, and 7 to 8 oclock temporally OS (Fig 5).

She also had skip posterior embryotoxon OD. There were no corneal opacities. The anterior chambers were shallow OU. There was extensive iris atrophy OD which was more marked inferiorly but there was no iris hole. There was also iris atrophy OS which was more marked inferiorly. She also had a corectopic pupil superiorly. There was loss of pupillary ruff. The pupils were sluggishly reactive to light. Her lenses were clear OU.

Intraocular pressures using the Goldmann applanation tonometer were 42mmHg and 32mmHg OD and OS respectively. Dark room gonioscopy revealed closed angles in all the quadrants with areas of synechiae (Shaffer's grade zero) OD and narrow angles (Shaffer's grade 2) except the temporal quadrant which had synechiae closure OS. Fundoscopy with 78D lens revealed a CDR of 1.0 by 1.0 OU. There was no disc hemorrhages OU. Peripheral retinal and macula examination was unremarkable OU. A diagnosis of Axenfeld-Rieger syndrome with bilateral advanced chronic angle-closure glaucoma was made. She was commenced on Gutt latanoprost and timolol OU and booked for bilateral trabeculectomy with mitomycin C. She subsequently had trabeculectomy with MMC OS.Nineteen months' post trabeculectomy OS, her IOP were 20mmHg OD and 12mmHg OS. She has had complete surgical success to the left eye without any anti-glaucoma medications. Her best corrected visual acuity was 6/18 OU. She is presently on cosopt, latanoprost, and alphagan OD. She has been scheduled for trabeculectomy with mitomycin C OD.

Discussion

Axenfeld in 1920, described a patient with a white line in the posterior aspect of the cornea near the limbus and tissue strands extending from peripheral iris to this prominent line[7].He called this posterior embryotoxon of the cornea. Rieger in the mid 1930 reported cases of similar anterior segment anomalies, but with additional changes in the iris, such as corectopia, atrophy and polycoria[8].Some of these patients he described also had associated systemic developmental defects, especially of the teeth and facial bones. He called his findings mesodermal dysgenesis of the cornea and iris [8]. The term Axenfeld-Rieger syndrome is now accepted as a spectrum of diseases which includes these clinical variations.

ARS results from a developmental arrest of the anterior segment which occurs during gestation. This causes incomplete posterior recession of the posterior uvea and the anterior uvea, then highly attaches to the trabecular meshwork[8].This developmental arrest results in the partial retention of the primordial endothelial cells on the iris and the iridocorneal angle. The contraction of these primordial cells leads to changes in the iris, corectopia and iris holes[10,11].

Common systemic abnormality in these patients includes mild craniofacial dysmorphism, dental abnormalities, and redundant umbilical skin. The facial abnormalities include telecanthus, maxillary hypoplasia, and a broad, flat nasal bridge. Dental abnormalities include microdontia, oligodontia, or hypodontia. In addition, some patients may have hypospadias, anal stenosis, pituitary abnormalities, growth retardation, and cardiac valvular abnormalities [12,13].Abnormalities of the pituitary gland and other surrounding areas are less common. Cases of empty sella syndrome, arachnoid cysts, growth hormone deficiency and short stature have been described.

Glaucoma typically occurs in late childhood or adulthood [14].The pathogenesis is thought to be related to an underlying trabeculodysgenesis, rather than to the degree of peripheral anterior synechiae or angle changes [15]. Glaucoma occurs as a result of a developmental arrest of anterior segment tissue derived from neural crest cells. The Schlemm's canal may be small or absent [2],development of trabecular meshwork may be aberrant and extracellular matrix is also altered. Defects in differentiation, migration, or arrested development of neural crest cells in the anterior chamber, facial bones, teeth, cardiovascular system, and peri-umbilical skin are considered to be the etiological basis for the systemic and ocular findings characteristic of ARS.

Both patients presented with posterior embryotoxon, iris atrophy, and advanced glaucoma in the clinical setting. The second patient had dental anomalies in addition to the ocular findings. The clinical findings in our patients are consistent with ARS.

Glaucoma occurs frequently in patients with ARS and this can lead to gradual, irreversible visual loss if not detected early and managed appropriately. There is a greater risk of developing glaucoma in ARS when the peripheral iris is highly attached to the trabecular meshwork [11]. Our patients had closed angles with the peripheral iris attaching to the anterior trabecular meshwork. As at the time of presentation, the patients already had severe visual impairment from advanced glaucoma as at presentation. This may be due to lack of a 'felt need' until late in the disease and poor socioeconomic

status. The second patient defaulted from follow up for one year and only returned to clinic when she realized that the vision in the un-operated eye was getting worse. In low socioeconomic settings, glaucoma is better managed surgically because of issues with compliance, drug affordability and availability. This is also true in young adults who may have difficulty complying with medications for many years. Medical therapy for glaucoma is used mainly as an adjunct to surgical intervention

Awareness and counseling is very important in preventing blindness from this disease. Multi-disciplinary approach is important in patients who have systemic features. Though Peters' anomaly which is a variant of anterior segment dysgenesis was reported by Samaila *et al*[6], to the best of our knowledge this is the first report of ARS in Nigeria. ARS should be suspected in all patients presenting with bilateral poor vision, and iris abnormalities regardless of age.

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Evaluation of the effect of chronic administration of local gin (*Ogogoro*) on liver and oxidative stress biomarkers in adult male wistar rats

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Abstract

Background: Alcohol-related disorders are major causes of morbidity and mortality globally. Previous studies have reported the acute effects of local gin on hepatic functions. This study evaluated the effect of chronic administration of local gin (*Ogogoro*) on liver enzymes, liver histology and oxidative stress biomarkers in adult male Wistar rats.

Methods: Twenty adult male Wistar rats were divided into four groups of 5 rats each. Group I (control) received 2 ml/kg normal saline and Groups II-IV received 3.5 ml/kg, 7.0 ml/kg, and 14.0 ml/kg of local gin (*Ogogoro*) by oral gavage respectively for 60 days. Following administration, liver enzymes [aspartate amino transferase (AST), alanine amino transferase (ALT) and alkaline phosphatase (ALP)] and biomarkers of oxidative stress [malondialdehyde (MDA), catalase (CAT), glutathione peroxidase (GPx) and superoxide dismutase (SOD)] were determined in the serum and hepatic histology was carried out. Data were presented as Mean ± SEM and analysed using one way ANOVA.

Results: The result showed significant increases in the serum levels of ALP, AST and ALT following administration of the local gin compared to the control ($p<0.05$). Malondialdehyde level was increased significantly in all treated groups while SOD, GPx and CAT levels were significantly decreased in the local gin treated groups compared to the control ($p <0.05$). Widespread liver damage evidenced by steatosis and periportal inflammations were observed in the groups administered the local gin compared to the control.

Conclusion: Local gin causes hepatotoxicity probably through initiation of oxidative stress which is not diminished by chronic exposure.

Keywords:*Local gin, Liver enzymes, Hepatotoxicity, Lipid peroxidation.*

Résumé

Contexte **:** Les troubles liés à l'alcool sont des causes importantes de morbidité et de mortalité dans le monde. Des études antérieures ont rapporté les effets aigus du gin local sur les fonctions hépatiques. Cette étude a évalué l'effet de l'administration chronique de gin local (*Ogogoro/Koutoukou*) sur les enzymes hépatiques, l'histologie du foie et les biomarqueurs du stress oxydatif chez les rats Wistar mâles adultes.

Méthodes **:** Vingt rats Wistar mâles adultes ont été divisés en quatre groupes de 5 rats chacun. Le groupe I (témoin) a reçu 2 ml / kg de solution saline normale et les groupes II-IV ont reçu 3,5 ml / kg, 7,0 ml / kg et 14,0 ml / kg de gin local (*Ogogoro/Koutoukou*) par gavage oral respectivement pendant 60 jours. Après administration, enzymes hépatiques [aspartate aminotransférase (AST), alanine amino transférase (ALT) et phosphatase alcaline (ALP)] et biomarqueurs du stress oxydatif [malondialdéhyde (MDA), catalase (CAT), glutathion peroxydase (GPx) et super oxydedismutase (SOD)] ont été déterminés dans le sérum et une histologie hépatique a été réalisée. Les données ont été présentées sous forme de moyenne ± SEM et analysées à l' aide d'ANOVA unidirectionnelle.

Résultats: Le résultat a montré une augmentation significative des niveaux sériques d'ALP, d'AST et d'ALT après l'administration du gin local par rapport au contrôle ($p<0,05$). Le niveau de malondialdéhyde a augmenté de manière significative dans tous les groupes traités tandis que les niveaux de SOD, GPx et CAT ont été significativement diminués dans les groupes traités au ginlocal par rapport au contrôle ($p<0,05$). Des lésions hépatiques généralisées mises en évidence par une stéatose et des inflammations péri-portales ont été observées dans les groupes ayant reçu le gin local par rapport au témoin.

Conclusion **:** le gin local provoque une hépatotoxicité probablement par l'initiation d'un stress oxydatif quin'est pas diminuée par une exposition chronique.

Mots-clés: *Gin local, Enzymes hépatiques, Hépatotoxicité, Peroxydation lipidique.*

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Introduction

Alcohols are hydroxyl derivative with straight or branched chain aliphatic hydrocarbons [1]. Alcohol, mainly ethanol, is by far the most abused drug for centuries globally [2]. The types of alcohol consumed as alcoholic beverages include wine, spirits, liquors, beers and traditional brew especially in developing countries [3]. The global consumption of alcoholic beverages is about 2 billion people in both developing and developed countries [4,5]. In West Africa, traditional alcoholic beverage is consumed by more than 10 million people [6,7].The effect of alcohol depends on the amount consumed per time and the duration of consumption. According to National Institute on Alcohol Abuse and Alcoholism [8], excessive alcohol consumption is defined as binge drinking on five or more days in a month or any amount of alcohol consumed during pregnancy. Binge drinking is any pattern of alcohol consumption that raises the blood alcohol concentration level to 0.08g/dl. This typically occurs after four drinks for women or five drinks for men in about 1-2 hours. Whereas, moderate alcohol consumption implies one drink per day for women and up to two drinks per day for men; above this value for more than one month is referred to as long term alcohol use [8]. The by-products of ethanol metabolism such as acetaldehyde, acetate, reactive oxygen species (ROS) such as hydroxyl radicals, superoxide anion and fatty acid ethyl esters (FAEEs) can disorganize the physiological functions of various tissues and liver [3]. Alcoholic liver disease, a leading cause of morbidity, mortality and cirrhosis, can range from simple steatosis to hepatocellular carcinoma. Multiple mechanisms such as oxidative stress, mitochondrial dysfunction, and alteration in gut-liver axis have been proposed for the pathogenesis of alcoholic liver disease [5,9].

Locally brewed alcoholic drinks in Nigeria include *pito*, *burukutu*, *palm wine*, *Ogogoro*/*kaikai*, fermented cocoa sap and *Agadagidi* (plantain drink); all with varied alcoholic contents depending on the type and method of preparation [10-12]. The brewing methods of the various local alcoholic drinks in Nigeria were reviewed by Uzogara *et al.* [12]. *Ogogoro* brewed from the distillation of fermented sap of different palm trees (*Arecaceae*) has 40 -60 % alcohol content per volume [13]. Consumption of this local gin increases body levels of toxic metabolite (acetaldehyde) resulting in increased toxic and carcinogenic effects as well as sociopolitical ills and vices [11].

The liver, brain and heart have been reported to increase their abilities to oxidize alcohol following habituation and that the central nervous system of habituated animals can oxidize more alcohol than that of the non-habituated thus utilize it as an energy source for cerebral activity [14,15]. Previous studies [16,17] reporting hepatotoxic effect of local gin and remediation with different agents were carried out after exposure to local gin ranging from one week to four weeks hence, literature on long term administration of local gin which might permit alcohol habituation is lacking. This study therefore investigated the effect of longer duration of exposure to local gin on liver function and the probable involvement of oxidative stress was evaluated in male Wistar rats.

Materials and methods

Materials

The local gin (*Ogogoro*) from Sapelle Delta state, Nigeria was purchased from a major distributor in Zaria, Kaduna State, Nigeria. It was identified and authenticated in the Department of Pharmacognosy and Pharmaceutical Chemistry, Ahmadu Bello University, Zaria, Kaduna state, Nigeria by its physical (colour and aroma) and chemical (pH and presence of ethanol, lead, copper, zinc, chloride and nitrate) characteristic.

Animals

Twenty male adult Wistar rats were obtained from the Animal House of the Department of Human Physiology, Faculty of Basic Medical Sciences College of Medica Sciences, Ahmadu Bello University, Zaria, Kaduna State, Nigeria. They were acclimatized for one week and were fed with compressed grower mash and given access to water *ad libitum* before administration commenced. The weights of the animals were monitored twice weekly throughout the duration of the experiment, using an electronic analytical and precision balance (Satorius GA, Goettingen, Germany). All experimental handling of the animals were carried out in conformity with the recommendation of the Ahmadu Bello University committee on animal use and care.

Determination of alcoholic content of the local gin and acute oral toxicity study:

The ethanolic content of the local gin (*Ogogoro*) was determined at the National Research Institute of Chemical Technology (NARICT) Zaria and found to be 32%.The acute oral toxicity study for *Ogogoro* was conducted using the method of Lorkes [18]. The LD_{50} was calculated to be greater than 5000mg kg-1 body weight, orally.

Animal grouping and experimental design
Twenty adult male Wistar rats weighing between (150-250 g) were randomly divided into four groups of five animals each as follows.
Group I: Normal saline 2 ml/kg,
Group II: *Ogogoro* 3.5 ml/ kg,
Group III: *Ogogoro* 7.0 ml/kg,
Group IV: *Ogogoro* 14.0 ml/kg.
Administrations were done by oral gavage for sixty (60) days.

Animal sacrifice and sample collection: At the end of the 60 days administration, each rat was anaesthetized by placing it in a closed plastic chamber containing cotton wool soaked with chloroform and the abdominal cavity was opened through a midline abdominal incision exposing the heart and the liver, blood sample (5mls) was collected through cardiac puncture and the serum was used for assay of liver enzymes and biomarkers of oxidative stress. The liver was carefully excised and trimmed of all fat. A portion of the median lobe of the liver was excised and fixed in 10% formal-saline for histological examination.

Estimation of liver marker enzymes: The alanine amino transferase and aspartate amino transferase, alkaline phosphatase level were evaluated using a commercially available ELISA kits (ALP, WAR-036; AST,WAR-088; ALT,WAR-108). Detailed procedures for the above measurements were performed according to the kit manufacturer's instructions (Wkea Med Supplies Corp, China).

Determination of the serum biomarkers of Oxidative Stress: Assay of serum superoxide dismutase (SOD), glutathione peroxidase (GPx) and catalase (CAT) activity and lipid peroxidation (MDA) levels were determined using appropriate ELISA kits (MDA,WAR-265;SOD,WAR-266; GPX,WAR-271;CAT,WAR-286) according to the manufacturer's manual (Wkea Med Supplies Corp, China).

Histological Analysis: Liver histology was carried out at the Department of Histopathology, Ahmadu Bello University Teaching Hospital, Zaria, Kaduna, Nigeria. The method of H and E staining technique was used. The formalin-fixed liver tissue was dehydrated in a 70%–100% gradient of ethyl alcohol, dealcoholized in xylene and embedded in paraffin for sectioning. The 5µm sections were deparaffinized in xylene, rehydrated in a reverse-gradient series of ethyl alcohol and stained with H & E. Liver steatosis was graded by a pathologist to detect the presence of fat, necrosis, fibrosis and inflammation using the standards proposed by Dixon for assessing changes in fat and inflammation [19].

Statistical Analysis
Data obtained were expressed as mean ± standard error of mean (SEM). The results were analyzed using one-way analysis of variance (ANOVA), followed by Tukey post-hoc test to compare the level of significance between groups using SPSS version 20.0, values of $p < 0.05$ was considered to be significant.

Results

As shown in table 1, significant weight loss was observed in the group IV animals when compared with the control ($p < 0.05$). Serum ALT, AST and ALP were increased following treatment with the different doses of local gin but statistically significant increase was obtained in group IV when compared with the control (table 2). The effects of the local gin on biomarkers of oxidative stress are shown in table 3, MDA level was significantly increased following administration of 3.5 ml/kg (1.22 ± 0.06 µmol/l), 7.0 ml/kg (1.42 ± 0.11 µmol/l) and 14 ml/kg (1.50 ± 0.08 µmol/l) of local gin when compared with the control (1.00 ± 0.07 µmol/l). On the other hand,

Table 1: Weight distribution: percentage gain/loss in adult male Wistar rats before and after administration of *Ogogoro*.

Treatment Groups	Before TX (g)	After TX (g)	% (Loss++/Gain+)
Group I (control)	121.40 ± 2.44	137.60 ± 1.57	11.77++
Group II (Ogogoro 3.5ml/kg)	144.00 ± 2.21	129.80 ± 2.71	10.94+
Group III (Ogogoro 7.0ml/kg)	164.60 ± 2.14	144.40± 3.02	14.00+
Group IV (Ogogoro 14.0ml/kg)	192.00 ± 4.70	151.80 ± 3.02	26.50*+

TX: Treatment
** =Statistically significant compared to control*

Table 2: Serum alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP) concentration in adult male Wistar rats treated with local gin (*Ogogoro*)

Treatment Groups	ALT (IU/L)	AST (IU/L)	ALP (IU/L)
Group I: Control	48.00 ± 2.00	55.80 ± 2.87	110.00± 4.25
Group II : (Ogogoro 3.5 ml/kg)	77.40 ± 11.76	80.00 ± 4.92	189.80±20.94
Group III: (Ogogoro 7.0 ml/kg)	77.80 ± 22.75	92.40 ± 3.40	222.00±2.88*
Group IV: (Ogogoro 14.0 ml/kg)	95.00 ± 8.54$^{\$}$	138.80±19.48*	211.60±2.88*

* = statistically significant ($P < 0.05$) compared to control.

Table 3: Serum level of Malondialdehyde (MDA), superoxide dismutase (SOD), glutathione peroxidase (GPx) and catalase (CAT) in adult male Wistar rats fed with *Ogogoro*.

Treatment Groups	MDA (umol/l)	SOD (IU/L)	GPx (IU/L)	CAT (IU/L)
Group I (Control)	1.00 ± 0.07	2.34 ± 0.06	48.60 ± 0.68	52.40 ± 0.93
Group II (*Ogogoro* 3.5 ml/kg)	1.22 ± 0.06	2.14 ± 0.07*	44.20 ± 0.86*	47.80 ± 1.07*
Group III (*Ogogoro* 7.0 ml/kg)	1.42± 0.11*	2.20 ± 0.17*	40.40 ± 0.68*	42.80 ± 1.16*
Group IV (*Ogogoro* 14.0 ml/kg)	1.50 ± 0.08*	1.68 ± 0.06*	40.20 ± 0.86	43.20 ± 0.86*

= statistically significant ($P < 0.05$) compared to control.

serum SOD, GPx and CAT were significantly reduced ($P < 0.05$) in all the local gin treated groups. The effect of higher dose (14.0 ml/kg) on markers of oxidative stress was more pronounced than the two lower doses.

Plates II-IV show the histology of liver tissue of the Wistar rats treated with local gin compared to the control. Plate I showed normal liver histology, plate II showed steatosis, while periportal inflammation and fibrosis were seen in plate III and IV respectively.

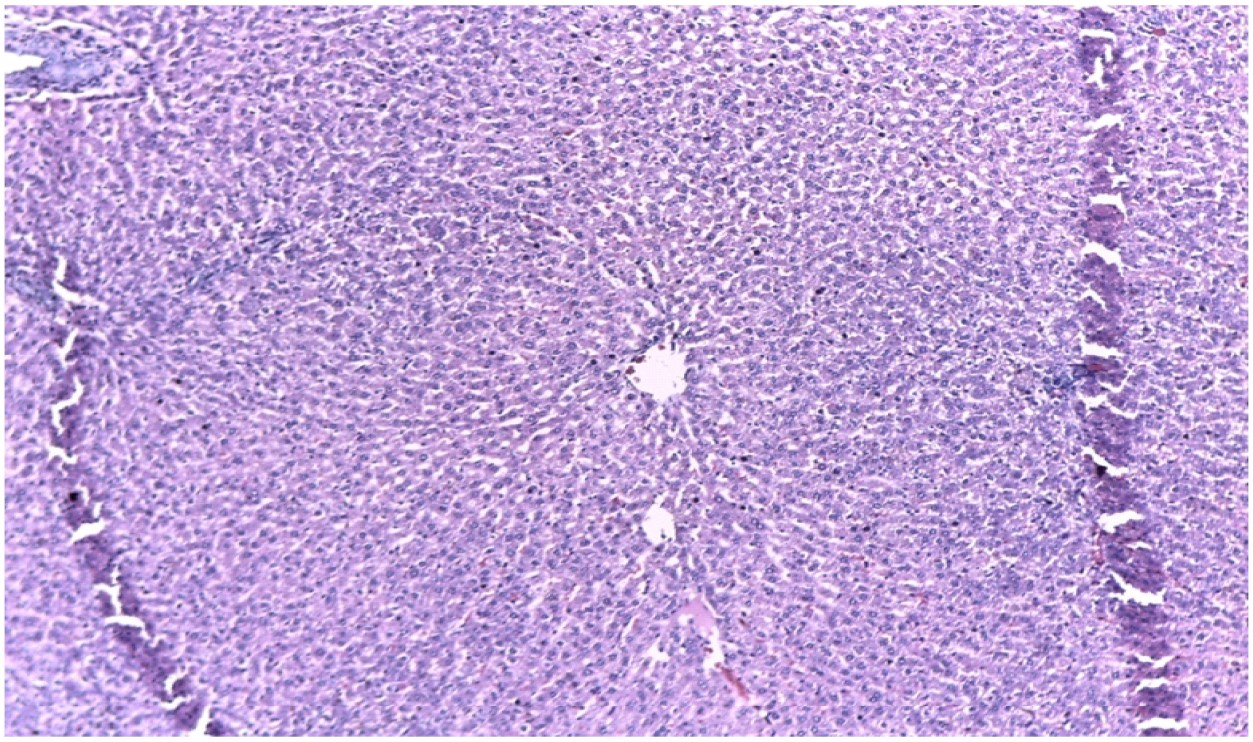

Plate I: Photomicrograph of group I (Control) rats, showing normal hepatocytes, central portal vein and parenchyma. H&E stain, x 200

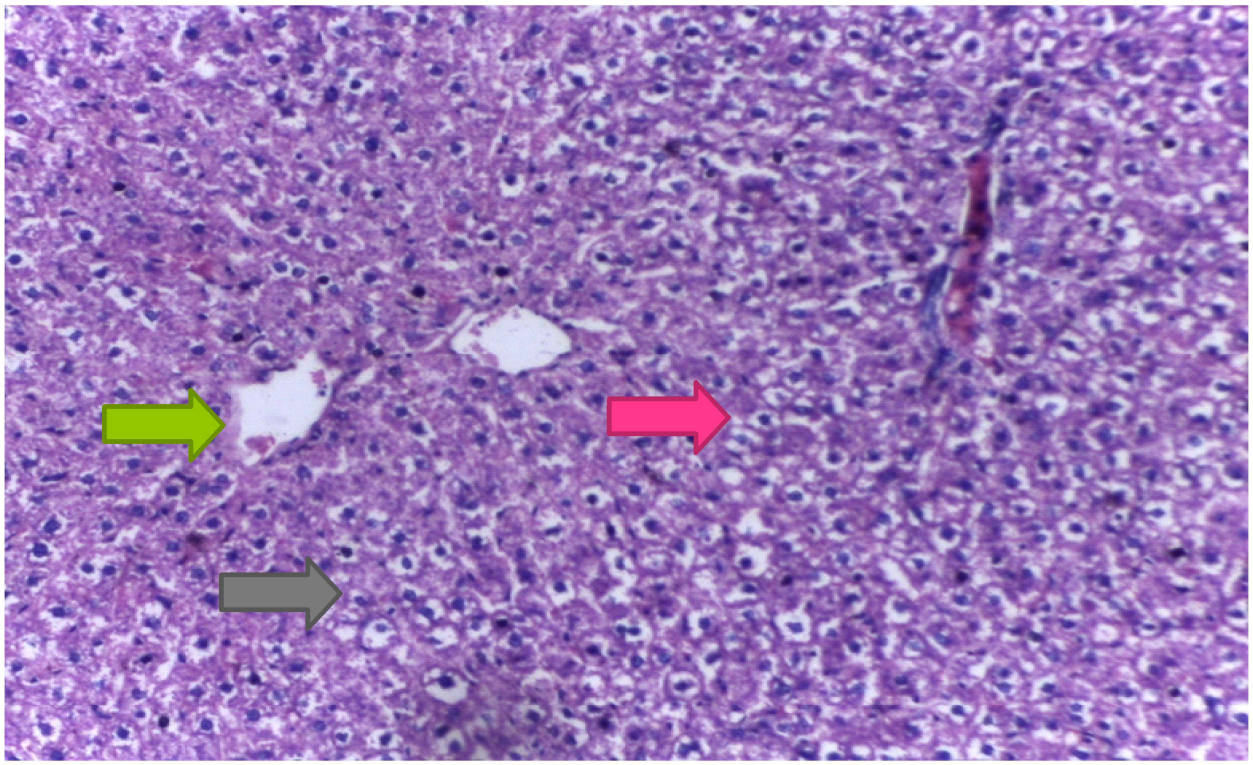

Plate II: Photomicrograph of group II (*Ogogoro* 3.5 ml/kg) rats,showing areas of steatosis(black arrow), distorted hepatocytes (red block arrows) and periportal inflammation (green block arrows) H and E stain, (x 200).

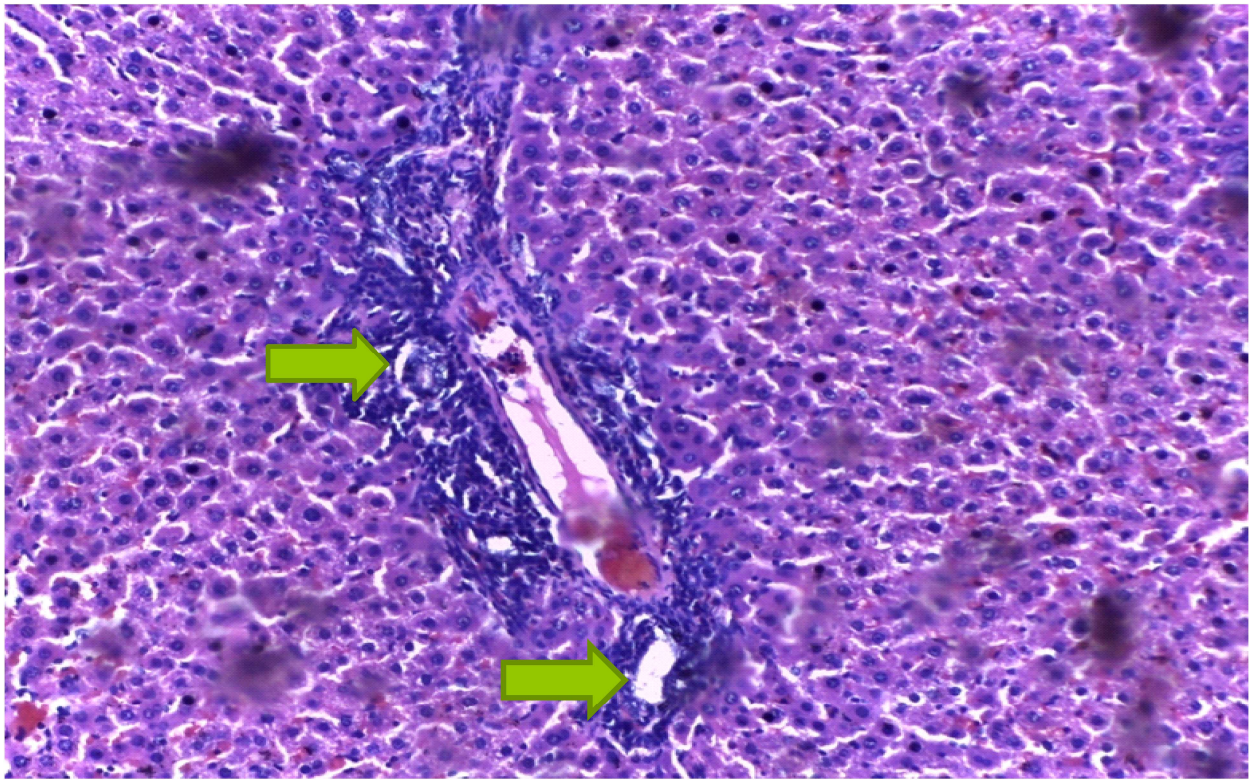

Plate III: Photomicrograph of group III (*Ogogoro* 7.0ml/kg) ratsshowing periportal inflammation (green block arrows). H&E stain, x200

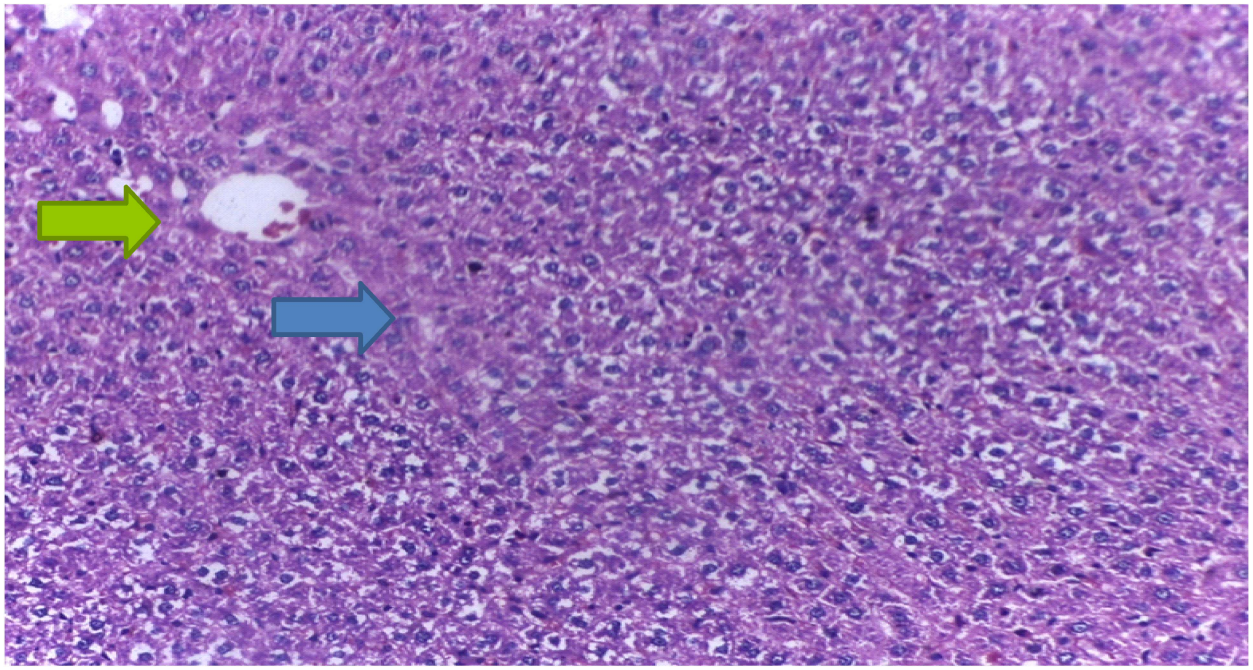

Plate IV: Photomicrograph of group IV (14.0 ml/kg) rats, showing areas of fibrohyalinization of liver parenchyma (blue block arrows), peri-portal inflammation and steatosis (green blockarrows). H&E stain, x200.

Discussion

Chronic alcohol consumption induces hepatic oxidative stress due to increased generation of reactive oxygen species and/or reduced antioxidant capacity. The liver is the most damaged organ in the body of chronic alcohol abusers. This is because the portal vein drains the intestines directly to the liver and approximately 80% of ingested alcohol is metabolized in the liver [20].

In the present study, there was a significant decrease in percentage body weight in group IV experimental animals. This suggests that chronic administration of *Ogogoro* imposed undue stress and possibly malnutrition in the rats, hence the presence of weight loss. Alcohol impairs nutrient absorption by damaging the cells lining the stomach and intestines, and disabling transport of some nutrients into the blood [21]. This result is in concert with the study of Saalu *et al*. [20] who reported a decrease in body weight following chronic alcohol administration in rats but in contrast to that of Ighodaro *et al*. [21] who reported a relative increase in body weight of rats treated with alcohol.

There was a significant increase in serum levels of ALT, AST and ALP in group IV while group III showed a significant increase only in ALP level.This increase could be caused by intermediate products of ethanol metabolism (acetaldehyde and free radicals) that could have deleterious effects on body and organs especially the liver, thereby interfering with normal metabolism and essential elements, leading to cellular damage through oxidative mechanisms [3]. The increased byproducts of local gin during the chronic administration may affect the liver cells by the increased destruction of the hepatocytes via abnormal ethanol metabolism, oxidative Stress, mitochondrial dysfunction, hypoxia and impaired proteasome function thereby increasing the liver enzymes as seen in the result of the study. The ALP and AST are known to be indicators of liver disease in general but less specific to alcohol induced liver damage, however, ALT had been reported to be more specific to alcohol induced liver cell injury than AST and ALP which can also be found in heart, muscle, kidney and brain cells [22]. The result of this study agreed with those of Agarwal *et al*. [2] and Chen *et al*. [22] on acute alcoholism in mice but in contrast to the work of Masahiro *et al*. [23] who reported no significant difference in liver enzymes between light drinkers and non-drinkers among Japanese females.

There was a significant increase in serum MDA level in the groups treated with *Ogogoro* (7.0ml and 14.0 ml/kg) compared to the control indicating increased lipid peroxidation. The increase in the level of MDA observed in the *Ogogoro* treated groups III and IV could be linked to the generation of free radicals, resulting in the peroxidation of membrane lipids and increase in liver enzymes. This result is in agreement with that of Nwozo and

Babatunji [24] who suggested that free radical generation and lipid peroxidation might be an important mechanism in the toxicity of ethanol within the liver. More so, the main pathway for alcohol metabolism involves the enzyme alcohol dehydrogenase; which metabolizes alcohol into toxic acetaldehyde, whose interaction with cell proteins and lipids can result in free radical generation and cellular damage [25].

This result showed a significant decrease in the levels of serum SOD and glutathione peroxidase concentrations in all the groups treated with *Ogogoro* compared to the control. The decrease in the levels of SOD and glutathione peroxidase could have been due to their utilization to restore balance between oxidants and anti-oxidants in an attempt to alleviate or ameliorate the existing oxidative stress by scavenging the free radicals, as indicated by the increased levels of malondialdehyde. Nwozo and Babatunji [24] reported a decrease in the SOD concentration in alcohol treated rats, but contrarily Maneesh *et al*. [26] found an increase in SOD levels and explained it as an adaptive response in alcohol abusers. Glutathione peroxidase (GPx) is an endogenous antioxidant and plays a significant role in the detoxification of xenobiotics and maintenance of the redox status of the cells [21]. Alcohol has been reported to deplete cellular glutathione peroxidase levels [27]. The depletion of glutathione peroxidase in the *Ogogoro* treated groups is consistent with other reports on the effect of ethanol on the liver [28]. Ethanol induced depletion of glutathione supports the hypothesis that reactive oxygen intermediates generated during the metabolism of ethanol lead to glutathione oxidation and lipid peroxidation and could be responsible for the toxicity of ethanol [20,24].

Serum catalase (CAT) concentrations in the group treated with *Ogogoro* (7.0 ml/kg and 14.0 ml/kg) showed significant decrease when compared to the control. The decrease in the concentrations of catalase in this present study could be attributed to the presence of oxidative stress as indicated by the MDA levels, hence the utilization of CAT to combat the oxidative stress. Catalase protects the cells from the accumulation of hydrogen peroxide by dismutation reaction to form water and oxygen or by using it as an oxidant in which it works as a peroxidase [26].

The histological profiles of the liver tissue of the control group of Wistar rats revealed normal liver comprising of hepatocytes arranged in cords radiating from a central vein (Plate I). After prolonged exposure to *Ogogoro* administration, there was a marked distortion of the liver cyto-architecture resulting from degeneration of the liver parenchyma, deposition of fat-steatosis (Plate II), peri-portal inflammation (Plate III) and fibrosis as seen in Plate IV.This could sum up the results of liver enzymes and oxidative stress biomarkers, showing the histological effects of alcohol biochemically and histologically.This result is in consonant with the histological finding of Saalu *et al*. [20] who reported a markedly distorted liver histological profile following chronic alcohol administration in rats.

Conclusion

This study has shown that chronic administration of *Ogogoro* could lead to elevated level of liver enzymes, significant lipid peroxidation, decreased endogenous antioxidant enzymes, increased hepatocytes destruction,steatosis and peri-portal inflammation of the liver tissue in the adult male Wistar rats. Hence, there was no evidence of habituation to local gin with regards to liver function following exposure for 60 days.

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The low prevalence of dementia in sub-Saharan Africa: a systematic review and meta-analysis of geographical variations and associations

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Abstract

*Background:*Conflicting findings from individual epidemiological studies do not allow for valid assumptions about the true prevalenceof dementia in sub-Saharan Africa (SSA). We conducted a systematic review and meta-analysis of dementia studies in SSA to arrive at a pooled prevalence estimate and associated factors.

*Materials and methods:*We searched Medline, EMBASE, PsychINFO, and African Journals Online using index medicus keywords for dementia and the .mp operator for all 54 SSA countries or regions. Further information was retrieved through a manual search of references from relevant articles. We included peer-reviewed original studies with epidemiological or experimental designs, conducted random effect meta-analysis of prevalence estimates and determined associated factors using the inverse of variance method.

*Results:*A total of 38 studies met criteria for syntheses. The pooled prevalence of clinically diagnosed dementia derived from an overall sample of 6964 older community-dwellers was 4.0% (95% C.I=3.0%-6.0%). We observed a pattern of distinctly low rates in West Africa (2.0%, 95% C.I=2.0%-3.0%)and higher rates in East and Central Africa (6.0%, 95% C.I=5.0%-8.0%). Older age was the dominant factor associated with prevalent dementia. This factor contributed 99.3% of the total variance of all systematically associated factors. Most of the weight of association of older age and dementia was provided by studies conducted in West Africa (the region with the lower estimated prevalence).

*Conclusion:*There are subsisting evidence gaps precluding robust estimation of age-adjusted prevalence of dementia in SSA. Nevertheless, the findings from the present study provide useful information about the possible mechanisms underlyingthe observed low prevalence of dementia in SSA and other developing countries.

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Keywords:*Low and Middle income countries; sub-Saharan Africa; Dementia; prevalence; epidemiology; pooled estimates*

Résumé

Contexte: Les résultats contradictoires des études épidémiologiques individuelles ne permettent pas de supposer valides sur la prévalence réelle de la démence en Afrique subsaharienne (ASS). Nous avons effectué une revue systématique et une méta-analyse des études sur la démence en Afrique subsaharienne pour arriver à une estimation de la prévalence regroupée et des facteurs associés.

Matériel et méthodes: Nous avons effectué des recherches dans Medline, EMBASE, PsychINFO et Journaux Africain En Ligne à l'aide d'index mots-clés Médicus pour la démence et l'opérateur mp pour tous les 54 pays ou régions d'Afrique subsaharienne. De plus amples informations ont été obtenues grâce à une recherche manuelle des références des articles pertinents. Nous avons inclus des études originales évaluées par des pairs avec des plans épidémiologiques ou expérimentaux, effectué une méta-analyse à effet aléatoire des estimations de la prévalence et déterminé les facteurs associés en utilisant la méthode de l'inverse de la variance.

Résultats: Au total, 38 études répondaient aux critères de synthèse. La prévalence groupée de démence diagnostiquée cliniquement dérivée d'un échantillon total de 6964 d'habitants plus âgés de la communauté était de 4,0% (IC à 95% = 3,0% à 6,0%). Nous avons observé un schéma de taux nettement bas en Afrique de l'Ouest (2,0%, IC 95% = 2,0% -3,0%) et des taux plus élevés en Afrique de l'Est et Centrale (6,0%, IC 95% = 5,0% - 8,0%). L'âge avancé était le facteur dominant associé à la démence prévalente. Ce facteur a contribué à 99,3% de la variance totale de tous les facteurs systématiquement associés. La majeure partie de lacharge de l'association entre l'âge avancé et la démence a été fournie par des études menées en Afrique de l'Ouest (la région avec la prévalence estimée la plus faible).

Conclusion: Il existe des lacunes dans les preuves qui empêchent une estimation robuste de la

prévalence de la démence ajustée selon l'âge en ASS. Néanmoins, les résultats de la présente étude fournissent des informations utiles sur les mécanismes possibles à l'origine de la faible prévalence observée de la démence en Afrique subsaharienne et dans d'autres pays en développement.

Mots-clés: *Pays à revenu faible et intermédiaire ; Afrique Sub-Saharienne ; Démence; prévalence ; épidémiologie; estimationsgroupées*

Introduction

Projections from the global literature [1,2] suggest that by 2040 over 71% of persons with dementia will reside in low- and middle-income countries (LMICs). However, evidence from individual studies conducted in sub-Saharan Africa (SSA) [3-5] suggest a pattern characterised by widely varied but low rates of dementia relative to reports from higher income countries.

Given the widely varying findings from individual studies, it is reasonable to hypothesize that the true prevalence of dementia in SSA is yet unknown. It is also currently difficult to make valid assumptions about the importance of associated factors identified in many individual studies.

One important strategy to generate an integrated understanding of conflicting findings from different studies is the syntheses of data derived from all such studies. Pooled data could generate more precise estimates of prevalence and significance of previously identified factors associated with dementia in SSA. This could, in turn, help in the identification of important targets for the design and trial of tailored preventive interventions for dementia in the sub-region.

The objective of the present study was to conduct a systematic review and meta-analysis of dementia studies in SSA to arrive at a pooled estimate of prevalence and associated factors.

Methods

This review followed conventional recommendations for the methodology and reporting of systematic reviews as described in the guidelines of the National Institute of health and Care Excellence (NICE) and Preferred Reporting Items for Systematic reviews and Meta-analyses (PRISMA) [6,7].

Search strategy

An initial search of the African Journals Online database was conducted on 15th January 2017. This was followed by a search of the Medline, PsychINFO, and Embase databases using the following keywords with the 'explode' operator: dementia or 'Alzheimer's disease', AND epidemiology OR frequency OR prevalence OR incidence OR factors OR 'risk factors'OR 'associated factors' OR outcome OR mortality. We next searched each of the 54 sub-Saharan African countries or regions by name using the .mp. operator.

A second stage consisting of hand searching of the reference list of relevant articles retrieved from the databases was also implemented. An additional search of the pubmed was conducted on the 2nd of February 2018 to retrieve ahead of print citations using the same keywords as for the other databases. Limits on language and publication dates were not imposed in conducting the searches.

Inclusion criteria

Studies were included if;1) they investigated epidemiological phenomena such as frequencies, prevalence, incidence, risk or associated factors, and outcome, 2) they included participants with any type of dementia regardless of method of diagnoses or ascertainment, 3) conducted among community-dwelling participants, those in hospitals, rehabilitation settings, nursing homes or other such institutions,4) they used epidemiological or experimental study designs such as descriptive and analytical cross-sectional studies, prospective and retrospective cohort studies, case control studies, randomized controlled trials, non-randomized controlled trials, quasi-experimental, as well as before and after studies.

Exclusion criteria

We excluded the following types of studies, 1)review papers, case series, individual case reports, other textual materials suchasexpert opinions, discussion papers, and position papers;and 2) studies focusing solely on qualitative data.

Study assessments and data extraction

Study assessment for inclusion and exclusion criteria as well as subsequent data extraction was conducted by two independent assessors based on the descriptions in the original article. It was agreed a priori that in cases of disagreement, a consensus will be reached based on the decision of an experienced colleague.

Ascertainment of risk of bias in studies exploring associations

A standard framework [6,8] was used for judgments about the risk of bias in studies describing

associations. All 5 steps in the modified Graphical Appraisal Tool for Epidemiologic Studies (GATE) [6,8] were used for the determination of the risk of bias. We determined external validity by assessing key characteristics of the eligible sample in the relevant studies and made judgments about the level of representativeness of the source population. We made judgment about internal validity by assessing the method of identification of outcome measurements, and analytical strategies. These steps were undertaken to ensure that the associations identified by the respective studies are valid and are not due to unidentified factors that may be related to both exposure and outcome.

Risk of bias was classified as low, unclear/ unknown, and high [6]. Points were allocated to each component of the study as follows: 2 points when the risk of bias was low, 1 point when this was unclear /unknown and no points when the risk of bias was clearly high. Judgment about overall risk of bias in the selected studies was made by averaging risk of bias for a particular study, calculated by summing up the total points accrued by that study and dividing the result by the total number of components assessed. Finally, we classified the overall risk of bias for a particular study as high (when the average risk of bias scores for that study is less than 1), moderate (when this is between 1 and 1.5), and low (when the score is greater than 1.5).

Statistical methods

Meta-analysis was conducted using prevalence estimates of dementia reported in the original articles meeting the review protocol criteria for quantitative synthesis. We centred the display of prevalence estimates on the point of zero forbetter illustration.

The 95% percent confidence intervals (C.I) of each prevalence estimate together with their quantitative summary are also presented. Greater weights are given to studies with narrower C.I.

As heterogeneity was expected due to differences in the type of dementia assessments (clinical diagnostic criteria or rating scales), as well as setting of studies, a random effect meta-analysis model was chosen. To reduce the extent of methodological heterogeneity, we combined studies with similar diagnostic procedures in the same meta-analysis model. To determine the extent of statistical heterogeneity, we estimated the percentage of total variation in estimates reported across studies that is due to heterogeneity, rather than chance. This was computed using the I^2 test. In the present study, values of I^2 >50% were chosen as evidence of statistical heterogeneity [9].

For the objective of investigating the most important factors associated with dementia by rank, we used the log of odds ratios (O.R) and the corresponding standard errors (S.E) of the associations. The inverse of variance method was used for weighting in all quantitative estimations.

All quantitative analyses were conducted using the Cochrane review manager (Revman) version 5.3 software [10].

Results

The combined database and hand searches identified a total of 2848 records. After removing duplicates in the databases (N=1647 articles), the titles and abstract of 1208 articles were screened.From these, 42 articles that might have contained information relevant to the review were retrieved and their full text evaluated. After reading through the texts, 4 articles were further excluded because they examined broadly defined cognitive impairment/disorders and did not provide information about participants with dementia (Figure 1). Of the four excluded articles, one each was from Senegal [11] and Rwanda[12], while the remaining two were from Nigeria[13,14].

Qualitative appraisal of identified studies

Studies included were published between February 1992 and May 2016. Over 60% of identified studies were publications of data from 6 major research programs (Indianapolis Ibadan Dementia Project, Epidemiology of Dementia in Central Africa-EDAC-, Epidemiology of Dementia in Central Africa-EPIDEMCA-, EPIDEMCA Follow-up, Ibadan Study of Ageing, Kilinmajaro cohort from the Hai District of rural Tanzania).

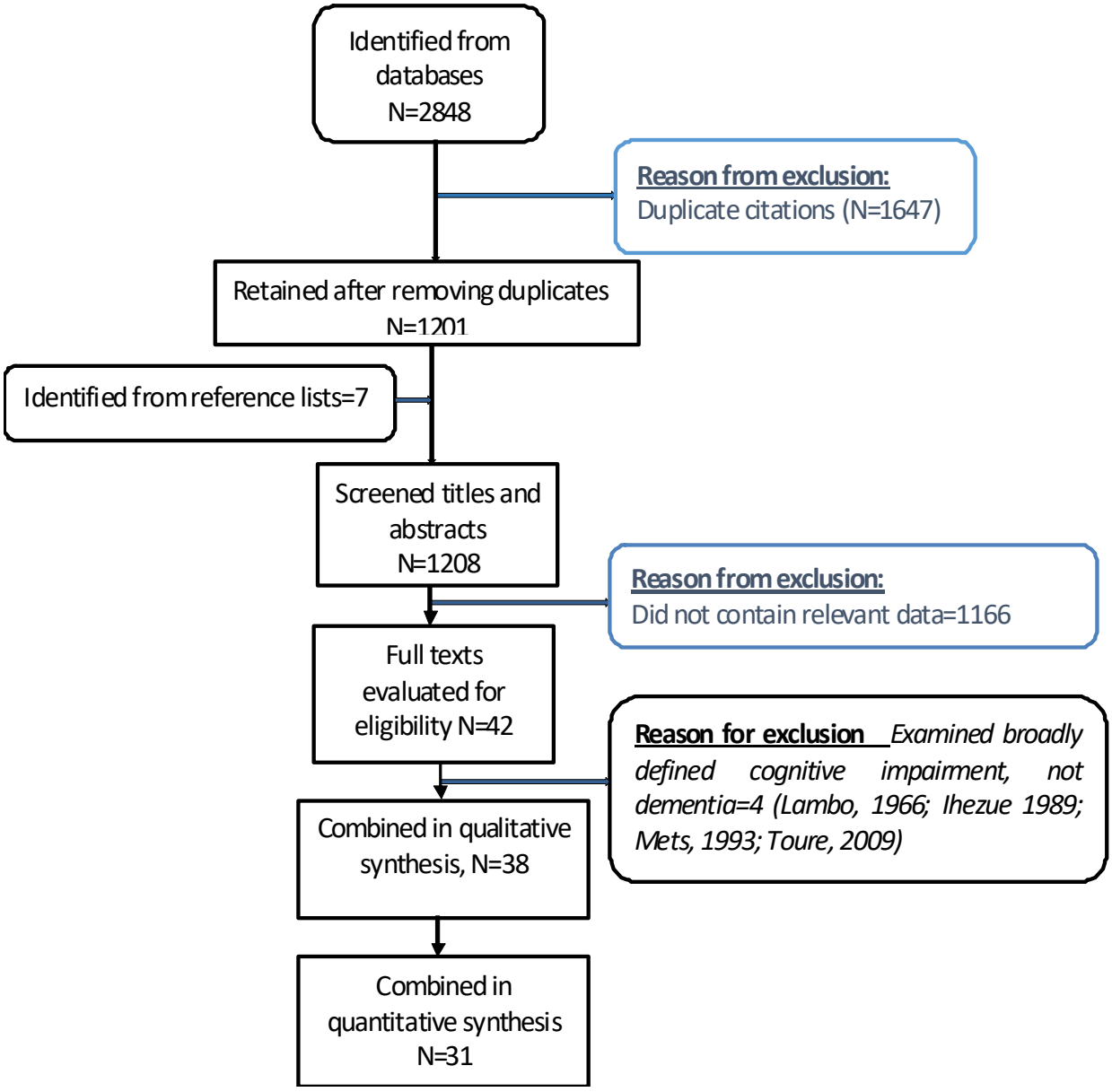
Geographical location of studies

All included studies came from primarily three regions in sub-Saharan Africa: West, East, and Central Africa. However, about 50% of identified studies were from one country, Nigeria.We did not identify any studies from Southern Africa meeting our review criteria.

Types of study design and methods

Six studies [15-20]relied on hospital records (Table 1). One report of cognitive examination conducted on nursing home residents in Lagos, Nigeria [21] is also included in the same table. However, 81.6%of identified studies were community based, including reports of ten prospective longitudinal observations of between two and ten years duration [3,5,22-29].As the objective of the present systematic review was to examine dementia prevalence and associated

Figure 1: Flow chart showing details of included and excluded studies



factors, only the baseline observations of the prospective longitudinal studies are included in qualitative and quantitative syntheses.

Ascertainment of dementia

The majority of included studies used a two staged procedure and made formal clinical diagnoses of dementia according to codified criteria [30,31].Two hospital based studies [17,18] relied on clinicians' best judgement of dementia while three community based cross-sectional surveys used rating scales in ascertaining dementia [32-34] (Table 2).

Quantitative syntheses

Extensive variability in types of setting (i.e., in-patients, outpatients, nursing homes and autopsy), definition of dementia and ascertainment procedures meant that we could not combine the hospital-based studies in a meaningful meta- analysis model.

The community-based studies provided useful data for quantitative syntheses. They included sufficient sample sizes and appropriate analytical techniques in establishing their findings. The combined risk of bias, as assessed using the modified GATE criteria was moderate.

Prevalence of dementia

Apart from a frequency of 12.4% reported in one study of 912 older attendees at a neurology clinic in the Cameroun[19], there was a pattern of mostly low frequency of dementia in hospital-based studies (0.5%-4%). The autopsy study of the brains of 198

Table 1: Hospital or Nursing home studies

Reference	Country	Setting	Definition of dementia	Sample size	Female %	Age (years) Mean (SD)	Frequency %
Ogunniyi et al 1993	Nigeria	General hospital medical In-patients	ICD 9 criteria	37	24.3	67 (9.0)	0.6
Osuntokun et al 1995	Nigeria	Autopsy	Histological hallmarks	198	46.0	40-85	0
Baiyewu et al 1997	Nigeria	Nursing homes	DSM III-R criteria	23	47.8	78.7 (8.6)	48
Napon et al, 2009	Burkina Faso In- and outpatient	General hospital	DSM IV 2396 In-patients	15817	33.3	62.2[a]	0.5
Siddiqi et al, 2010 Out/Inpatient	Zambia	General hospital	Clinician best judgment	811	52.2	39/15-80	2.9/4.0 Out/Inpatient
Ouango, et al 2014	Burkina Faso	General hospital In- and outpatients	Clinician best judgment	7974	40.2	49-90[b]	1.9
Calliste et al, 2015	Cameroun	Neurology Outpatient	ICD 10 criteria	912	50.8	68.8 (7.2)	12.4

Notes: SD=Standard deviation, DSM=Diagnostic and Statistical Manual of Mental disorders, III-R=Text revision of 3rd edition, IV=4th Edition, ICD= International Classification of Diseases

[a]Median

[b]Range

Table 2: Community based cross-sectional surveys

Reference	Country/Location	Definition of dementia	Sample size	Female (%)	Age (Years) Mean (SD)	Prevalence (%)
Clinically diagnosed						
Osuntokun et al, 1992	Nigeria (Idikan)	DSM III-R	930	61.2	40-85	0
IIDP[a]	Nigeria (Idikan)	ICD 10/DSM III-R	2494	71.4	81.0 (9.9)	2.3
Guerchet et al, 2009	Benin (Djidja)	DSM-IV	502	57.0	76.1 (9.4)	2.6
Yusuf et al 2010	Nigeria (Zaria)	ICD 10/DSM IV	322	60.2	75.5 (9.4)	2.8
Ogunniyi et al, 2016	Nigeria (Lalupon)	DSM IV/ Alzheimer's Association	613	69.7	72.9 (8.9)	2.9
EDAC Survey[b]	CAR (Bangui)	DSM IV/Alzheimer's Association	496	55.6	77.4 (7.3)	8.1
EDAC Survey[b]	Congo (Brazzaville)	DSM IV/Alzheimer's Association	520	40.9	74.7 (6.7)	6.7
Kilinmajaro cohort[c]	Tanzania (Hai)	DSM IV	1198	56.2	≥70[e]	6.4
EPIDEMCA[d]	CAR (Nola)	DSM IV	359	91.4	75.6 (7.1)	6.5
EPIDEMCA[d]	Congo (Gamboma)	DSM IV	460	69.7	72.9 (8.9)	3.4
Rating scales defined						
Ochayi et al 2006	Nigeria (Jos)	CSID	280	89.0	77.2 (9.7)	6.4
Gureje et al, 2006	Nigeria (West/Central regions)	10 Words list learning/Delayed recall test	2152	53.8	74.5 (8.4)	10.1
Paraiso et al 2011	Benin	CSID/Five word test	1139	54.1	73.4 (7.2)	3.7

Notes: SD=Standard deviation, DSM=Diagnostic and Statistical Manual of Mental disorders, III-R=Text revision of 3rd edition, IV=4th Edition, IIDP=Indianapolis Ibadan Dementia Project, ICD 10=10TH Revision of the International Classification of Diseases, EDAC= Epidemiology of Dementia in Central Africa, CAR=Central African Republic, EPIDEMCA=Epidemiology of Dementia in Central Africa, CSID=Community Screening Instrument for Dementia.

[a]*Reported in three studies with 21.6% also meeting 10/66 dementia research group criteria,*

[b]*Reported in five studies*

[c]*Reported in three studies*

[d]*Reported in four studies*

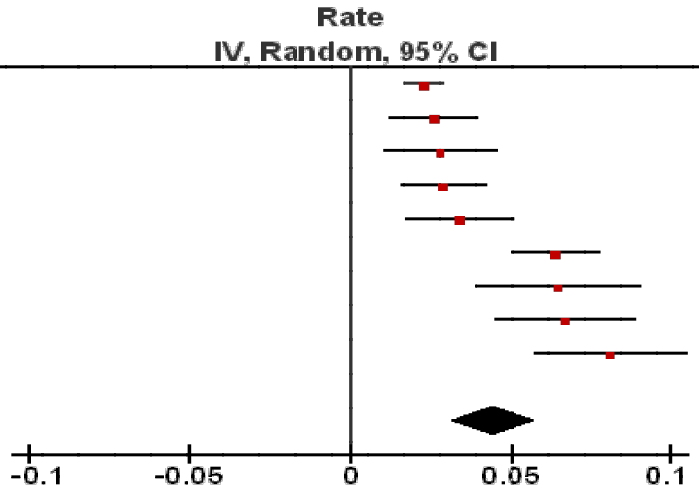
[e]*All participants were 70 years or older.*

Fig. 2: Forest polts showing the prevalence of clinicallly diagnosed and rating scale defined dementis in sub-saharan Africa.

A. Clinically diagnosed dementia

Study or Subgroup	Rate	SE	Total	Total	Weight	Rate IV, Random, 95% CI
IIDP	0.023	0.003	2494	0	13.2%	0.02 [0.02, 0.03]
Guerchet et al 2009	0.026	0.007	502	0	11.9%	0.03 [0.01, 0.04]
Yusuf et al, 2010	0.028	0.009	322	0	11.0%	0.03 [0.01, 0.05]
Ogunniyi et al, 2016	0.029	0.0068	613	0	12.0%	0.03 [0.02, 0.04]
EPIDEMCA-Gamboma	0.034	0.0085	460	0	11.2%	0.03 [0.02, 0.05]
Kilinmajaro cohort	0.064	0.007	1198	0	11.9%	0.06 [0.05, 0.08]
EPIDEMCA-Nola	0.065	0.013	359	0	9.2%	0.07 [0.04, 0.09]
EDAC-Brazaville	0.067	0.011	520	0	10.1%	0.07 [0.05, 0.09]
EDAC-Bangui	0.081	0.012	496	0	9.6%	0.08 [0.06, 0.10]
Total (95% CI)			**6964**	**0**	**100.0%**	**0.04 [0.03, 0.06]**

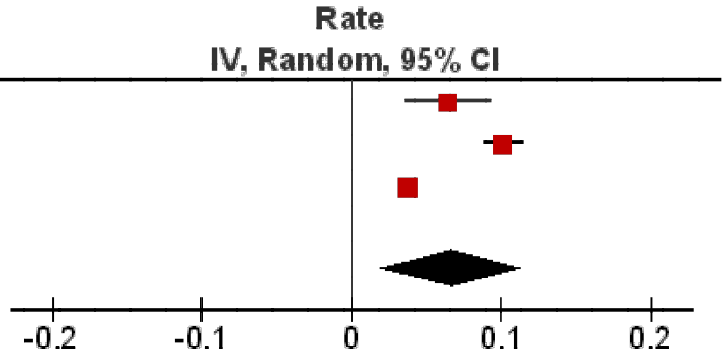
Heterogeneity: Tau² = 0.00; Chi² = 63.99, df = 8 (P < 0.00001); I² = 87%
Test for overall effect: Z = 6.42 (P < 0.00001)



B. Rating scales defined dementia

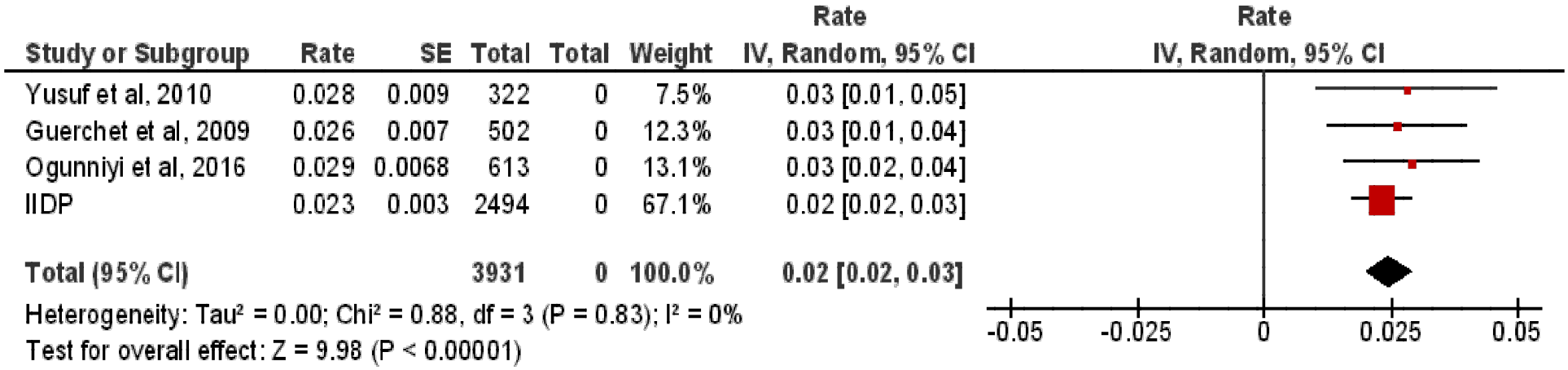
Study or Subgroup	Rate	SE	Total	Total	Weight	Rate IV, Random, 95% CI
Ochayi et al, 2006	0.064	0.0146	280	0	31.1%	0.06 [0.04, 0.09]
Gureje et al, 2006	0.101	0.0065	2152	0	34.1%	0.10 [0.09, 0.11]
Paraiso et al, 2011	0.037	0.0018	1139	0	34.9%	0.04 [0.03, 0.04]
Total (95% CI)			**3571**	**0**	**100.0%**	**0.07 [0.02, 0.12]**

Heterogeneity: Tau² = 0.00; Chi² = 92.37, df = 2 (P < 0.00001); I² = 98%
Test for overall effect: Z = 2.74 (P = 0.006)

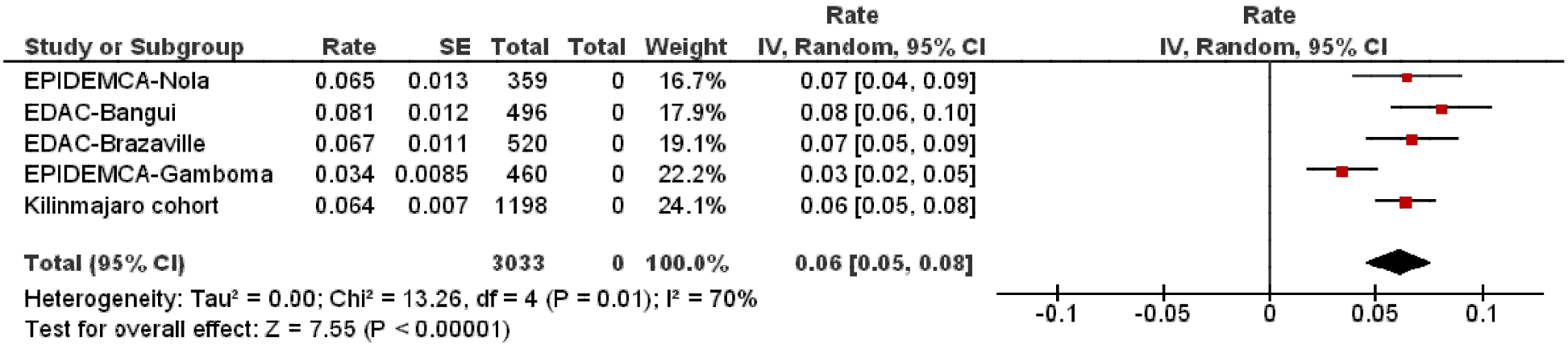


Key: IIDP= Indianapolis Ibadan Dementia Project, EDAC= Epidemiology in Central Africa, EPIDEMCA= Epidemiology of Dementia in Centra Africa

Figure 3: Prevalence of clinically diagnosed dementia by geographical distribution showing distinctly low rates in West Africa and Higher rates in East/ Central Africa.



B. Prevalence of clinically diagnosed dementia (East and Central Africa)



Key: IIDP= Indianapolis Ibadan Dementia Project, EDAC= Epidemiology in Central Africa, EPIDEMCA= Epidemiology of Dementia in Centra Africa

adult Nigerians did not find the histological hallmarks of Alzheimer's disease [16]. However, 48% of nursing home residents in Lagos Nigeria met clinical diagnostic criteria for dementia [21].

Figure 2 presents forest plots showing the prevalence of dementia in community based cross-sectional surveys. A higher pooled prevalence estimate of 7.0% (95% C.I=2.0%-12.0%) was reported among 3571 participants in studies using various rating scales in defining dementia. The pooled prevalence of clinically diagnosed dementia among 6964 participants was 4.0% (95% C.I=3.0%-6.0%). There was an indication of statistical heterogeneity in these estimates (Rating scale: I^2= 98%, p<0.001; Diagnostic assessment: I^2=87.0%, p<0.001). Heterogeneity was investigated and found to be due to rate-ratio outliers in one study of rating-scale-defined dementia [33] and four studies of clinically diagnosed dementia[35-39]. We also observed important geographical variations in the prevalence estimates of clinically diagnosed dementia.

In adjusted analyses to correct for heterogeneity (Figure 3), the pooled prevalence reported in studies from West Africa was 2.0% (95% C.I=2.0%-3.0%), with results indicating absence of heterogeneity (I^2=0.0%, p=0.84). In contrast, the pooled prevalence of dementia in East/Central Africa was 6.0% (5.0%-6.0%). Notably, the estimates determined for the two regions showed distinct non-overlapping confidence intervals.

Systematic associations with prevalent dementia

Older age was the most cited associated factor with prevalent dementia [32-35,39-43]. Older age also had the most precise systematic association (by weight) with prevalent dementia (Table 3). Three studies [32,40,42] from West Africa provided 99.8% of the weight of association of age with prevalent dementia.

All other identified factors contributed less than 1.0% to the total variance of all associations with prevalent dementia. Female gender [32-34,40,43] and undernutrition[32,44,45] were the other frequently cited associated factors.

Discussion

In the present systematic review and meta-analyses we found that the pooled prevalence of clinically diagnosed dementia in SSA is 4.0%. We observed a pattern of distinctly low prevalence estimatesin West Africa and higher proportions in East and Central Africa. Older age was the dominant factor associated with prevalent dementia in SSA. Other commonly cited factors in individual studies contributed less than 1.0% to the total variance of associations with prevalent dementia.

Table 3: Independently associated factors with prevalent dementia in Sub-Saharan Africa (ranked by the inverse of variance method**)**

Associated factors	S.E	Weight (%)
Older age[a]	0.02	99.3
Systemic hypertension[b]	0.49	0.1
Loss of a parent before age 16 years[b]	0.49	0.1
Recent change in residence[b]	0.51	0.1
Female gender[c]	0.64	0.1
No formal education[b]	0.66	0.1
Undernutrition[d]	0.74	0.1
Peripheral artery disease[b]	0.74	0.1
Diet low in olegenous acid[b]	1.71	<0.1
Dependent personality disorder[b]	2.42	<0.1
Depression[e]	3.33	<0.1
Change in financial status[b]	5.28	<0.1

NOTE: S.E is the estimated Standard error of the association as reported by the original study or determined by meta-analysis (if reported in more than one study)

[a]Nine studies,

[b]One study

[c]Five studies

[d]Three studies

[e]Two studies

Our results overlap within 95% C.I of age adjusted prevalence (3.9%-6.5%) of dementia in persons who are 65 years or older living in developing countries[4].Also, the finding in the present study suggesting varying estimates of dementia within SSA is similar to reports from other developing regions of the world [4,46-48]. This variation in pooled prevalence estimates has been observed to reflect the use of different dementia-ascertainment procedures [49,50], genetic predispositions to the disease, lifestyle factors [51], urban versus rural distribution of study participants [52], literacy levels [48], and age structure of the studied population [53]. In the present systematic review, we have combined data comprising similar diagnostic procedures in the same meta-analysis model in order to reduce the effect of methodological differences in identified studies on our results.

Clinical and epidemiological implications of the key findings

We found in the present study that older age was the pre-eminent factor associated with prevalent dementia in SSA, with most of the weight of association of age and prevalent dementia provided by studies conducted in West Africa (the region with a distinctly low estimated prevalence of the disease). This pattern of stronger association of older age with dementia in regions with the lowest reported prevalence would suggest the operation of a possible 'natural selection phenomenon' within samples of older persons from those regions. Given the prevailing low life expectancy at birth in most of SSA [54], individuals surviving to old age in locations with lower life expectancy may includea comparatively healthier section of the population who may have a lower latent risk of dementia, while those with higher cumulative morbidity may be more likely to die at a younger age [55]. In a country like Nigeria, as an example,it is projected that despite an average life expectancy at birth of about 52 years [56], the population surviving to the age of 65 years may have the prospect of an additional 15 years of life [57,58]. It is important to note that Nigeria also provided about 50% of the studies included in the present review.

Low and varying estimates of dementia in SSA may also be the result of differences in sociocultural practices and knowledge about the disease. For example, multigenerational living is common in most of SSA. In this scenario, older people are more likely to be supported by family members in the performance of activities of daily life. As such, milder functional deficits (which may nonetheless reach the threshold for the diagnosis of dementia) may become unobservable. In many cases of apparent functional deficits, family members simply take over social-functional roles of the affected individual. The above observation is reflected in the results of the present systematic review suggesting a higher prevalence of dementia in studies [32-34] relying on ascertainment procedures that precluded physical functioning assessments.

Beyond SSA, variations in socio-cultural practices within the same country or region have also been shown to result in disparitiesof reported estimates of dementia in other developing contexts [51].The low frequency of dementia found in hospital-based studies included in the present systematic review may reflect a possible low healthcare utilization which may also result from prevailingsociocultural practices and pathways to care [59]. These and other factors such as stigma and cost [60] may in turn lead toa higher risk of mortality from dementia in developing countries compared with more developed parts of the World. Pooled estimates of differential mortality from dementia and its effect on reported prevalence of the disease is yet to be determined in developing countries, and could be the basis of a future meta-analytic study.

Strength and limitations

The search strategies were designed to be meaningfully sensitive. In this regard, the searches were focused on some of the largest repositories of biomedical literature. We included additional search strategies to cover references of fully appraised articles. Nevertheless, our results might not be completely representative of all regions in SSA since we did not find studies from southern Africa meeting our review criteria.

Conclusion

The pooled prevalence of clinically diagnosed dementia in SSA is 4.0%. It varies between 2.0% in West Africa and 6.0% in East and Central Africa. Older age is the dominant associated factor. While there are subsisting evidence gaps precluding robust estimation of age-adjusted prevalence across studies, the findings in the present systematic review provides useful information about the possible mechanisms driving variations in the prevalence of dementia in SSA and other developing contexts.

Implication for future research

It is feasible that there is a higher risk of mortality from dementia in developing countries compared with more developed parts of the World. This difference may be hypothesized as another important

mechanism (apart from natural selection) underlying the observed low prevalence of dementia in SSA. Future systematic reviews of observational studies from SSA should quantify the substantive effect of differential mortality from dementia in sustaining the prevailing low rates of the disease in the region.

Acknowledgements

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Experience with bendopnoea: a novel heart failure symptom in an African cohort

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Abstract

Background: Dyspnoea, a major symptom of Congestive Heart Failure (CHF) recently had a sub-class added. This sub-class bendopnoea reflects a worse clinical state; and in its presence, quality of life (QOL) is impaired. It could be used as a surrogate for severity where investigative hardware are lacking. Given our perennial resource constraints we sought to see how much of it occurs in our CHF population, its impact and effect on outcome

Methods: In the course of our study on Dysnatraemia in CHF, we took the opportunity to request patients to bend forward as if putting on socks for 30 seconds during physical examination. Dyspnoea that developed during that time frame defined bendopnoea. Presence or absence of bendopnoea was correlated with echocardiographic, electrocardiographic, radiological and biochemical indices determined in standard fashion.

Results: Seventy patients (39M, 31F) had complete data and are reported. Twenty four (34%) had bendopnoea. Patients with bendopnoea tended to be older, had significantly higher blood glucose and were more represented in the group with chronic kidney disease. They were also more dysnatraemic (p=0.03), spent more time on admission and posted worse clinical outcomes. Chest X Ray, Electrocardiographic and Echocardiographic indices did not significantly discriminate between the groups with and without bendopnoea.

Conclusion: Bendopnoea, a simply elicitable symptom can be used to determine CHF patients in worse clinical state who would spend more time on admission, and post worse clinical outcomes. Its presence despite result of other modern investigations should draw the attention of clinicians to a more severe disease requiring team response for palliative care.

Keywords: *Bendopnoea, Novel Symptom, Heart Failure, Nigeria*

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Résumé

Contexte : Dyspnée, un symptôme majeur de l'insuffisance cardiaque congestive (CHF) a récemment eu une sous-classeajoutée. Cette sous-classe ben-dyspnée reflète un état clinique pire; et saprésencede qualité de vie(QOL) est altérée. Il pourrait être utilisé comme substitut de la gravité lorsque le matériel d'enquête fait défaut. Compte tenu de nos contraintes de ressources pérennes, nous avons cherché à voir dans quelle mesure cela se produit dans notre population CHF, son impact et son effet sur les résultats.

Méthodes: Au cours de notre étude sur la dysnatrémie en CHF, nous en avons profité pour demander aux patients de se pencher en avant comme s'ils mettaient des chaussettes pendant 30 secondes lors de l'examen physique. La dyspnée qui s'est développée au cours de cette période a défini la ben-dyspnée. La présence ou l'absence de la ben-dyspnée était corrélée aux indices écho-cardiographiques, électro cardio graphiques, radiologiques et biochimiques déterminés de façon standard.

Résultats : Soixante-dix patients (39M, 31F) avaient des données complètes et sont rapportés. Vingt-quatre (34%) avaient la ben-dyspnée. Les patients atteints de la ben-dyspnée avaient tendance à être plus âgés, avaient une glycémie significativement plus élevée et étaient plus représentés dans le groupe souffrant d'insuffisance rénale chronique. Ils étaient également plus dysnatrémiques (p = 0,03), ont passé plus de temps à l'admission et ont affiché de moins bons résultats cliniques. Les indices radiographiques thoraciques, électrocardiographiques et écho-cardiographiques n'ont pas fait de distinction significative entre les groupes avec et sans la ben-dyspnée.

Conclusion : La ben-dyspnée, un symptôme tout simplement éligible, peut être utilisée pour déterminer les patients atteints de CHF dans un état clinique pire qui passeraient plus de temps à l'admission et afficheraient de moins bons résultats cliniques. Sa présence malgré le résultat d'autres investigations modernes devrait attirer l'attention des cliniciens sur une maladie plus sévère nécessitant une réponse d'équipe pour les soins palliatifs.

Mots - clés : ben-dyspnée *, nouveau symptôme, insuffisance cardiaque, Nigéria*

Introduction

Dyspnoea is one of the cardinal symptoms of heart failure (HF), which can be sub-classified based on activity or position provoking it. These sub-classes usually give an idea of the type and severity of HF. Recently a new sub-class called bendopnoea was characterized by Thibedeau*et al* [1]. This followed their observation that many HF patients described shortness of breath within 30 seconds of bending forward. The prevalence of bendopnoea in their cohort was 28% in the said publication [1]. This symptom which Brandon and Mehra [2] preferred to call flexopnoea while Falk [3] suggested kamptopnoea has however not been characterized in Nigerian HF patients or indeed in any sub-Saharan African group to the best of our knowledge.

Most activities of daily living require bending forwards such as putting on socks, lacing the shoes, buckling the sandals, ablution, as well as searching for and picking up items. Dyspnoea arising from or worsening in this position would impair quality of life(QOL), induce a sense of dependence, resulting in frustration and depression. Anxio-depression has been shown to be linked with respiratory symptoms [4]. Given the established relationship of bendopnoea to advanced HF, and short-term mortality [5] it would be a useful symptom to trigger initiation of multi-disciplinary and palliative care in resource constrained settings; where modern cardiac investigations may not be readily available. Having not been previously described among our HF patients, we sought to determine its prevalence, clinical characteristics and impact as well as outcome in a Nigerian HF cohort.

Methodology

As part of a study in our unit involving HF patients which was approved by the Research Ethics Committee of Jos University Teaching Hospital, we asked patients during physical examination to bend forward as if putting on socks for 30 seconds. Dyspnoea developing within this period was recorded as bendopnoea. Study patients were 18 years and above who presented with HF irrespective of cause and on admission on the medical service of Jos University Teaching Hospital, Jos Nigeria. Each patient was interviewed and then fully evaluated for documentation by SUU. Body Mass Index (BMI) was derived from height and weight measurements as the quotient of weight in kilogrammes and square of height in metres. The height was measured in metres using a stadiometer with patients standing bare footed, without shoes or head gear. Weight was measured in kilogrammes on a weighing scale with patients in light clothing only. Blood pressure was measured by standard sphygmomanometry using Accosson mercury sphygmomanometer and appropriately sized cuff after a 5 minutes rest in both upper limbs. Two additional readings were taken in the limb with the higher reading and averaged. Korotkoff phase I and V sounds defined systolic and diastolic blood pressures respectively.

All patients had venepuncture and blood was taken after at least 8 hours of fasting and sent to the Chemical Pathology laboratory for analysis of electrolytes, urea, creatinine, uric acid, fasting blood glucose and full lipid profile. The estimated glomerular filtration rate was calculated using the Cockcroft-Gault formula. Twelve lead resting electrocardiogram (ECG) was done using GE Medical Systems Information Technology MAC 1200 ST v 1.2 machine in standard fashion. Evidence of hypertrophy and arrhythmia were noted

Chest X ray was done in the hospital X-Ray Department and Cardio-thoracic ratio determined in the standard fashion; and any evidence of pleural effusion noted. Finally, they all underwent echocardiography using ALOKA SD 3500 machine with a 2.5 mHz transducer in standard fashion. Two- dimensional, M mode and Doppler measurements were taken following the American Society of Echocardiography guidelines [6]. Systolic function was measured by ejection fraction (EF) and shortening fraction (SF). Mitral inflow velocities were measured in the apical 4 chamber view with pulse wave Doppler with sample volume at the tip of the mitral valve leaflets. The inflow characteristics were used to measure diastolic function; namely E/A ratio and deceleration time (DT). Other parameters measured were end-diastolic diameter (EDD) and end diastolic volume (EDV). Systolic dysfunction was defined by EF < 50% and or SF < 25%; while diastolic dysfunction was defined by E/A < 0.9 and DT > 240 ms (Stage 1), E/A 0.9 – 1.5 and DT 140 – 200 ms (Stage 2), E/A > 1.8 and DT < 140 ms (Stage 3) and E/A > 2 and DT < 130 MS (Stage 4).[7]

STATISTICS: Epi Info version 7.1.4.0. Software (CDC Atlanta Georgia USA) was used for analysis. Quantitative variables were summarized as median (25^{th}, 75^{th}) percentiles. Categorical variables were expressed as frequencies or percentages. Chi square was used to test for significance between categorical

variables while student t – test was used to compare two groups of quantitative data. In all cases, $p< 0.05$ determined statistical significance.

Results

There were 70 patients made up of 39 males and 31 females with median ages of 59(44, 63) years and 56 (34, 65) years respectively.Patients with bendopnoea were slightly older 59(41,63) compared to those without 54(38,63). The difference was however not statistically significant. Overall, the median age was 57(40, 64) years. Twenty four out of 70 had bendopnoea, a prevalence of 34%. There was about an equal representation of males and females with bendopnoea; as well as history of hypertension. However, history of diabetes mellitus (DM) and chronic kidney disease (CKD) was got more among those with bendopnoea with p value narrowly missing statistical significance for DM (See Table 1). Using fasting plasma glucose (FPG) as a discriminator, it turned out that the level for those with bendopnoea was significantly higher than for patients without bendopnoea.

Using sodium values < 135 mmol/L to define hyponatraemia, patients with hyponatraemia were more represented in the bendopnoea group to a statistically significant extent, $p = 0.03$. This is despite the median values of sodium being within the same range in both groups. The dysnatraemia group (hypo and hypernatraemia) spent more time on admission (13.0 ± 7.5 days versus 7.8 ± 4.8 days; $p < 0.001$) and posted worse outcome; mortality of 21.2% versus 7.4% with a p value of 0.03.

For CXR, ECG and echocardiographic indices, there was nothing that significantly differentiated both groups (Table 2).

Discussion

This is to the best of our knowledge the first report of bendopnoea in a sub-Sahara African HF cohort. Thirty four percent of this population satisfied the definition of bendopnoea. Some controversy has trailed bendopnoea being considered a sub-class of dyspnea; as the phenomenon can be seen in subjects without dyspnoea[3]. The elderly and those with obesity are known to manifest bendopnoea even

Table 1: Clinical characteristics of patients with and without dyspnoea

Characteristic	Patients with Bendopnoea (n = 24)	Patients without Bendopnoea (n = 46)	P
Age (y)	59(41,63)	54(38,63)	0.80
Male	14(36%)	25(64%)	0.96
Female	10(32%)	21(68%)	0.95
History of HBP	18(75%)	34(74%)	0.85
History of DM	7(29%)	4(9%)	0.06
History of CKD	5(21%)	3(7%)	0.16
Weight (kg)	69(63,78)	65(56,72)	0.04
BMI (Kg/m2)	26(22,29)	23(21,25)	0.06
SBP (mmHg)	110(100,145)	110(97,140)	0.79
DBP (mmHg)	85(70,90)	70(65,90)	0.20
Na (mmol/L)	136(129,145)	139(137,143)	0.12
K (mmol/L)	4.6(4.1,5.2)	4.3(3.8,5.0)	0.19
Cr(micromole/L)	120(81,158)	100(84,124)	0.11
UA(micromole/L)	404(360,443)	406(360,428)	0.87
eGFR(ml/min/1.73m2)	57(42,92)	58(47,76)	0.93
FPG(mmol/L)	5.1(4.7,5.9)	4.9(4.2,5.3)	0.01
TC(mmol/L)	4.2(3.4,4.9)	4.2(3.8,5.3)	0.23
TG(mmol/L)	1.1(0.9,1.4)	0.9(0.7,1.2)	0.99
Hyponatraemia	9(38%)	6(13%)	0.03
Normonatraemia	10(42%)	34(74%)	
Hypernatraemia	5(21%)	6(13%)	

Values are median(25^{th},75% percentiles) and number (%)

KEY: BMI – Body Mass Index, HBP – High Blood Pressure, SBP – Systolic Blood Pressure, DBP – Diastolic Blood Pressure, Na – Sodium, K – Potassium, Cr – Creatinine, UA – Uric Acid, eGFR – Estimated Glomerular Filtration Rate, FPG – Fasting Plasma Glucose, TC – Total Cholesterol, TG – Triglycerides

Table 2: Cxr, EcgAnd Echocardiographic Data Of Patients

Characteristic	Patients with Bendopnoea (n=24)	Patients without Bendopnoea (n=46)	P
CXR			
Pleural Effusion	6(25%)	9(20%)	0.60
CT Ratio	0.75(0.65,0.75)	0.65(0.65,0.70)	0.54
ECG			
AF	6(25%)	9(20%)	0.50
Other Arrhythmias	6(25%)	15(33%)	0.51
ECHO			
EF (%)	35(27,52)	39(30,55)	0.62
FS (%)	17(12,27)	20(14,28)	0.64
E/A Ratio	1.6(0.8,2.3)	1.5(0.7,2.4)	0.78
DT (msec)	156(148,214)	149(117,198)	0.78
EDD(mm)	61(53,65)	59(53,65)	0.82
EDV(ml)	184(148,214)	170(138,221)	0.99
LVSD	16(67%)	30(65%)	0.89
LVDD	18(75%)	36(78%)	0.99

Values are median(25^{th},75^{th} percentile) and number(%)

KEY: CXR – Chest X Ray, CT Ratio – CardioThoracic Ratio, ECG – Electrocardiogram, AF – Atrial Fibrillation, EF – Ejection Fraction, SF – Shortening Fraction, DT – Deceleration Time, EDD – End Diastolic Diameter, EDV – End Diastolic Volume, LVSD – Left Ventricular Systolic Dysfunction, LVDD – Left Diastolic Dysfunction

without HF [5]. Expectedly, the proportion of the aged and obese in any HF cohort would impact on prevalence of bendopnoea. Consequently, our 34% is less than the 48.8% of Baeza-Trinidad *et al* [5] but higher than the 28% of Thibodeau*et al* [1] and 18% of Thibodeau*et al* in another publication [8].

In our cohort, there was no gender predeliction neither was age a significant associated factor. This seems to be the trend as it is similar to the experience of other workers [1,2]. Bendopnoea was associated with history of DM but not to a statistically significant extent in our cohort. In the only series encountered that considered history of DM [1], there was no difference. In support of this tendency in our cohort, the mean FBG was significantly higher in the group with bendopnoea compared to those without. DM may partly point to severity of HF. As posited by Demant*et al* [9], the low cardiac output in HF implies low oxygen and glucose and insulin to the peripheral muscles. This biochemical milieu together with increase in catecholamines increase insulin resistance and reduced insulin sensitivity.

Though median values of sodium were similar in those with and without bendopnoea, dysnatraemia (hyponatraemia more than hypernatraemia) was more in the bendopnoea group ($p = 0.03$). This is no surprise. Hyponatraemia is a major marker of severe disease and not necessarily a treatment target. As posited by Lu *et al* [10], hyponatraemia seen in severe HF is not due to depletion of the cation but impaired water excretion due to cardio-renal insufficiency. Though not attaining statistical significance, the fact that CKD was more in those with bendopnoea is supportive. All said, dysnatraemia has been shown to indicate a markedly compromised prognosis of HF regardless of ejection fraction [11]. In this cohort (data not shown), patients with dysnatraemia spent more time on admission and posted worse outcomes.

CXR, ECG and echocardiographic indices did not statistically differ between both groups. This sounds surprising given the higher risk of HF severity and propensity for adverse outcomes when there are CXR, ECG and echocardiographic abnormalities. The explanation may be in bendopnoea as a degree of limitation being subjective; as well as in the fact that it could occur in clinical conditions devoid of HF. The contribution of posture change to bronchial vasculature and airway changes have not been considered [12].

Though most studies did not reveal BMI as a factor associated with bendopnoea in HF, our study pointed to BMI being a possible index to consider; as there was an obvious tendency that narrowly missed statistical significance. When there is overweight/obesity especially in the mid-section, bending down will get the abdominal fat and contents

splinting the diaphragm. The patients are also likely to manifest dyspnea even if not in HF because of Pickwickian syndrome. Even if EF is preserved, obese HF patients are likely to be more symptomatic. This is because obesity raises left ventricular filling pressures even before patient has cause to bend down [4].

In conclusion, where advanced cardiac diagnostic and treatment facilities are lacking or inadequate, eliciting the symptomatology of bendopnoea should help identify patients in advanced HF and at short term mortality risk. Such patients would then be availed of multi-disciplinary and palliative care to optimize outcome.This study is however limited by the relatively small number and the fact of being from one centre. That creates the problem of external validity. Controlling for age and Body Mass Index would also have improved sensitivity as both factors can cause bendopnoea without heart failure. Notwithstanding, we have shown that this new symptom also occurs in heart failure patients in sub-Saharan Africa and could pick out without elegant gadgets those patients with advanced heart failure and in need of multi-disciplinary care

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Impact of maxillofacial injury on the severity of head injury

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Abstract

*Background***:** The maxillofacial region is in close proximity with the cranium and its contents. Studies exploring the relationship between injuries in the cranial versus facial regions are sparse but they appear to come to conflicting conclusions regarding what that relationship really is. Some studies suggest that the maxillofacial region may act as a protective shock-absorbing region against traumatic impacts to the cranium while some other studies have documented that the occurrence of facial fractures does not necessarily prevent head injury and might actually be an indicator of an increased likelihood of the presence of head injury. This study aims to investigate the possible impacts of the presence of maxillofacial injuries (MFI) in a population of head injured (HI) patients.

Methods: The study was a cross-sectional analysis of a prospective cohort of patients with craniofacial trauma. It compared the severity of HI, which was assessed clinically using the Glasgow Coma Scale (GCS); presence and duration of loss of consciousness (LOC), and findings on the brain computed tomography (CT) scan of the head injured among patients with HI alone (Group I) and those with HI and associated osseous MFI (Group II).

Results: Ninety-nine patients with HI were included. Mean age was 30.2 years. Motorbike crashes, (44.4%), was the most common mechanism of injury. The frequency of severe HI, LOC and intracranial injuries were higher in those with isolated head injury than those with associated MFI. However, these findings were not statistically significant.

Conclusion: The findings of this study did not support a cushioning effect of maxillofacial injury on severity of head injury.

Keywords: *Head injury, maxillofacial trauma, severity.*

Résumé

Contexte: La région maxillo-faciale est à procheproximitédu crâne et de son contenu. Les études explorant la relation entre les blessures dans les régions crâniennes et faciales sont rares, mais elles semblent arriver à des conclusions contradictoires sur ce qu'est réellement cette relation. Certaines études suggèrent que la région maxillo-faciale peut agir comme une région protectrice absorbant les chocs contre les impacts traumatiques sur le crâne tandis que d'autres études ont documenté que la survenue de fractures faciales n'empêche pas nécessairement les traumatismes crâniens et pourrait en fait être un indicateur d'une probabilité accrue de la présence d'un traumatisme crânien. Cette étude vise à étudier les impacts possibles de la présence de lésions maxillo-faciales (LMF) dans une population de patients souffrant de traumatismes crâniens (TC).

Méthodes: L'étude était une analyse transversale d'une cohorte prospective de patients souffrant d'un traumatisme crâniofacial. Celle-ci a comparé la gravité de TC, ce qui a été évaluée cliniquement à l'aide de l'Echelle Coma de Glasgow (ECG); présence et durée de la perte de conscience (PDC) et les résultats de la tomodensitométrie(TDM) cérébrale de la tête blessée chez les patients atteints d'TC seule (groupe I) et ceux atteints deTCet de LMF osseuse associée (groupe II).

Résultats **:** Quatre-vingt-dix-neuf patients atteints de TC ont été inclus. L'âge moyen était de 30,2 ans. Les accidents de moto (44,4%) étaient le mécanisme de blessure le plus courant. La fréquence des lésions TC, DPC et intracrâniennes sévères était plus élevée chez les personnes souffrant d'un traumatisme crânien isolé que chez celles ayant une LMF associée. Cependant, ces résultats n'étaient pas statistiquement significatifs.

Conclusion: Les résultats de cette étude ne soutiennent pas un effet d'amortissement des lésions maxillo-faciales sur la gravité des traumatismes crâniens.

Mots-clés: *traumatisme crânien, traumatisme maxillo-facial, gravité .*

Introduction

The maxillofacial region is in close proximity with the cranium and its contents. The midface includes left and right paired, mirror-image bones that makeup the orbits, nasal structure, cheekbones, maxillae, and palate. The bones of the mid-face fracture easily

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during trauma because they are composed of a network of fragile bones only held together across sutures, a relationship which is potentially easily disrupted even with minimal trauma to the head and neck region [1].

Studies exploring the relationship between injuries in the cranial versus facial regions are sparse [2] but they appear to come to conflicting conclusions regarding what that relationship really is. On the one hand, some of the studies suggest that the maxillofacial region may act as a protective shock-absorbing region against impacts to the cranium during trauma, thereby reducing the severity of associated head injury [3,4] Some other studies, on the other hand, have documented that the occurrence of facial fractures does not necessarily prevent head injury and might actually be an indicator of increased likelihood of the presence of head injury [5] This study aims to investigate the possible impacts of the presence of maxillofacial injuries (MFI) in a population of head injured (HI) patients.

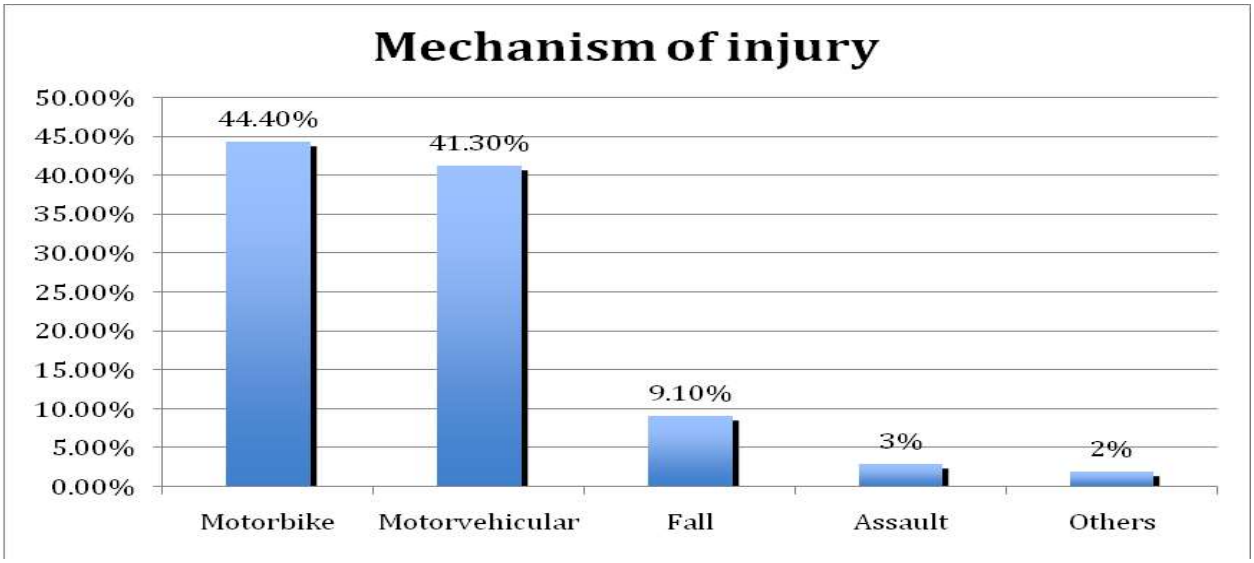

Fig. 1: Mechanism of injury

Materials and methods

The study was a cross-sectional analysis of a prospective cohort of patients with possible craniofacial trauma. It spanned the period from January to December 2014. Clinical records of consecutive patients who sustained head injuries were entered into pre-designed forms. Information obtained included patients' biodata and time of presentation after the traumatic event; location of the traumatic event causing the craniofacial injuries; mechanism of injury; use of personal protective devices in cases of road traffic crashes (RTC); severity of HI which was assessed clinically using the Glasgow Coma Scale (GCS); presence and duration of loss of consciousness (LOC) and findings on the brain computed tomography (CT) scan of the head injured, including the occurrence of intracranial injury such as extra/subdural and intracerebral haemorrhages, brain contusions, and diffuse axonal injury. The types of maxillofacial injuries (MFI) were also recorded. The HI was categorized as mild (GCS 13/15 to 15/15), moderate (GCS 9/15 to 12/15) and severe (GCS 3/15 to 8/15). The study population was categorized into those with HI alone (Group I) and those with HI and associated osseous MFI (Group II). The osseous MFI was further categorized into midfacial with or without upper facial fractures (Group IIa) and lower facial fractures (Group IIb). These categories of MFI were cross-tabulated against the different classes of the HI severity to explore for associations between the two groups.

Statistical analysis

The SPSS version 20 (SPSS Inc, IL) was used for data analysis. Descriptive data of categorical variables were presented in sizes and proportions. The ÷-squared test was used to explore for associations between categorical variables and the p-value <0.05 was set as level of statistical significance.

Results

Ninety-nine patients, 71 males and 28 females (M:F 2.5:1), with HI were included. Mean age was 30.2 years (SD ±17.34). Motorbike crashes, occurring in 44.4%, was the most common mechanism of injury (Fig.1). Majority (75.6%) of the accidents occurred in the intra-city locations between 6 pm and 12 midnight (45.8%), Fig. 2. The commonest time lapse

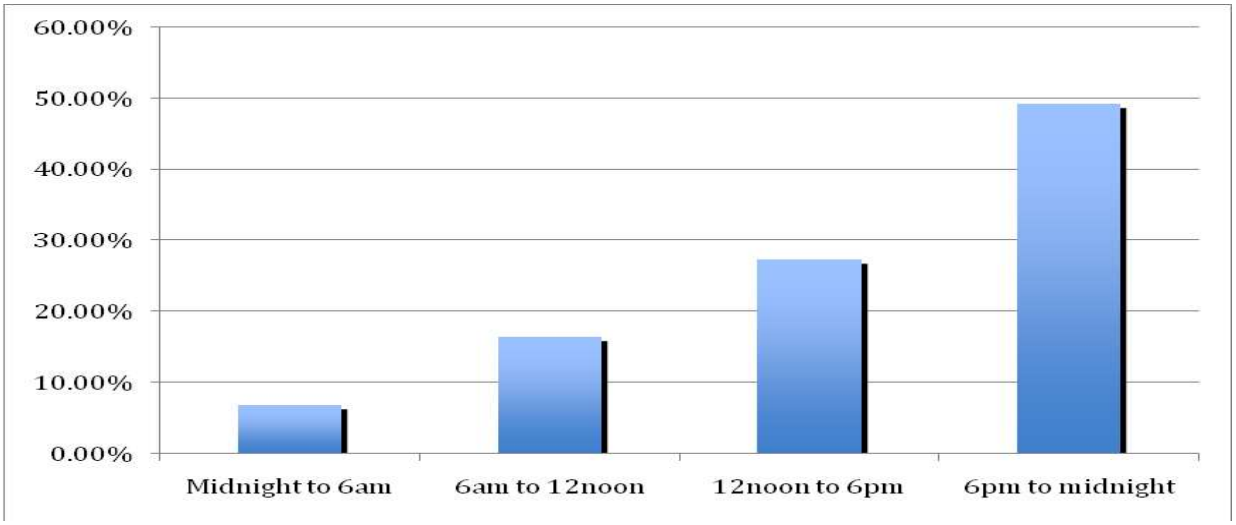

Fig. 2: Time of event occurrence

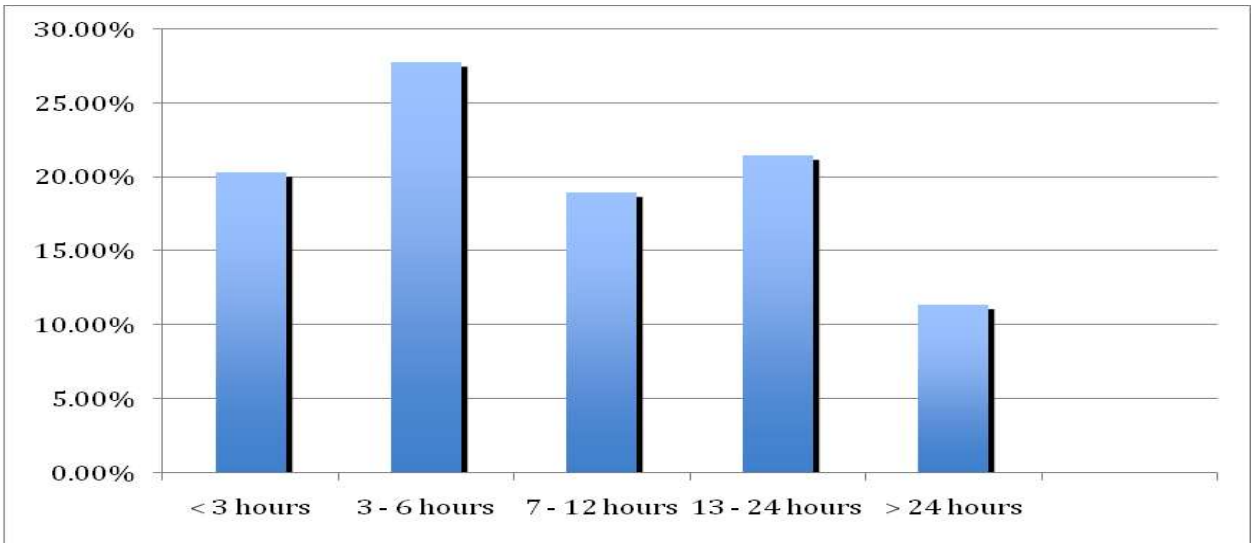

Fig. 3: Time interval before presentation at definitive treatment facility

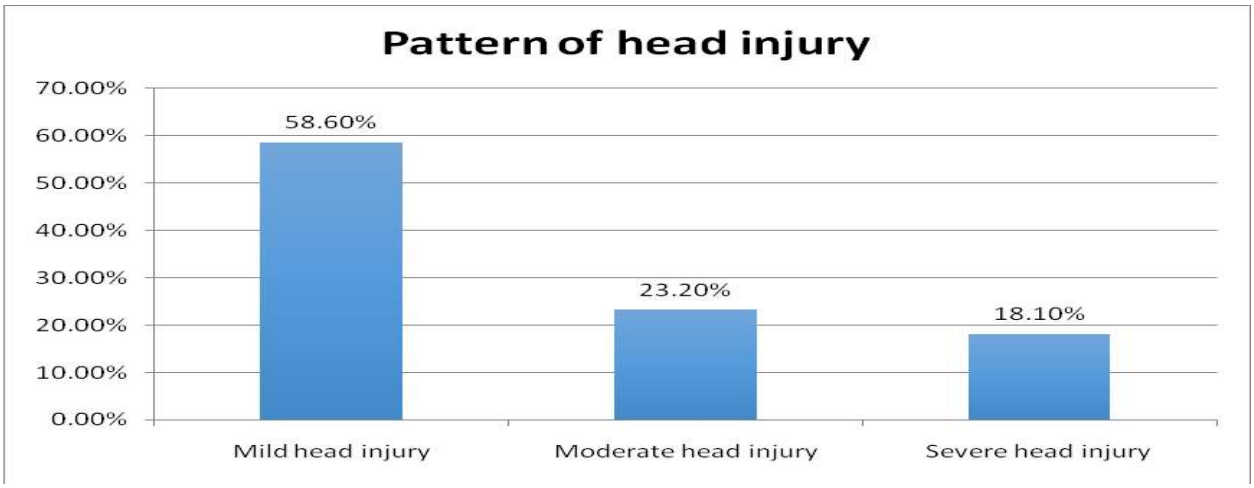

Fig. 4: Pattern of head injury

before presentation at the definitive treatment facility was 3 to 6 hours after the trauma (Figure 3). The use of seat belt for motor-vehicle-passenger trauma victims was 2.2% and alcohol intoxication was noted in 2.3%. None of the 34 victims of mounted motorbike crashes (23 riders and 11 passengers) reported the use of helmets.

The HI was from blunt trauma in 96.9% and 58.6% sustained mild HI according to the Glasgow coma scale (Figure 4). Majority (65.7%) had associated MFI, half (50.8%) of which were soft tissue injuries (STI) alone. About a third had osseous MFI (32.3%). Mid-facial fractures with or without upper facial fractures (Group IIa) constituted the majority, 78.1%, of the osseous MFI.

with isolated HI than those with associated MFI, however, a majority of Group IIa (HI with associated midfacial plus/minus upper facial MFI) experienced LOC (Table 2). The occurrence of intracranial injuries was observed in 47 (47.5%) cases that had CT scan available. These include 76.6% (23/30) of Group I patients (isolated HI) and 64.7% (11/17) of Group II patients (HI with associated MFI) (Table 3). However, the difference between groups was not statistically significant, p> 0.05.

Discussions

The main aim of this study was to evaluate the relationship between the presence of facial injury and severity of head injury in patients with this kind

Table 1: Distribution of the type of Glasgow Coma Scale (GCS)

		Mild	Moderate	Severe	Total
Group I		38 (56.7%)	16 (23.9%)	13 (19.4%)	67 (100.0%)
Group II		20 (62.5%)	7 (21.9%)	5 (15.6%)	32 (100.0%)
	Group IIa	17 (68.8%)	3 (12.0%)	5 (20.0%)	25 (100.0%)
	Group IIb	3 (42.9%)	4 (57.1%)	0 (0.0%)	7 (100.0%)

P=0.201

Table 2: The frequency of Loss of Consciousness

		YES	NO	Total
Group I		53 (79.1%)	14 (20.9%)	67 (100.0%)
Group II		25 (78.1%)	7 (21.9%)	32 (100.0%)
	Group IIa	20 (80.0%)	5 (20.0%)	25 (100.0%)
	Group IIb	5 (71.4%)	2 (28.6%2)	7 (100.0%7)

P=0.180

Table 3: The occurrence of intracranial injury (ICI)

		YES	NO	Total
Group I		23 (76.6%)	7 (23.3%)	30 (100.0%)
Group II		11 (64.7%)	6 (35.3%6)	17 (100.0%)
	Group IIa	9 (64.3%)	5 (35.7%)	14 (100.0%)
	Group IIb	2 (66.7%)	1 (33.3%)	3 (100.0%)

P=0.145

The frequency of severe HI was higher in those with isolated head injury than those with associated MFI, while none in Group IIb (lower facial osseous MFI) was severely head injured (Table 1). The frequency of LOC was also higher in those

of concomitant trauma. We found out that patients with isolated HI had more severe neurological injury than those with associated facial injuries. This may suggest that the presence of facial injury attenuates

the impact of the injuring force on the cranium. This is contrary to the findings of Haug *et al* [6] who stated that despite no significant difference in severity of HI based on mechanism of injury or presence of mandibular fracture, patients presenting with middle third facial fractures had more than twice the chance of sustaining cranial fractures than patients with mandible fractures. They therefore concluded that the facial skeleton actually transmits forces of impact to the cranium. This view was supported by Keenan et al[5], who in a study on a population of bicyclists, reported that there was no evidence to suggest that facial fractures mitigate the severity of associated traumatic brain injury.

Mithani *et al* [7] found that HI was present in 28.7 – 79.9% of patients with isolated maxillofacial fractures while 65.5 – 88.7% of patients with multiple facial fractures were diagnosed with HI. They described a predictable pattern of force-dispersion and transmission from the maxillofacial skeleton to the cranial vault presupposing that forces resulting in upper third fractures are transmitted directly to the intracranial contents and may result in rotational forces which may be associated with lower cervical spine injuries. However, bilateral midface injuries result in dissipation of the inciting force, whereas unilateral injuries are transmitted to the skull base. In the setting of high-energy midface injury, force-dissipation mechanism may be overcome.

This was similar to the assertion of Zandi and Hoseini [2] who opined that Le Fort II fracture is a strong predictor of HI , and also noted that fracture of the facial skeleton may attenuate but not totally remove the impact of the injuring force for the associated HI. This suggests that depending on the site of primary impact, a single force transmitted via the face may be attenuated by the facial skeleton, whereas multiple impacts as seen commonly in road traffic crashes, especially in motorbike crashes, may involve multiple impacting forces that will be transmitted to the cranium independently and may therefore mask the cushioning effect of the face.

In patients with HI and associated facial injuries, the occurrence of loss of consciousness was similar in both the group that had midfacial injuries and those with lower facial injuries, in this study. Hampson attributed association between middle – third facial fractures and head injuries to the low tolerance of the mid-facial bones to traumatic forces as compared to the frontal and mandibular bones thereby allowing more force transmission to the cranium in the former[8]. In contrast, Chang *et al*. suggested that the maxilla, together with the neighboring bones, is capable of absorbing considerable impact force, thus protecting the brain from the direct collision [9]. They further concluded that there should be a direct correlation between the severity of the maxillary fracture and that of the initial HI. Rahman and Chandrasala [10] observed that when the severity of HI increased using the GCS score, the number of facial injuries decreased, suggesting that the more severe the facial injury, the less severe the HI. Thus, implying that facial injury dissipates forces so that a less serious cranial injury would be sustained by the victim. Lee *et al* [3] also suggested that facial bones act as a protective cushion for the brain, explaining the fact that injuries that crush the facial bones frequently cause no apparent brain damage.

Road traffic injuries remain the commonest cause of head and facial trauma in this study, and motorbike crashes accounted for more than half of all the road trauma. Motorbike crashes occurred more frequently in intracity locations and between 6pm and midnight. These findings are similar to previous reports [11-16]. In our environment, road designs, in general, do not allow for traffic calming and there are usually no dedicated lanes for vulnerable road users. This forces the cyclists to compete for space on the roads with other road users, motorists as well as pedestrians. It was also reported that cyclists do engage in dangerous driving practices [17].

Agnihotri *et al* [14] reported helmet use of 4.25% stated that two-wheelers are the most commonly affected vehicles in road traffic crashes and noted that the common causes of the crashes were over-speeding, negligence of traffic rules and bad road condition. Cyclists also rarely used the protective devices designed to mitigate the impact of crashes. This ûnding emphasizes the need for safety improvements in the automobile industry especially for motorcyclists. There is a need for increased research and development into helmet designs to include full frontal protection; the use of more resilient materials for the helmet manufacturing process, as well as education of motorcyclists on proper conduct, and safety-consciousness on the roads.

The importance of self-protective devices like the helmets for motorized two-wheelers cannot be over-emphasized. In this study, as in many others, craniofacial trauma was most frequently seen in mounted motor-cycle passengers. This ranges from 44% to 76% in studies looking at all causes of facial trauma [12,15,16]. Yet the helmet usage rate is as low as 0% in our study as in some other reports, and only as high as 15.5% in available reports [12, 15-17]. Not surprisingly, in view of such low proportions

of helmet usage rates, no conclusions could be drawn in most of these studies as to what impact the use of this protective device might have had on the incidence, as well as the severity of the craniofacial injury incurred.

In the same token, enforcement of compulsory usage of rear seatbelts and increasing airbag protection in vehicles should be endorsed as this has been shown to signiûcantly reduce the risk of facial fractures[18]. The main aim of these protective methods is to reduce the transfer of forces to facial bones that will indirectly reduce the force transferred to the skull therefore protecting the brain.

The gender distribution of the study population in this report is similar to that found in the literature. This is also true of the age distribution [14,19-21]. These all show young males to be more vulnerable to traumatic injury due to their lifestyle choices. This continuous trend is worrisome, as the groups of individuals who are exposed to these brain injuries are young patients, who may face lifelong neurological disabilities. These permanent disabilities will lead to long-term expensive medical treatments causing signiûcant ûnancial strain on families as well as national healthcare systems. There is therefore an urgent need for more enforcement of road trafûc safety especially education and increasing requirements on providing driving licenses to young people.

In our study only 20% of the victims reached the hospital within 3 hours. A significant proportion of RTA victims (34 %) could not reach the hospital within the 6-hour period. Time-lapse before reaching the hospital is of significant prognostic value and is a possible metric of the trauma care transport system [22]. In most circumstances, an injured person should be transported from the scene of injury to definitive care at a trauma unit, as quickly and safely as possible. In settings where this is feasible, transportation is best done using an ambulance that is appropriately designed, equipped and staffed [23]. Beyaztas *et al* [24] in their study observed that 45.2% victims reached the hospital within the first hour of accident. In our environment, the cause(s) for this delay need to be investigated. However, lack of proper emergency response and transportation system may be possible causes. Addressing the causes of this delay will help in improving outcome of traumatic injuries.

There are a couple of shortcomings in this study. Firstly, the patient data were collected within just one-year period of time, and in only one tertiary hospital setting. As such, only a total of 99 patients were enrolled, which is relatively limited in number. A more exhaustive project, for instance, a multicenter case-control study with larger sample and additional parameters will be essential to reach deûnitive conclusions regarding the impact of facial injuries on the severity of HI.

Another limitation of this work if the fact that the actual parameters undergoing statistical analysis were restricted, for instance, the association of the Glasgow Coma Scale and CT image finding was not compared, making GCS the only variable available for comparison.

All said, this report is nonetheless unique with respect to the subject studied in that the study population consisted of patients primarily diagnosed with head injuries. We were able, therefore, to infer that traumatic disruption of the upper/ mid-facial bone might be expected to be associated more commonly with HI compared to injury to the lower facial skeleton.

Conclusion

The findings of this study corroborates the opinion that facial fractures may be protective against head injuries since loss of consciousness and presence of intracranial injuries were more common in cases of isolated head trauma compared with cases of head injury with concomitant maxillofacial injury.

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Salvaging the diabetic foot: is earlier better?

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Abstract
Background: It has been observed that patients present with advanced diabetic foot ulcers and gangrene of the feet. Most studies have not assessed the timing and reasons for late presentations and if earlier presentation would improve outcomes of treatment.
Objective: To determine the time from onset of ulceration to presentation and reason(s) for delayed presentations. The risk factors and precipitating factors for foot ulceration were also determined as identifying these could help in focusing on preventive strategies.
Methods: This was a cross-sectional study among 56 patients with diabetic foot ulcers and diabetic foot gangrene admitted to the Medical wards of a tertiary Hospital in Nigeria.
Results: The mean age of respondents was 53.4±13.6 years and 48.2% were males. Median duration of ulcer before presentation was 30 days (range 1-365 days). Almost 50% of the patients presented with gangrene. A significantly higher proportion of those with advanced ulcers (grades 4-5) had an amputation performed (88.5%) compared with 3.3% of those with lower grades (1-3) ($p < 0.0001$).
Conclusions: Despite prior diagnosis of diabetes, most patients still presented late. Education of patients at diagnosis of diabetes is important for prevention and early treatment of diabetic foot. Health care providers in peripheral hospitals also need continued education on management of diabetic foot ulcers and the need for timely referrals to improve outcomes.

Keywords: *Diabetes, foot ulcers, gangrene, risk factors, amputation*

Résumé
Contexte : Il a été observé que les patients présentaient des ulcères avancés du pied diabétique et une gangrène des pieds. La plupart des études n'ont pas évalué le moment et les raisons des présentations tardives et si une présentation préalable améliorerait les résultats du traitement.
Objectif: Pour déterminer le délai entre le début de l'ulcération et la présentation et les raisons des présentations retardées. Les facteurs de risque et les facteurs déclenchants de l'ulcération du pied ont également été déterminés car leur identification pourrait aider à se concentrer sur les stratégies de prévention.
Méthodes: Il s'agissait d'une étude transversale menée auprès de 56 patients souffrant de l'ulcère du pied diabétique et de la gangrène du pied diabétique admis dans les services médicaux d' un hôpital tertiaire au Nigéria.
Résultats: L'âge moyen des répondants était de 53,4 ± 13,6 ans et 48,2% étaient des hommes . La durée médiane de l'ulcère avant la présentation était de 30 jours (entre 1 et 365 jours). Près de 50% des patients présentaient une gangrène. Une proportion significativement plus élevée de ceux ayant des ulcères avancés (grades 4-5) ont subi une amputation (88,5%), contre 3,3% de ceux avec des grades inférieurs (1-3) ($p < 0,0001$).
Conclusions: Malgré un diagnostic préalable de diabète, la plupart des patients se présentaient encore tard. L'éducation des patients au diagnostic du diabète est importante pour la prévention et le traitement précoce du pied diabétique. Les prestataires de soins de santé dans les hôpitaux périphériques ont également besoin d'une formation continue sur la prise en charge des ulcères du pied diabétique et la nécessité de références en temps opportun pour améliorer les résultats.

Mots-clés: *diabète, ulcères du pied, gangrène, facteurs de risque, amputation*

Introduction

With the rising prevalence of diabetes, diabetes-related complications which include diabetic foot ulcers are on the increase [1]. Diabetic foot ulcers ((DFUs) are a widespread problem with devastating consequences if not properly treated. Persons with diabetes are at a higher risk of lower extremity complications as compared to those without diabetes.

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DFUs are the commonest cause of non-traumatic lower-extremity amputations (LEA) and remain a major cause of morbidity and mortality in persons with diabetes. In Western countries, 2 of 100 diabetic patients are estimated to suffer from a foot ulcer every year. The lifetime risk of a person with diabetes developing an ulcer may be as high as 25%, even though it is reported that up to 85% of diabetic foot problems are preventable [2]. Diabetic foot accounts for nearly 35% of all hospital admissions in diabetic clinics and nearly 80% of all non-traumatic lower limb amputations [3].

In the United States, approximately 60% of all LEA occur among persons with diabetes [4]. It is said that approximately 85% of LEA are preceded by a foot ulcer [5]. In Nigeria, diabetic foot ulceration is the leading indication for non-traumatic LEA in tertiary hospitals [6-8] Prevalence rates of diabetic foot ulceration in hospital based studies conducted in Nigeria, ranged from 15.8% to 24.7% [9] . Ikeh *et al* reported prevalence of amputation and mortality for patients with foot ulcers as 18.4% and 15.8% respectively.

DFUs result from a multifactorial process with the major risk factors being peripheral neuropathy, arterial disease, past history of previous ulceration, prior lower extremity amputation and foot deformities which result in abnormal foot biomechanics [5,10]. DFUs are often complicated by infection, thus greatly increasing the risk of gangrene and limb amputation [9].

Faliure of early recognition and control of the infectious process may result in complications like sepsis, limb loss and premature death. To reduce ulcer-related hospitalizations and amputations, ulcers need to be treated promptly and aggressively. There is also a need for patient education on foot care [11], and where indicated, provision of therapeutic foot wear and revascularization procedures.

We aimed to find out the reasons why patients with DFUs delayed in presenting to our hospital for care, as well as the risk factors, and precipitating factors for foot ulceration in patients presenting with diabetic foot ulcers and diabetic foot gangrene. The findings from this study could help in better educating patients with diabetes and health care providers which may improve the outcome of foot ulceration.

Patients and methods

A cross-sectional design was used to study all patients (56) with active DFUs admitted under the care of the Diabetes and Endocrinology Unit of the University College Hospital Ibadan, Nigeria from June 2011 to January 2014.

All participants were interviewed using a semi-structured questionnaire (after informed consent was obtained) and the following information were obtained and documented: demographic data, history of duration of diabetes and type of diabetes (from case records), duration of the foot ulcer(s), reason(s) for presentation at the time they did, and precipitating factors for foot ulcer. History of presence of neuropathic pain and intermittent claudication was also obtained. Documented results of last blood glucose test before foot ulceration were obtained from patients' records. Ethical approval was obtained from the joint University of Ibadan/University College Hospital Ibadan Ethical review board.

Examination

All patients had physical examination and then detailed examination of both feet for presence of deformity, cracks, fissures, corns or calluses. Foot ulcers were assessed for location, number of ulcers, size and depth and then graded using the Meggitt - Wagner classification [12]. The feet were also examined, for evidence of foot or limb infection. Infection was present if e"2 of the following were present: tenderness, pain, warmth, foul smell or gas gangrene.

Neuropathy assessment

Peripheral neuropathy was assessed using 2 scoring systems: the Diabetic Neuropathy Score (DNS)[13] for symptoms and the revised Neuropathy Disability Score (NDS) for signs of neuropathy [14]. The NDS score included: vibration threshold, (assessed using a 128mHz tuning fork), temperature, pinprick and Achilles reflex, which were assessed and scored. Each foot was assesed and the sum of the score obtained was recorded. In cases where prior amputations had been done, the score awarded to the examined foot was doubled. Peripheral neuropathy was defined as: NDS score of 3-5 as evidence of mild neuropathic signs, 6-8 moderate and 9-10 severe. Using the DNS, score of 0 was considered as no peripheral neuropathy and a score of 1-4 was considered as presence of peripheral neuropathy.

Peripheral vascular disease assessment

Peripheral Vascular Disease (PVD) was assessed by enquiring about symptoms suggestive of intermittent claudication and palpation of the doraslis pedis and posterior tibial arteries. The Ankle Brachial Pressure

Index (ABPI) was measured using a hand-held Doppler: PVD was considered present if there was an incontrovertible history of intermittent claudication or absence of at least 2 out of 4 peripheral pulses in the feet, or absent pedal pulses of the involved foot or ABPI <0.9 or Dopper ultrasound evidence of PVD or history of revascularization procedure of the lower leg arteries.

Using the information obtained, the type of foot lesion was determined and classified as either neuropathic (presence of peripheral neuropathy) ischaemic (presence of PVD) or neuroischaemic (presence of both).

Statistical analysis

Data were coded and entered in Statistical Package for Social Sciences (SPSS) version 22 (IBM Corp). Continuous variables were expressed as mean ± SD; categorical variables were described as proportions. Comparison of means was done using a t-test for continuous data and chi-square test for categorical data. The level of significance was set at $P < 0.05$.

Results

Sociodemographic characteristics

Table 1 shows the sociodemographic characteristics of the subjects. Out of 56 patients studied, 48.2% were males. Mean age was 53.4±13.6 years; 25% of patients were young adults (29-39), 60.7% were middle aged (40-59) and 14.3% were elderly (≥60).

Diabetes type, duration and biochemical characteristics

Most (89.3%) had type 2 diabetes while 10.7% had type 1 diabetes. Majority (78.6%) of the patients had been diagnosed with diabetes prior to occurence of the foot ulcer. 21.4% of the patient had diabetes diagnosed after the foot ulcer had ocured. Median duration of diabetes before occurrence of ulcer was 5.0 years (range < 1 – 30 years). Mean random blood glucose at presentation was markedly elevated (356±173.4 mg/dl).

Time of presentation, reasons for delayed presentation

Median duration of foot ulcer before presentation at our hospital was 30 days (range 1-365 days). Only

Table 1: Sociodemographic characteristics

Socio-Demographic Variables	All N = 56 N (%)	Male N = 27N (%) N (%)	Female N=29 N (%)
Age Group (Years)			
29-39	14(25)	3 (11.1)	5 (17.3)
40 – 59	34 (60.7)	18 (66.7)	15 (51.7)
≥ 60	8 (14.3)	6 (22.2)	9 (31.0)
Mean Age	53.4 ± 13.6	53.3 ± 13.1	53.5 ± 14.4
Highest educational level			
No formal	11 (19.7)	3 (11.1)	8 (27.6)
Primary	12 (21.4)	7 (25.9)	5 (17.2)
Secondary	17 (30.4)	7 (25.9)	10 (34.5)
Above secondary			
Smoking status			
No	53 (94.6)	24 (88.9)	29 (100.0)
Yes	3 (5.4)	3 (11.1)	0 (0.0)
Employment status			
No	23 (41.0)	10 (37.0)	13 (44.8)
Yes	33 (58.9)	17 (63.0)	16 (55.2)
Religion			
Christianity	35 (62.5)	14 (51.9)	21 (72.4)
Islam	21 (37.5)	13 (48.1)	8 (27.6)
Marital status			
Married	37 (66.1)	19 (70.4)	18 (62.1)
Currently living with partner	13 (23.2)	3 (11.1)	10 (34.5)
Married, not currently living with partner	6 (10.7)	5 (18.5)	1 (3.5)
Never married			

Table 2: Reasons For Delayed Presentation

Reason(S) for all delayed presentation	All N (%)	Male N (%)	Female N (%)
Lack of knowledge	13 (23.3)	5 (18.5)	8 (27.6)
Financial constraints	6 (10.7)	4 (14.8)	2 (6.9)
Painless ulcer	4 (7.1)	2 (7.4)	2 (6.9)
Fear of hospital or surgery	7 (12.5)	4 (14.8)	3 (10.3)
Self- treatment at home	26 (46.4)	11(40.7)	15 (51.7)
Attending traditional healing homes, quacks or use of herbal remedies	9 (16.1)	4 (14.8)	5 (17.2)
Attending peripheral hospitals	28 (50.0)	10 (37.0)	18 (62.1)

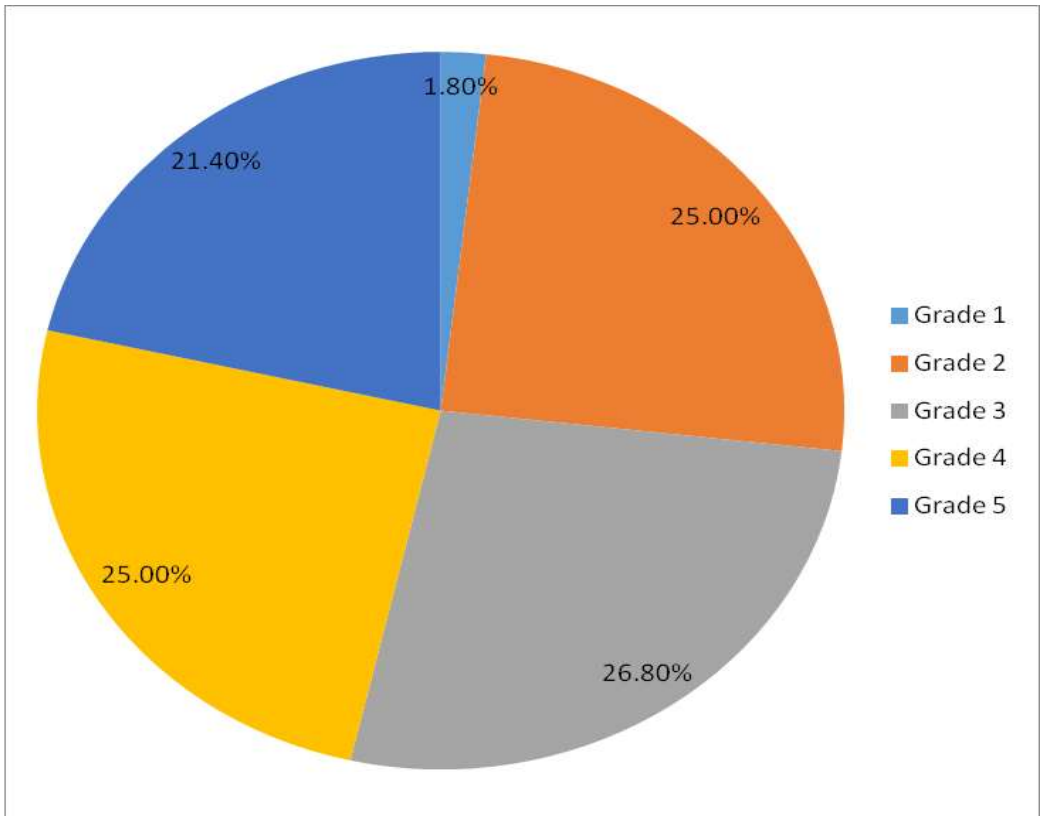

Fig. 1: Ulcer grade at presentation

7.1% of patients presented within 1 week of foot ulceration, while 92.9% presented after one week of ulceration. Several reasons were given for delays in presentation (Table 2). Most frequent reasons were: attending a peripheral hospital (50%) and self-treatment at home (46.4%). Majority of the patients were presenting newly to our hospital (Only 16.1% of them had attended the outpatient clinic of our hospital prior to present admission).

Ulcer grade at presentation & risk factors for foot ulceration

Ulcer grade at presentation is shown in Figure 1. This figure showed that most patients presented with advanced grades of ulcers. Statistical analysis showed that those who presented after one week of ulceration had higher grades of ulcer compared to those who presented within one week of ulceration (likelihood ratio 1.214, p value 0.54).

Peripheral neuropathy was present in 80.4%, ischemia(PVD) in 37.5% and combination of neuropathy and ischemia in 35.7% (Figure 2). Foot deformity and corns/calluses were present in 32% and 39% of patients respectively. A significantly higher proportion (46.2%) of those with advanced ulcer (grade 4-5) had foot deformity compared with 20.0% of those with lower grades of ulcer (1-3) ($p<0.0001$).

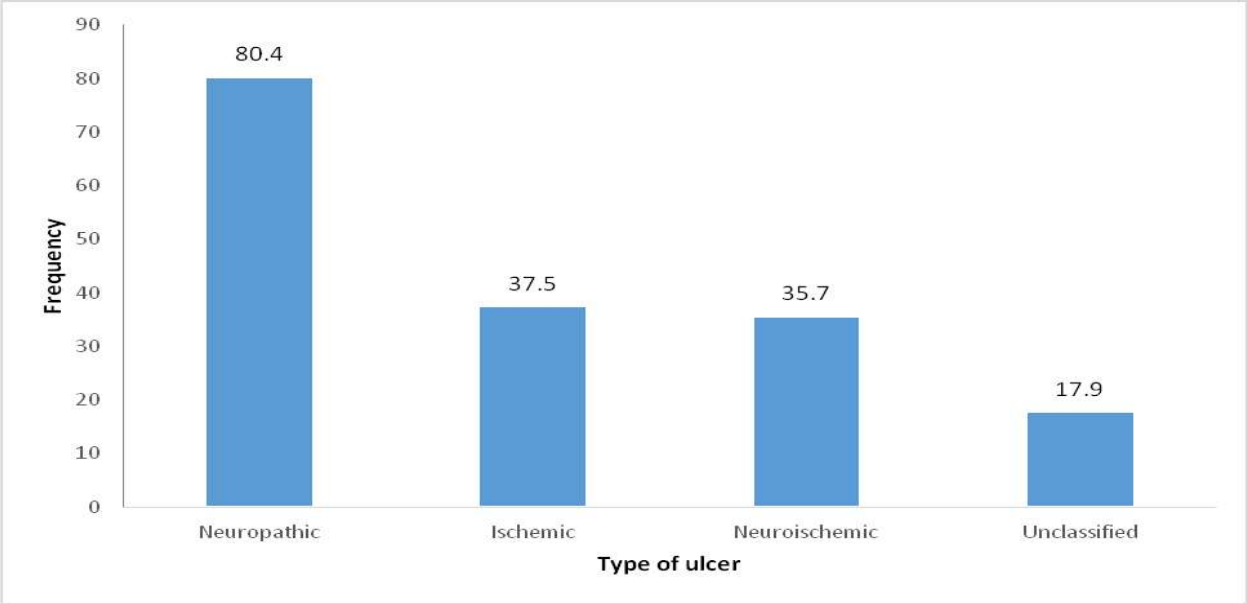

Fig. 2: Type of ulcer (risk factors for ulceration)

As at the time of presentation, 25% had superficial ulcers while 75% had deep ulcers. About 50% of the patients presented with gangrene of the foot, while 93% had infected ulcers.

Precipitating factors for ulceration

Majority of the patients had a spontaneous blister preceding the ulcer, while a substantial number had an identifiable external precipitating factor for the ulcer, of which mechanical trauma /puncture wounds were the most common followed by burns and ill-fitting shoes (Table 3).

Table 3: Precipitating Factors for Foot Ulcer

Precipitating Factor	All N (%)	MaleN (%)	FemaleN (%)
None	5 (8.9)	2 (7.4)	3 (10.3)
Mechanical trauma/puncture wound	21 (37.5)	8 (29.6)	13 (44.8)
Burn /scald	4 (7.1)	3 (11.1)	1 (3.4)
Spontaneous blister	23 (41.1)	12 (44.4)	11 (37.9)
Ill-fitting shoes	2 (3.6)	2 (7.4)	0 (0.0)
Foot infection/ cellulitis	1 (1.8)	0 (0.0)	1 (3.4)
Total	56 (100)	27 (100)	29 (100)

Outcome of foot ulcers

Among those who presented after one week of ulceration, 44.2% required some form of amputation, while 25% of those who presented within one week required amputation (χ 2= 0.561, p=0.454).

There was a significant relationship between ulcer grade and need for surgical intervention. A significantly, higher proportion of those with advanced ulcers (grade 4-5) had amputation (88.5%) compared with 3.3% of those with lower grades (1-3) ($p<0.0001$).

Discussion

Diabetic foot ulceration poses a great threat to loss of limbs and is the commonest cause of non-traumatic limb amputation. Diabetes is a complex disease with huge attendant morbidity and mortality, and imposes a lot of financial burden on both the patients and relatives.

Our study showed that majority of the patients with foot ulcers had been diagnosed with diabetes before ulceration occurred (few were diagnosed after ulceration) but they still presented with advanced grades of ulcers. Almost half (46%) presented with Wagner grade 4 and 5 ulcers. This is similar to a report by Ngim *et al* [9] This finding implies that there is poor level of diabetes education and foot care practices among patients with diabetes in our environment. Comprehensive education and

counselling of patients could help patients with diabetes to prevent foot ulceration and those with diabetic foot ulceration to seek prompt intervention in hospitals with facilities for managing diabetic foot ulcers, such as ours.

Our study showed that one of the commonest reasons for delays in presentation was attendance of a peripheral hospital for care of the foot ulcer. Therefore, health care providers working in hospitals providing primary and secondary levels of care need to be educated on management of minor cases of foot ulceration and need for prompt referral, to a tertiary hospital, of ulcers not responding to treatment or beyond their managing capacity.

This is of particular importance as earlier access to experts in wound care could help reduce the risk of LEA. Median duration of ulcer before presentation to our hospital was 30 days. Less than 10% of our patients presented within one week of the development of foot ulceration. Similar pattern of late presentations has been reported and this was attributed to several factors [15]. Other reasons included self-treatment at home, lack of knowledge and fear of surgery. The fear of amputation was the major factor preventing patients from presenting early in a study conducted in a tertiary hospital in northern Nigeria [16]. Patients need adequate health education during clinic visits to reduce late presentation.

The commonest precipitating factor for ulceration was spontaneous blister (41.1%) followed by external precipitating factors such as mechanical trauma and puncture wounds. Tseng et al [17] reported trauma as a common precipitating factor for ulceration but this differed from our findings as spontaneous blisters were the most common precipitating factor. Foot ulcers usually result from a combination of many risk factors occurring together. Peripheral neuropathy was the most common identifiable risk factor for DFUs in this study, occurring in 80.4% of patients studied. .Adeleye et al in a retrospective review in the same hospital over a decade ago found peripheral neuropathy to be a common risk factor present in 83.6% of patients admitted for diabetic foot disease [17].

PVD and foot deformities were present in slightly over a third of patients in this study. Due to the loss of protective sensation, damaging stimuli or trauma are not well perceived or not perceived at all, which may result in foot ulceration. While trauma may include puncture wounds and blunt injury, a common injury leading to ulceration is moderate repetitive stress associated with walking or day-to-day activity. Indeed, several studies have shown that diabetic patients with peripheral neuropathy have a higher risk of plantar ulcers due to excessive localised pressures [10,18]. In the presence of foot deformities, repetitive movement, such as walking or prolonged standing, and ill-fitting shoes increases foot pressure further. A large number of diabetic foot ulcers are reported to occur as a result of the critical triad of peripheral sensory neuropathy, foot deformity and minor trauma [19].

PVD appears to be an increasingly important risk factor in the aetiology of foot ulceration in our environment and it is a major determinant of the outcome of a diabetic foot ulcer [15]. Persons with diabetic foot ulcers and PVD are more likely to have non- healing ulcers, gangrene and require major amputations [20].

Identifying and categorizing feet at risk, followed by adequate preventive measures and where necessary, by appropriate treatment will help reduce amputation rates and save costs. Intensive diabetic foot care will be required for patients with diabetes who have risk factors for DFU as they constitute a high-risk group. Comprehensive preventive foot care programmes have been shown to effectively reduce the occurrence of foot ulceration and amputation, as well as the attendant morbidity and mortality [21,22].

Our study also showed many patients had marked hyperglycemia at the time of presentation. This may be an indicator of poor metabolic control in these patients. This could be a contributory factor for foot ulceration as poor glycaemic control is a risk factor for diabetic complications. Poorly controlled diabetes also increases the risk for infection and causes delays in wound healing. On the hand, many patients presented with infected ulcers and as a result of the interdependence of infection and plasma glucose, glycemic control could deteriorate resulting in or exacerbating hyperglycemia.

Limitation of the study: The sample size was small and this was because all patients seen during the study period who consented to the study and were fit enough to have the assessments done were the ones studied. HbA1c was not used in the analysis as it was not done in most patients due to financial constraints.

In conclusion, this study shows that majority of the patients with diabetic foot ulcer presented late to our hospital with advanced grade of ulcers. Ignorance, attendance of a peripheral hospital, self-treatment at home, fear of surgery, poor hygiene, infections, lack of foot care were responsible for the late presentations to our centre.

People with diabetes need to be able to recognize potential foot problems and know the appropriate action to take. There is a need for health care providers to intensify efforts in educating people living with diabetes about foot care and early presentation to a tertiary centre with experience in diabetic ulcer care. We also propose the institution of programmes aimed at educating health workers caring for patients with diabetes at all levels of health care, in a bid to improve diabetes education and standards of care. Creating public awareness on diabetic foot care and other complications through talks, advertisements/jingles and seminars is also crucial. These early interventions could lead to better outcomes.

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Appendices

Appendix 1: Meggitt- Wagner Classification Of Diabetic Foot[12]

Grade 0	Foot symptoms like pain, only
Grade 1	Superficial ulcer
Grade 2	Deep ulcer
Grade 3	Ulcer with bone involvement or abscess formation
Grade 4	Forefoot gangrene
Grade 5	Full foot gangrene

**This is the most widely accepted and universally used grading system for lesions of the foot in persons with diabetes

Appendix 2: Revised Neuropathy Disability Score (NDS) [14]

Neuropathy disability score (NDS)			
		Right	Left
Vibration perception threshold 128-hz tuning fork: apex of big toe: Normal = can distinguish vibrating/ not vibrating Normal = 0Abnormal = 1			
Temperature perception on dorsum of the foot Use tuning fork with beaker of ice/warm water			
Pin-prick Apply pin proximal to big toe nail just enough to deform the skin; Trial pair – sharp, blunt; Normal = can distinguish sharp/not sharp			
Achilles reflex	Present = 0 Present with reinforcement = 1 Absent = 2 NDS total out of 10		

**Peripheral neuropathy using the Revised NDS score is defined as:
3-5 - mild neuropathic signs
6-8 – moderate neuropathic signs
9-10 – severe neuropathic signs

Appendix 3: DNS-score and guidelines[13]

DNS items	Rate
Unsteadiness in walking	0 = absent, 1 = present
Numbness in legs or feet	0 = absent, 1 = present
Burning, aching pain or t enderness in legs or feet	0 absent, 1 = present
Prickling sensations occurring at rest or night	0 = absent, 1 = present

***Peripheral neuropathy assessment using the DNS score:*
Score of 0 is considered as no peripheral neuropathy
Score of 1-4 is considered as presence of peripheral neuropathy

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Fluoride concentrations in ground water supplies in an urban and a rural community in Oyo State Nigeria

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Abstract

Background: Knowledge of fluoride concentrations in community ground water supplies is important because it will aid decision making on the use of fluoride at individual and community level.

*Objective:*To determine fluoride concentrations of common community groundwater supplies in selected rural and urban communities of Oyo State Nigeria.

Materials and methods: Fluoride concentrations in 200 randomly selected common community ground water supplies in 2 Local Government Areas (LGAs) of Oyo State were determined by Fluoride-Ion-Selective Electrode. The accuracy and validity of the fluoride analysis by direct method was estimated by re-analysis of 7% of the water samples. Ground water supplies were categorised into 3 groups according to the fluoride concentration in mg/l [10]: (i) < 0.29 mg/l (low F concentration); (ii) from 0.30 up to 0.60 mg/l (appropriate F concentration), (iii) 0.60 – 1.5 mg/l (optimal F concentration) and > 1.5 mg/l (high F concentration).The data obtained were analysed using SPSS version 22. The frequency distributions were analysed with student t-tests and chi-square tests at $p < 0.05$.

Results:The minimum fluoride concentration in all samples was 0.03 mg/l, the maximum was 3.0 mg/l while the median was 0.30 mg/l.Fluoride concentration in most, 96 (48.0%) of the ground water supplies was ≤0.29 mg/l while 75 (37.5%) had appropriate fluoride concentration (0.30-0.60 mg/l). There was no statistically significant difference between the mean (SD) fluoride concentration (mg/l) in wells and boreholes (p=1.0) and in rural and urban areas ground water supplies these ground water supplies (p=0.07). Twenty-three (29.1%) and 13 (10.7%) of the ground water supplies in rural and urban areas respectively contained >0.60 mg/l of fluoride (p=0.001).

Conclusion:Most of the samples belong to the low fluoride concentrations group while few belong to the high concentrations group that would necessitate defluoridation or provision of alternative water supplies. Rural samples had higher fluoride concentrations.

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Keywords: *Fluoride, Ground water, Rural, Urban, Nigeria*

Résumé

Contexte: La connaissance des concentrations de fluorure dans les approvisionnements en eau souterraine de la communauté est importante car elle aidera la prise de décision sur l'utilisation du fluorure au niveau individuel et communautaire.

Objectif :Pour déterminer les concentrations de fluorure dans les approvisionnements communautaires communs en eau souterraine dans certaines communautés rurales et urbaines de l'État d'Oyo au Nigéria.

Matériaux et méthodes : Les concentrations de fluorure de 200 sources d'eau souterraines communes aux communautés sélectionnées au hasard dans 2 communes municipales de l'État d'Oyo ont été déterminées par électrodesélective fluorure-ion. La précision et la validité de l'analyse du fluorure par méthode directe ont été estimées par une nouvelle analyse de 7% des échantillons d'eau. Les sources d'eau souterraine ont été classées en 3 groupes selon la concentration de fluorure en mg / l [10]: (i) <0,29 mg / l (faible concentration en F); (ii) de 0,30 à 0,60 mg / l (concentration F appropriée), (iii) 0,60 - 1,5 mg / l (concentration F optimale) et> 1,5 mg / l (concentration F élevée). Les données obtenues ont été analysées à l'aide de SPSS version 22. Les distributions de fréquence ont été analysées, avec les tests t et les tests du chi carré à p <0,05.

Résultats: La concentration minimale de fluorure dans tous les échantillons était de 0,03 mg / l, le maximum était de 3,0 mg / l tandis que la médiane était de 0,30 mg /l. La concentration en fluorure dans la plupart, 96 (48,0%) des approvisionnements en eau souterraines était ≤0,29 mg / l tandis que 75 (37,5%) avaient laconcentrationde fluorure appropriée (0,30 à 0,60 mg / l). Il n'y avait pas de différence statistiquement significative entre la concentration moyenne (ET) de fluorure (mg / l) dans les puits et les forages (p = 1,0) et dans les zones rurales et urbaines, de ces approvisionnements en eau souterraine (p = 0,07). Vingt-trois (29,1%) et 13 (10,7%) des approvisionnements d'eau souterraine

respectivement dans les zones rurales et urbainescontenaient ≥0,60 mg /l de fluorure (p = 0,001). *Conclusion:* La plupart des échantillons appartiennent au groupe àfaible concentration de fluorure tandis que peu appartiennent augroupe àhaute concentration ce qui nécessiterait la défluoruration ou la fournituralternativede autres sources d'eau. Les échantillons ruraux avaient des concentrations de fluorure plus élevées.

Mots - clés: *Fluorure, Eaux souterraines, Rural, Urbain, Nigéria*

Introduction

Chemical weathering of minerals that contain fluoride in soils results in leaching out of fluoride into natural water [1]. It has been estimated that 0.6% of the total water resources on earth come from ground water [2]. In the last decade, over 300 million wells had been sunk translating into an increase in human exposure to fluoride [3]. Reports have shown that ground water from deep or shallow wells is the main source of water used for drinking and cooking in Nigeria [4]. The waters from these wells are usually fetched directly using plastic containers or through hand driven pumps and are presented for consumption through taps, bottles and sachets. Exposure to drinking water containing optimal concentration of fluoride (0.7 mg/l) for a long period can lead to the prevention of dental caries [5]. A key factor for prevention of dental caries is the intake of fluoride because it makes the tooth-enamel surface acid resistant by preventing bacterial demineralization and promotion of remineralization of incipient carious lesions [6]. In addition, fluoride in low concentrations prevents bacterial adhesion to tooth structure while in high concentration, it is highly toxic to cariogenic oral bacterial [7]. Prolong ingestion of water whose fluoride concentration is above 1.5 mg/l can cause dental fluorosis and values above 3 mg/L may lead to skeletal fluorosis [8]. The problem of high concentration of fluoride in groundwater has become an important toxicological and environmental issue in many parts of the world [1].

Galagan and Vermillion [9] suggested a formula for calculating appropriate fluoride level in drinking water for different climatic conditions based on ambient temperature. For tropical countries with mean maximum ambient temperature higher than 27°C, the recommended appropriate fluoride concentration in drinking water based on the Galagan and Vermillionformula was 0.6-0.7 mg/l [10]. However, in the tropics, severe dental fluorosis has been observed in communities exposed to apparently appropriate fluoride concentration in drinking water [11, 12] and this is probably due to high water consumption [10]. Unlike bottled water whose fluoride concentration is mentioned on outer label, the fluoride concentration in groundwater is unknown. It is therefore imperative to determine whether fluoride concentration in groundwater supplies are within the recommended and accepted concentrations to prevent dental caries and reduce the risk of dental fluorosis. Knowledge of fluoride concentrations in groundwater supplies is also of importance in public health dentistry because it provides a basis for decisions concerning community based fluoride programmes and the clinical use of fluoride to avoid fluoride ingestion from multiple sources.Previous studies [10, 13, 14]on fluoride concentration in drinking water supplies in Nigeria showed a fluoride concentration that varied widely from 0.0 – 6.7 mg/L. However, there is a need to undertake further studies in other parts of Nigeria so as to have a wide knowledge about fluoride concentrations in drinking water supplies that is optimal for health in the country. Periodic assessment of fluoride concentrations in drinking water supplies is also necessary due to seasonal variation in the fluoride content of natural water sources.

Therefore, the aim of this study was to determine the fluoride concentrations of common community ground water supplies in selected rural and urban communities of Oyo State Nigeria.

Materials and methods

Oyo state is situated in the Southwest of Nigeria. It has an area of 28,454 square kilometres. In 2006, the population of Oyo state was estimated to be 6,617,720 [15]. Administratively and politically, the state is divided into 3 senatorial districts and each senatorial district is divided into a number of Local Government Areas (LGAs) and Local Council Development Areas (LCDAs). Altogether, there are 33 and 35 LGAs and LCDAs respectively in Oyo state. Sedimentary rocks are mostly found in Oyo state since it is in the South of Nigeria. Oyo state is situated in the North of the equator therefore, the state has humid tropical climate and is warm with temperature ranging from 28 to 32 °C throughout the year. The wet season in Oyo state is between March/April and October/November with mean annual rainfall of between 1200 and 3000 millimetres.

The sampling frame comprised the 3 senatorial districts in Oyo state, out of which Oyo

South senatorial district was randomly selected by balloting. A list of rural and urban LGAs in the district was drawn from where Ibarapa Central (population of about 103,243) and Ibadan North (population of306,795) LGAs were randomly selected as rural and urban LGAs respectively. Ibarapa Central and Ibadan North LGAs have 10 and 12 wards respectively. About 30 ml of water sample was collected with polythene bottles from 9 identifiable common community ground water supplies (wells and boreholes) in each ward after rinsing bottle with the source water 3 times making 108 samples from Ibadan North LGA and 90 samples from Ibarapa LGA. An additional sample was collected in a ward in each of the 2 LGAs therefore making a total sample of 200 (109 samples from Ibadan North LGA and 91 samples from Ibarapa LGA. These identifiable common community ground water supplies (wells and boreholes) have been in use for at least 5 years.

The water samples collected were analysed for fluoride concentration using a F-Ion Selective Electrode (Thermo Scientific Orion 9609BNWP, Orion Research, USA) and meter (Thermo Scientific Orion Star A214 Benchtop pH/ISE Meter, Orion Research USA) in the Oral Pathology Laboratory at the University of Ibadan, Nigeria by a direct method after addition of TISAB III [16].The accuracy and validity of the fluoride analysis by direct method was estimated by re-analysis of 7% of the water samples. The data obtained were analysed using SPSS version 22(Chicago Inc. USA). The frequency distributions were performed. Student t-test was used to test association between continuous variables while chi-square test was used to test association between categorical variables at $p < 0.05$. Ground water supplies were categorised into 3 groups according to the fluoride concentration in mg/l[10]: (i) < 0.29 mg/l (low F concentration); (ii) from 0.30 up to 0.60 mg/l (appropriate F concentration), (iii) 0.60 – 1.5 mg/l (optimal F concentration) and > 1.5 mg/l (high F concentration).

Result

There was no statistically significant difference between the mean (SD) fluoride concentration (mg/l) in the first and repeat ground water samples ($p=0.95$) and the measure of agreement was 0.819. The mean (SD) fluoride concentration of all the ground water supplies was 0.43 (0.53) mg/l. The minimum fluoride concentration in all the samples was 0.03 mg/l, the maximum was 3.0 mg/l and the median was 0.30 mg/l.

Table 1 shows that the fluoride concentrations in 96 (48.0%) of the samples, representing the majority were low (≤0.29 mg/l). Seventy-five (37.5%) samples had appropriate concentrations (0.30-0.60 mg/l) and 13 (6.5%) had excessive concentrations (>1.5 mg/l).

There was no statistically significant difference ($p=1.0$) between the mean (SD) fluoride concentration (mg/l) in wells and boreholes (Table 2).Table 2 also shows that the mean (SD) fluoride concentrations of ground water supplies in rural areas was 1.67 (0.52) while that of urban areas was 1.20 (0.42) mg/l and the differences were not statistically significant ($p=0.07$).

Table 3 shows that 19 (18.6%) and 13 (17.3%) of the ground water supplies in wells and boreholes respectively contained ≥ 0.60 mg/l of fluoride ($p=0.86$).

Table 1: Fluoride concentrations (mg/l) in ground water supplies (n=200)

Fluoride concentrations (mg/l)	No.	%
≤0.29	96	48.0
0.30-0.60	75	37.5
0.61 – 1.50	16	8.0
> 1.50	13	6.5
Total	200	100.0

Table 2: Mean (SD) fluoride concentrations (mg/l) by source and location of ground water supplies

Source	Fluoride concentration mg/lMean (SD)	p	Location	Fluoride concentration mg/lMean (SD)	p
Wells	1.50 (0.54)	1.0	Rural Areas	1.67 (0.52)	0.07
Boreholes	1.50 (0.53)		Urban Areas	1.20 (0.42)	

Table 3: Relationship between fluoride concentration (mg/l) and source of ground water supplies

Source	Fluoride concentration (mg/l)		Tota	p
	< 0.60	≥ 0.60		
	No. (%)	No. (%)	lNo. (%)	
Wells	83 (81.4)	19 (18.6)	102 (100.0)	0.86
Boreholes	81 (82.7)	13 (17.3)	98 (100.0)	
Total	173 (82.0)	27 (18.0)	200 (100.0)	

Table 4: Relationship between fluoride concentration (mg/l) and location of ground water supplies

Location	Fluoride concentration (mg/l)		Total	p
	< 0.60	≥0.60		
	No. (%)	No. (%)	No. (%)	
Rural Areas	56 (70.9)	23 (29.1)	79 (100.0)	0.001
Urban Areas	108 (89.3)	13 (10.7)	121 (100.0)	
Total	173 (82.0)	27 (18.0)	200 (100.0)	

Table 4 also shows that 23 (29.1%) and 13 (10.7%) of the ground water supplies in rural and urban areas respectively contained ≥ 0.60 mg/l of fluoride (p=0.001).

Discussion

It is reported that more than half of the world population obtain drinking water from ground water sources [17]. It was observed that an estimated 60% of Nigeria's population get drinking water from ground resources due to infrastructural decay in the portable water supply sector in the country [3]. In the present study, a wide spread of common community ground water sources analysed was ensured by making use of all wards in the two randomly selected LGAs as the sampling frame. A study on fluctuation in fluoride concentration in drinking waters reported seasonal variation in the fluoride content of natural water sources [18]. In this present study, the fluoride concentrations of the ground water supplies are likely to be intermediate between the values for the rainy and dry seasons as the water samples were collected in January-February at the end of dry season. There may be no clear-cut boundaries to the geographical distribution of fluoride concentrations in the ground water supplies because fluoride concentrations varied widely between 0.03 and 3.0 mg/l. Previous studies reported wide variations of between 0.0 and 0.4 mg/l in fluoride concentrations in drinking water sources in central Nigeria [13] and between 0.03 and 6.7 mg/l when fluoride concentrations in drinking water sources were geographically mapped [10]. On the contrary, the fluoride concentrations of drinking water sources in a previous study[14] in Ibadan undertaken a decade ago were between 0.02 and 0.03 mg/l which did not vary widely. The present study provides some indications of the distribution of fluorides in ground water supplies in the different parts of the LGAs. Information from this study will provide a guide to dentists in these LGAs who wish to provide fluoride therapy. It will also help the policy makers to know the areas where fluoridation is necessary and the places where defluoridation is required.

A recent Cochrane Review on water fluoridation for the prevention of dental caries concluded that the initiation of water fluoridation results in reduction in caries which translate into a 35% reduction in caries in primary teeth and a 26% reduction in caries in permanent teeth [19]. The review also reported an increase of 15% and 14% in the percentage of children free of decay experience in primary and permanent teeth respectively.In several communities in temperate countries, exposure to drinking water containing 1 ppm of fluoride has been shown to reduce caries experience by 40-65% [20, 21]. In hot climatic conditions in tropical countries, appropriate fluoride exposure is lower than intemperate countries due to higher water consumption [10]. Depending on other sources of fluoride ingestion, the appropriate fluoride level recommended for tropical countries like Pakistan [22], Senegal [9] and Nigeria were 0.35ppm, 0.6 ppm and 0.3-0.6 ppm [10] respectively. In this present study, 37.5% of the ground water supplies in the 2 LGAs had F concentrations within the recommended range for Nigeria while 48% had lower fluoride concentrations. This indicates that most common

community ground water supplies may be fluoride deficient. To determine the appropriate fluoride concentration for water sources in these 2 LGAs, epidemiological works that will correlate dental caries experience with fluoride exposure and fluorosis are required. This is necessary because fluoride intake may be influenced by other factors like malnutrition, genetic predisposition, gastric acidity and kidney function [10].

Several reports in Nigeria have shown that there is an increased consumption of free sugars among children in both rural and urban communities and this has been correlated with increased caries experience [23, 24]. In the fluoride deficient areas, such children who are at risk of caries attack may benefit from appropriate fluoride exposure for caries prevention. In addition, the control of other caries aetiological factors in these fluoride deficient areas must not be neglected. In this present study, there was no drinking water source from waterworks, therefore, artificial fluoridation of pipe-borne water would not benefit these fluoride deficient communities. It can only benefit them if water from the groundwater supplies are stored in large tanks where they can be artificially fluoridated and piped to homes.Where indicated, other sources of fluoride intake such as salt and milk may be explored.

In this present study, fluoride concentrations in 6.5% of ground water supplies were higher than 1.5 ppm, the upper limit of fluoride concentration in drinking water set by the World Health Organization [4]. The upper limit in Nigeria will be expected to be lower because of higher water consumption in the tropics [25]. Therefore, ground water sources in areas containing higher fluoride concentration in the 2 LGAs will need to be partially defluoridated to prevent the occurrence of dental fluorosis. Future studies should investigate the prevalence and severity of dental fluorosis in these areas. It should be noted that severe dental fluorosis has been reported in areas with high fluoride concentrations in Central [13], Northern and Southwestern [26] Nigeria. In addition, drinking water was reported as positive predictor of dental fluorosis in Oyo State, Southwestern Nigeria where this present study was undertaken [27]. In some areas in this present study where fluoride concentration was as high as 3 ppm, the possible occurrence of skeletal fluorosis when high volume of this water is consumed together with other factors needs to be investigated. Ground water supplies in this present study had higher fluoride concentrations when compared to urban supplies probably due to geographical differences between the 2 LGAs. The rural LGA has previous history of volcanic activity and rocks in this area tend to leach out fluoride into ground waters.

Although water samples were collected from common community ground water supplies, some few high or middle socio-economic group of people especially in the rural communities might not drink water from these sources. Therefore, water samples analysed in this present study might not be representative of actual water consumed by these few group of people. Further research should be consider using samples of actual water used for drinking and cooking provided by study participants.

Conclusion

Most of the samples belong to the low fluoride concentrations group while few belong to the high concentrations group that would necessitate defluoridation or provision of alternative water supplies. Rural samples had higher fluoride concentrations.

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Pattern and predictors of antibacterial use among adults in rural and urban communities, Oyo State, Nigeria.

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Abstract

Background: Indiscriminate use of antibacterial is a driver of selection pressure increasing antimicrobial resistance. This study determined the pattern and predictors of antibacterial use among adults in the rural and urban communities, Oyo State, Nigeria.

Methods: A comparative cross-sectional study was carried out among 999 adults aged ≥ 18 years enrolled at the Local Government Areas randomly selected by multistage sampling. The interviewer-administered semi-structured questionnaire was used to obtain information on respondents' socio-demographic characteristics, the pattern of antibacterial use, prescribers and sources of drugs acquisition. Analyses were done with SPSS version 22.

Results: A total of 999 adults participated in the study, with mean age of 38±15years. Of the respondents, 501(50.2%) were from rural communities. The respondents' use of antibacterials was, rural vs urban, lifetime use, 240(47.9%) vs 234(47.0%)[p=0.80], current use, 109(21.8%) vs 108(21.7%) [p=0.80] and past use, 129(25.8%) vs 125(25.1%)[p=0.80]. The commonly used antibacterials were ampicillin/ cloxacillin 94(43.5%) vs 126(53.2%)[p=0.04], amoxicillin 32(14.8%) vs 18(7.6%)[p=0.014], ampicillin 16(7.4%) vs 40(16.9%)[p=0.002] and trimethoprim/sulfamethoxazole 18(8.3%) vs 13(5.5%)[p=0.23]. Self-prescription is common in both rural and urban communities, 51.3% vs 50.9% [p=0.85] and the antibacterial were mostly acquired from patent medicine stores, 70.2% vs 60.8%[p=0.032]. Respondents' residence did not significantly affect antibacterial use [X2=0.02, p=0.5]. The predictors of antibacterial use were low education level [AOR=1.7 (95% CI: 1.3-2.3], age < 65 years [AOR=1.7 (95% CI: 1.1-2.9], and chronic medical illness [AOR=2.0 (95% CI:1.3-3.0].

Conclusion: Substantial proportion of respondents engaged in indiscriminate antibacterial use. We suggested effective legislative strategies including the prohibition of sales of antibacterial agents without a prescription and educational interventions aiming at behavioural modification for the public.

Keywords:*Antibacterials, Antimicrobial agents, Determinants, Patterns, Self-medication, Surveillance*

Résumé

Contexte: L'utilisation indiscriminée d'antibactériens est un facteur de pression de sélection augmentant la résistance aux antimicrobiens. Cette étude a déterminé le schéma et les prédicteurs de l'utilisation des antibactériens chez les adultes dans les communautés rurales et urbaines de l'État d'Oyo, au Nigéria.

Méthodes: Une étude transversale comparative a été menée auprès de 999 adultes âgés de e" 18 ans inscrits dans les mairies sélectionnées aléatoirement par échantillonnage à plusieurs étapes. Le questionnaire semi-structuré administré par intervieweur a été utilisé pour obtenir des informations sur les caractéristiques sociodémographiques des répondants, le schéma d'utilisation des antibactériens, les prescripteurs et les sources d'acquisition des médicaments. Les analyses ont été effectuées avec SPSS version 22.

Résultats **:** Un total de 999 adultes a participé à l'étude, avec un âge moyen de 38 ± 15 ans. Parmi les répondants, 501 (50,2%) provenaient des communautés rurales. L'utilisation d'antibactériens par les répondants était, rurale vs urbaine, utilisation à vie, 240 (47,9%) vs 234 (47,0%) [p = 0,80], usage actuel, 109 (21,8%) vs 108 (21,7%) [p = 0,8] et utilisation antérieure, 129 (25,8%) vs 125 (25,1%) [p = 0,80]. Les antibactériens couramment utilisés étaient l'ampicilline / cloxacilline 94 (43,5%) vs 126 (53,2%) [p = 0,04], l'amoxicilline 32 (14,8%) vs 18 (7,6%) [p = 0,014], l'ampicilline

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16 (7,4%) vs 40 (16,9%) [p = 0,002] et triméthoprime / sulfaméthoxazole 18 (8,3%) vs 13 (5,5%) [p = 0,23]. L'auto-prescription est courante dans les communautés rurales et urbaines, 51,3% contre 50,9% [p = 0,85] et les antibactériens ont été principalement achetés dans les boutiquesde médicaments patent, 70,2% vs 60,8% [p = 0,032]. La résidence des répondants n'a pas affecté significativement l'utilisation des antibactériens [X^2 = 0,02, p = 0,5]. Les prédicteurs de l'utilisation des antibactériens étaient un faible niveau d'éducation [AOR = 1,7 (IC à 95%: 1,3-2,3], un âge <65 ans [AOR = 1,7 (IC à 95%: 1,1-2,9]) et une maladie médicale chronique [AOR = 2,0 (IC à 95%: 1,3-3,0].

Conclusion: Une proportion substantielle de répondants s'est engagée dans l'utilisation antibactérienne indiscriminée. Nous avons proposé des stratégies législatives efficaces, notamment l'interdiction de la vente des agents antibactériens sans ordonnance et des interventions éducatives visant à modifier le comportement du public.

Mots - clés : *Antibactériens, agents antimicrobiens, déterminants, modèles, automédication, Surveillance*

Introduction

Antibacterial drugs are life-saving drugs and are important weapons against life-threatening infections. They are among the most commonly used medications worldwide [1-3]. Despite their importance, the continuing efficacy of antimicrobial drugs is threatened by the emergence of wide-spread resistance [4]. Inappropriate use of antibacterial agents at the community level has been reported as an important factor that contributes to the emergence of antibiotics resistance through selective pressure [5].Furthermore, the development and progressively increasing multiple antibacterial resistance worldwide has been associated with the legacy of many decades of inappropriate antimicrobial use [6, 7].

Antibacterial resistance may be associated with significant morbidity, longer duration of hospitalization, excess/additional costs and mortality [8]. According to the US Center for Diseases Control and Prevention (US CDC), bacteria that are resistant to antibacterial account for more than 2 million infections and 23,000 deaths annually in the USA [9]. This value may be more in Nigeria and other developing countries where hygiene practice is sub-optimum and irrational drug use is not uncommon. The patient-related factors reported to contribute to the increasing menace of antimicrobial resistance in the community include patients' misperceptions, self-medication, advertising and promotion, and poor adherence to dosage regimens [10].

Studies have shown that inappropriate drug use is more prevalent in developing countries [11-13]. According to the World Health Organization (WHO), 20-50% of the 80% antibiotics used in the communities were inappropriate [14]. Some factors that have been reported to be associated with inappropriate antibiotics use include gender [15], level of education [16-18], location of residency [19, 20], marital status, age [18, 21, 22], health insurance [16], storing of antibiotics at home [23, 24], poor access to healthcare [24] and dissatisfaction with the health care services [19, 25]. In Nigeria, there is a paucity of data on antibacterial use in the communities. The few available studies were conducted among the participants presented at the pharmacy stores in the communities [26-28] and Universities environment [29, 30]. Data on antibacterial use in the community will improve awareness and understanding of antimicrobial resistance (AMR) through effective communication, education and training [10, 31]. The aim of this study, therefore, was to determine the pattern and predictors of antibacterial use among adults living in selected rural and urban communities of Oyo State, Nigeria.

Methods

Study design

The study employed a comparative descriptive cross-sectional design to determine the pattern, and predictors of antibacterial use among adults in selected rural and urban communities in Oyo State, Nigeria.

Study area

The study was conducted in Oyo State, Southwestern part of Nigeria. The capital of Oyo State is Ibadan. Oyo State has a total population of 5,591,589, comprising 2,802,432 males and 2,778,432 females. The population of adults in the state was 3,481,190, representing 62.3% of the total population of the state [32]. There are 3 senatorial zones, comprising 33 Local Government Areas (LGAs), some of which may be described as urban or rural. Yorubas constitute the predominant ethnic group, though significant numbers of other ethnic groups such as Igbo and Hausa also reside in the state. The major occupations of the adult population in the state are farming, petty trading, artisan works and civil service. There are about 1565 health facilities in Oyo State, comprising 678 public health institutions and 887 registered private health facilities. Of the 678

public health institutions, there are 517 primary health care/maternity centres, 45 secondary and 6 tertiary health centres.

Sample size determination

The required sample size for the study was estimated using the formula for comparing two population proportions, $n = \frac{(Z_{\alpha} + Z_{1-\beta})^2 (p_1 (1-p_1) + p_2 (1-p_2))}{(p_1 - p_2)^2}$.

The assumptions made in the calculation include: two comparison groups, rural (n1) and urban (n2) populations with 1:1 ratio, P1(50%) [assumed prevalence], Zα (1.96), $Z_{1-\beta}$ (0.84), 80% power, 10% differences between rural and urban communities. Assuming a nonresponse proportion of 20% and a design effect of 1.5, a minimum sample size of 420 in each group was obtained. However, sample sizes of 501 and 498 were used for the rural and urban communities respectively.

Sampling technique

The sampling method was multi-stage comprising five stages beginning with the three senatorial zones and using simple randomization at each stage. At stage 1, Oyo South Senatorial zone was randomly selected from the three senatorial zones. Stage two involved random selection of Ido and Ibadan Southwest LGAs as a rural and an urban LGA, respectively among the nine LGAs that constitute Oyo South Senatorial zone. Thereafter, four wards each were selected from Ido and Ibadan Southwest LGA. The fourth stage involved the selection of five settlements from each of the selected wards. At the final stage, one eligible adult was selected from each alternate household until the required number of participants has been enrolled. The total population of Ido (rural) LGA was 104,087, with 62.3% (64,846) adults. The total population of Ibadan Southwest (urban) LGA was 283,098, with adults representing 62.3% (176,370)[32].

The inclusion criteria included consenting adult, male or female, aged 18 years and above residing in the selected Local Government Areas of Oyo State. Such an individual should have stayed in that community for at least six months to be included in the study.

Description and design of the study instruments

A semi-structured questionnaire was adapted from the WHO Students drug use questionnaire, a questionnaire on how to investigate the use of medicines by consumers[33], and previous similar studies[34, 35]. The WHO students drug use questionnaire had been validated for use in Nigeria[36]. The questionnaire consists of three sections. Section A composed of sociodemographic characteristics of the respondents while section B was used to collect information about the pattern of antibacterial use. The participant's response to ever taken the antibacterial was used to obtain information about lifetime use, while antibacterial use recall periods of within 3 and 12 months represented current and past antibacterial use respectively. Other information obtained in this section included reasons for antibacterial use, prescribers and sources of acquisition.

Training of the research assistants and study preparation

Six research assistants, holders of Master of Public Health, Bachelor of Science in Health Education, Higher National Diploma, and registered nurses were trained for one week: two days for the final design of the questionnaire and five days after the design of the questionnaire. Each variable in the questionnaire was discussed with a view to determining appropriate meaning, the expected response and alternative response. The research assistants were also trained on the steps to take in identifying drugs and how to administer the questionnaire on the field. The training also involved critiquing the Yoruba version of the questionnaire, and joint agreement of the way questions will be asked from the respondents so as to achieve uniformity by everybody. Selection of the wards and settlements as well as (initial) visits were jointly conducted.

Forty questionnaires were pretested in 4 settlements selected from one rural and one urban LGAs (Egbeda and Ibadan North LGAs). The interviewer-administration of the questionnaires was done by all members of the research team including the research assistants. The ambiguities were corrected, the data was entered into SPSS version 22 and mini-analysis was done.

Fieldwork

Enrollment of study participants was between February 1 and April 30 2017. The questionnaire was interviewer-administered in the local language (Yoruba) after informed consent was obtained. It took about 20 to 30 minutes to complete an interview. All the research assistants participated in the administration of questionnaires in both the rural and urban communities. Questionnaires were checked for completeness at the end of everyday fieldwork.

Variables

The dependent variables were the pattern of antibacterial use and prevalence of self-medication. The independent variables were the location (rural and urban), educational level, gender, occupation, and socioeconomic status.

Ethical Approval

The ethical approval for the study was obtained from the Oyo State Ethical Review Committee. Permission was obtained from the LGAs and community leaders. Informed consent was obtained from each respondent before the administration of the questionnaire. Respondents were informed of the voluntariness of

Table 1: Socio-dermographic characteristic of the respondents (n=999)

Variable	Rural Frequency (%)	Urban Frequency (%)	X^2	p-value
Number	501 (0,2)	498 (49.8)		
Sex				
Male	157(31.3)	162(32.5)		
Female	344(68.7)	336(67.5)	0.16	0.686
Age group (years)				
<20 years	27(5.4)	32(6.4)		
20-29	140(27.9)	142(28.5)		
30-39	141(28.1)	117(23.5)		
40-49	79(15.8)	99(19.9)		
50-59	49(9.8)	49(9.8)		
≥ 60	65(13.0)	59(11.9)	5.20	0.392
Religion				
Christianity	264(52.7)	229(46.0)		
Islam	235(46.0)	264(53.0)		
Traditional	1(0.2)	3(0.6)		
Others	1(0.2)	2(0.4)	5.50	0.139
Marital Status				
Single	89(17.8)	116(23.3)		
Married	373(74.5)	363(72.9)		
Widow	27(5.4)	15(3.0)		
Others*	12(2.4)	4(0.8)	11.11	0.011
Educational level				
None	54(10.8)	45(9.0)		
Primary	102920.4)	106(21.3)		
Some Secondary	44(8.8)	30(6.0)		
Completed secondary	200(39.8)	228(45.8)		
Tertiary	101(20.2)	89(17.9)	6.12	0.190
Occupation				
Unemployed	44(8.8)	45(9.0)		
Students	29(5.8)	45(9.0)		
Atisans	14(28.5)	122(24.6)		
Trading	217(43.3)	254(51.0)		
Farming	27(5.4)	0(0.0)		
Civil servant	15(3.0)	18(3.6)		
Professionals	15(3.0)	14(2.8)		
Others*	11(2.2)	0(0.0)	46.34	<0.001
Average monthly income				
≤10,000	89(17.7)	90(18.1)		
10,100-20,000	196(39.1)	107(21.5)		
20,100-30,000	105(21.0)	73(14.7)		
30,100-40,000	11(2.2)	33(6.6)		
40,100-50,000	24(4.8)	33(6.6)		
50,100-60,000	20(4.0)	37(7.4)		
>=60,100	56(11.2)	125(25.1)	75.70	<0.001

their participation and assured of the confidentiality and anonymity of the data obtained from them.

Analyses methods

Data obtained were double entered into SPSS version 22 and cleaned. The socio-demographic variables were summarised using descriptive statistics (frequency and percentage) and presented with tables and graphs. The quantitative variables were summarised with mean (standard deviation) and median (range). Chi-square test and odd ratio (bivariate analysis) were used to test the relationship between the dependent, for example, the prevalence of antibacterial drugs use, and independent variables, for example, socio-demographic factors. Binary logistic regression (multivariate analysis) was used to determine the predictors of antibacterial drugs use. The level of significance was set at 5%.

Results

Sociodemographic characteristics

One thousand and twenty individuals were interviewed but 999 questionnaires could be analyzed due to missing data and inconsistencies in the remaining 21 questionnaires. There were 501(50.2%) respondents from rural communities. The male to female ratio of the respondents was 1:2.1, and the mean age (rural vs urban) was 38.1 ± 15.3 vs 38 ± 15.0 years[p=0.81]. Table 1 shows other sociodemographic characteristics of the respondents in the rural and urban communities. The median(range) monthly income (rural vs urban) of the respondents was N18000.00 (N2000- N 500000) vsN30000.00(N1200-500000) (p<0.0001).

The Pattern of Antibacterial drugs use within the Communities

Table 2 shows the prevalence of antibacterial use among the respondents in rural and urban communities. Penicillin was the most common class of antibacterial used, with ampicillin plus cloxacillin (ampiclox^{R}), being the most commonly used antibacterial by the respondents in both the rural and urban communities respectively, 94(43.5%) vs 126(53.2%)[p=0.04] [Table 2]. "Nonspecific infections" 185(35.5%) was the most common indication for antibacterial agents used by the respondents [Table 3].

Table 2. Pattern and Categories of the Antibacterial drugs used by the respondents in the rural and urban communities of Oyo State

Pattern and Categories of the Antibacterials	Rural Frequency (%)	Urban Frequency (%)
Prevalence of antibacterials use		
Lifetime use	240(47.9)	234(47.0)
Current use	109(21.8)	108(21.7)
Past use	129(25.8)	125(25.1)
Categories of antibiotics used		
Penicillins/Penicillins combinations	147(68.1)	188(79.4)
Ampicillin/Cloxacillin (Ampiclox^{R})	94(43.5)	126(53.2)
Ampicillin	16(7.4)	40(16.9)
Amoxicillin	32(14.8)	18(7.6)
Amoxicillin and Clavulanate	4(1.9)	4(1.7)
Penicillin	1(0.4)	0(0)
Sulfonamides	18(8.3)	13(5.5)
Trimethoprim/sulfamethoxazole(Co-trimoxazole)	18(8.3)	13(5.5)
Tetracyclines	12(5.6)	5(2.1)
Tetracycline	11(5.2)	4(1.7)
Doxycline	1(0.4)	1(0.4)
Quinolones	4(1.9)	11(4.6)
Ciprofloxacin	4(1.9)	9(3.8)
Ofloxacin	0(0)	2(0.8)
Macrolides	1(0.4)	5(2.1)
Erythromycin	1(0.4)	3(1.3)
Kitasamycin (Leucomycin^{R})	0(0)	2(0.8)
Others	34(15.7)	15(6.3)
Chloramphenicol	1(0.4)	5(2.1)
Metronidazole	33(15.3)	10(4.2)
Total	216(100.0)	237(100)

Table 3: Conditions/symptoms for which the respondents took the antibacterials

Conditions/Symptoms	Frequency (%)
Abdominal/Gastrointestinal	
Abdominal pain	27(5.2)
Appendicitis	29(0.4)
Dysentery diarrhea	15(2.9)
Peptic ulcer	11(2.1)
Worm	8(1.5)
Dental	
Teeth pain	9(1.7)
Ear, Nose and Throat	
Ear Infection	12(2.3)
Sore throat	14(2.7)
Fever	
Fever	12(2.3)
Malaria	23(4.4)
Typhoid	20(3.8)
Gynaecological/Urinary Tract	
Childbirth	4(0.8)
Dysuria/UTI	13(2.5)
Toilet disease/STI	16(3.1)
Miscarriage	5(1.0)
Musculoskeletal	
Body pain	14(2.7)
Injury/wound	10(1.9)
Respiratory Tract	
Cough/catarrh	37(7.1)
Psychological	
Stress	12(2.3)
Skin	
Acne(pimples)	4(0.8)
Body rashes/itching	37(7.1)
Boil	27(5.2)
Others	
Infection*	185(35.5)
Surgery	4(0.8)
Total	521(100)

**nonspecific*
UTI-Urinary Tract Infection, STI-Sexually Transmitted Infection

Prescribers and sources of drugs acquisition by the respondents

Figure 1 shows the initiators of antibacterial drugs used by the respondents; the majority was based on self-prescription in both the rural and urban communities. Patent Medicine Stores were the major source of antibacterial used by the respondents (Figure 2).

Factors associated with drug use by the respondents

Tables 4 and 5 show factors associated with lifetime use, current and past use of antibacterial. The factors that were significantly associated with lifetime use of antibacterial were age, educational level and chronic medical illness. Gender and educational level were found to be significantly associated with the current and past use of antibacterial.

Predictors of medical drugs use

Table 6 shows the predictors of lifetime, current and past antibacterial use among the respondents. Among the respondents, the only factor that was a predictor of current and past use of antibacterial was educational level.

Discussion

Antibacterial agents are lifesaving medications that must be protected from inappropriate use. AMR is very common and is threatening the global health success recorded in the treatment of infectious diseases since the discovery by Alexander Flemings [4, 37]. In this study, we report a high prevalence of inappropriate antibacterials use, mostly self-prescribed and obtained from the patent medicine stores.

The prevalence of inappropriate antibacterial drugs use in this study was high but lower than what has been reported in some other parts of Nigeria. A prevalence of 57.8% inappropriate antibacterials use was reported by Esimone *et al.* in South-eastern Nigeria [28], 86% by Badger-Emeka *et al*. in Nsukka [30], 49.3% by Osemene and Lamikanra in Ile-Ife [29], 65% by Enato and Uwaga in Port Harcourt [26], while Israel *et al.* reported 93.9% of antibacterial self-medication among civil servants in Uyo, South-southern Nigeria [38]. The sociodemographic characteristics of the respondents and the fact that other studies were mostly conducted in the premises of the community pharmacies, medicine retail outlets and around tertiary institutions may account for the observed differences. However, Auta *et al.* in Jos, North-central Nigeria, reported 22.3% of inappropriate antibacterial use, which is similar to our findings [27]. High rate of inappropriate use of antibacterials have been reported in other countries. For example, Biswas *et al.* in Bangladesh reported 26.7% [39] and Abasaeed in Abu Dhabi, United Emirate obtained 46% [40] prevalence of current antibiotics used but different pattern of antibiotics used. Similarly, in a study that involved 1200 general education teachers who accessed antibacterials through the community pharmacies in three Countries of Western and Central Asia, the prevalence of non-prescription antibacterials used ranged from 48% in Saudi Arabia to 78% in Yemen and Uzbekistan [41]. This inappropriate use of antibacterials is a driver of

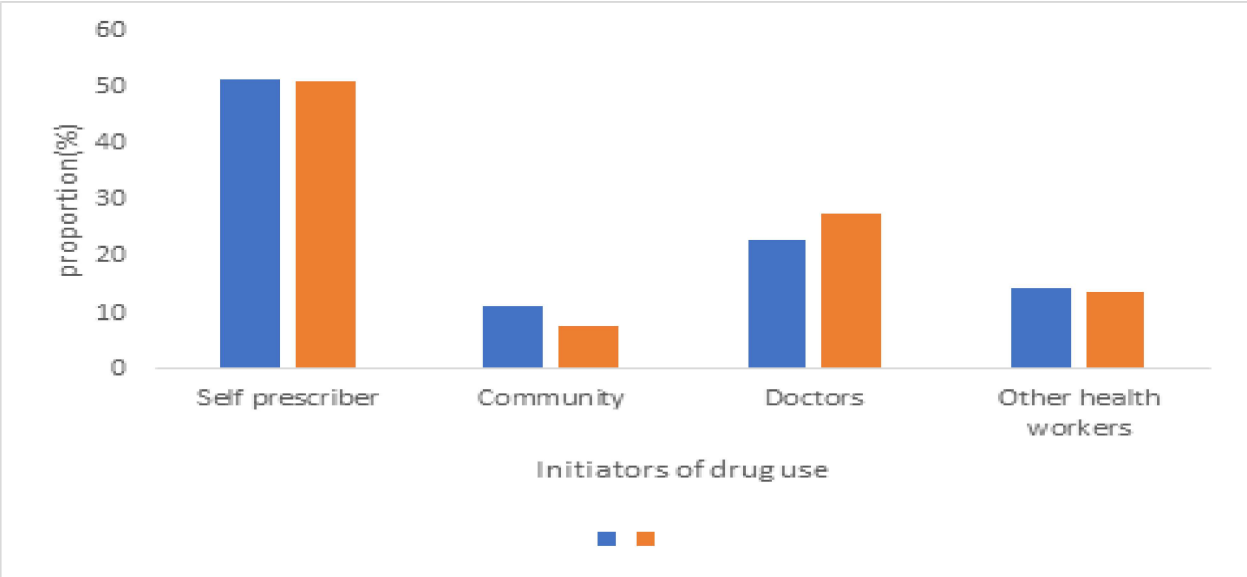

Fig. 1: Initiators of antibacterials use by the respondents in the rural and urban communities, Oyo State

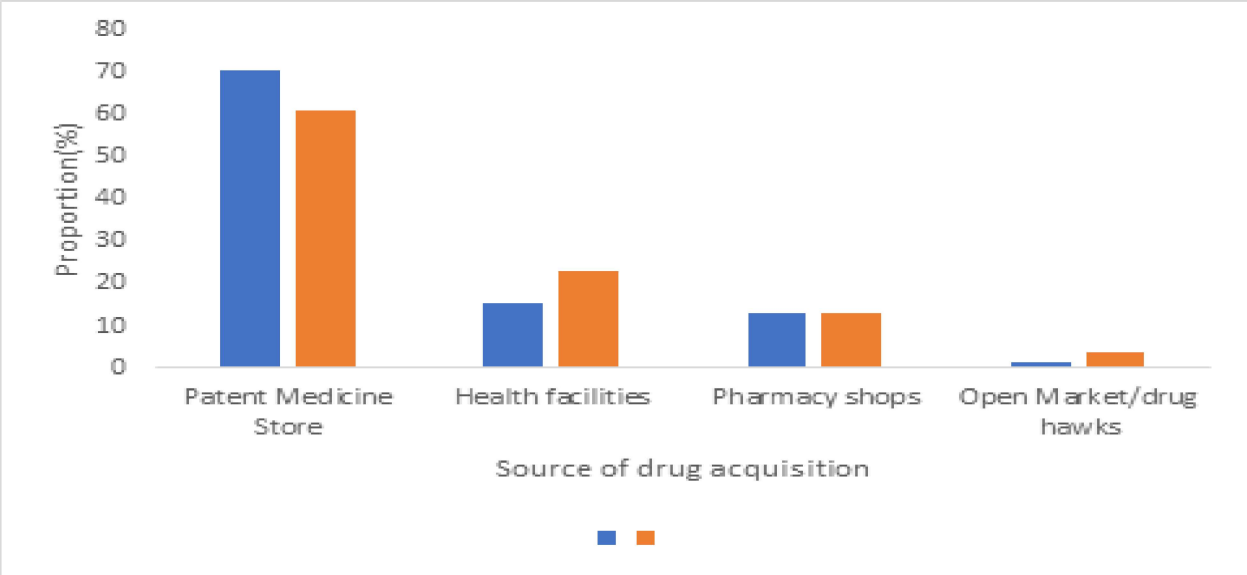

Fig. 2: Sources of antibacterials acquisition by the respondents in the rural and urban communities, Oyo State

selection pressure that has been documented as an important factor increasing AMR globally [42].

The use of antibacterials was mostly premised on the presumption of infective illnesses, and the penicillins were the most commonly used antibacterials class. Ampicillin/cloxacillin (Ampiclox^{R}) was the most commonly used of the penicillins in this study. This is similar to a report by Israel *et al.*in a study conducted among 471 Civil Servants in Uyo, Nigeria[38]. Ampicillin/cloxacillin is more effective than ampicillin, another commonly used antibacterial in this study. While ampicillin alone is highly vulnerable to the beta-lactamase producing organisms, the addition of cloxacillin (beta-lactamase resistant) to ampicillin make Ampicillin/cloxacillin marginally more effective. Although this explanation may not be known by the respondents, but perhaps, this may partly explain the common use and findings in this study. However, amoxicillin was reported to be the most commonly used antibiotics in some developing countries like Ethiopia [43, 44], Uganda [45], Romania [46], Guatemala [47], Mongolia [23] and Indonesia [48]. We reported amoxicillin to be the third commonly used penicillin after ampicillin/cloxacillin, and ampicillin in this study. Another commonly inappropriately used antibacterial in this study was cotrimoxazole. Although the study did not assess the

Table 4: Factors associated with lifetime antibacterial use by the respondents in Oyo State

Variables	Lifetime use of antibacterials			
	Total No	Lifetime Use (%)	COR Ratio (95% CI)	p value
Gender				
Male	319	144(45.1)	0.9(0.7, 1.1)	0.342
Female	680	330(48.5)		
Age				
<65 years	920	447(48.5)	1.8(1.1, 3.0)	0.014
>65 years	79	27(34.2)		
Married or living with a partner				
Yes	740	358)48.4)	1.2(0.9,1.5)	0.347
No	259	116(44.8)		
Residence				
Rural	501	240(47.9)	1.0(0.8,1.3)	0.800
Urban	498	234(47.0)		
Education Level				
Completed Secondary School	618	327(52.9)	1.8(1.4, 2.3)	<0.001
Not Completed Secondary School	381	147(38.6)		
Average Monthly Income				
≥#25000	503	236(46.9)	1.0(0.8, 1.2)	0.752
<#25000	496	238(48.0)		
Medical illness				
Yes	103	61(59.2)	1.7(1.1, 2.6)	0.010
No	896	413(46.1)		
Presence of Health Facility				
No	111	46(41.4)	0.8(0.5, 1.1)	0.191
Yes	888	428(48.2)		
Distance of Health facilities to Respondents' house				
<5 km	568	284(50.0)	0.7(0.5,1.0)	0.061
>5km	206	119(57.8)		
Perception of risk				
High risk	488	245(50.2)	1.2(1.0, 1.6)	0.099
Low risk	511	229(44.8)		

COR-Crude Odd Ratio

occurrence of ADRs among the respondents, cotrimoxazole use is an important aetiological factor for severe ADRs including Steven-Johnson Syndrome and Toxic Epidermal Necrolysis (SJS/TENs). Co-trimoxazole was the most common antibacterial agent implicated as an aetiological agent of SJS/TENs in a study among four sub-Saharan African countries [49]. Apart from the possibility of ADRs, continuing inappropriate use of co-trimoxazole may also predispose to increasing resistance, and hence, increase morbidity and mortality among people living with HIV/AIDs (PLWHA).This is because co-trimoxazole is an important chemoprophylactic drug among PLWHA. In view of easy access, and the fact that diarrhoeal diseases are more rampant in rural communities may explain the use of metronidazole and tetracyclines more in the rural than in the urban communities. In rural areas, the duo are erroneously use in the management of non-infectious diarrhoea, as against recommended Oral Rehydration Therapy (ORT) [50].

More worrisome were indications for the use of antibacterial among the study population. Reasons offered by respondents for use of antibacterial include non-specific conditions and non-bacterial causes including the so-called "blood infections", upper respiratory tract infection, diarrheal diseases, malaria, among others. Although with little variations, these conditions had been reported by previous studies in developing countries of the world

Table 5. Factors associated with current and past antibacterials use in Oyo State

Variables	Current use of antibacterials				Past use of antibacterials		
	Total No.	Current Use (%)	COR (95% CI)	p value	Past Use (%)	COR (95% CI)	p value
Gender							
Male	141	53(37.6)	0.6	0.020	88(62.4)	1.6	0.020
Female	330	164(49.7)	(0.4,0.9)		166(50.3)	(1.1,2.5)	
Age							
<65 years	445	201(45.2)	0.5	0.110	244(54.8)	1.9	0.110
>65 years	26	16(61.5)	(0.2,1.2)		10(38.5)	(0.9,4.4)	
Married or living with a partner							
Yes	353	159(45.0)	0.9	0.457	194(55.0)	1.2	0.457
No	118	58(49.2)	(0.6,1.3)		60(50.8)	(0.8,1.8)	
Residence							
Rural	238	109(45.8)	1.0	0.927	129(54.2)	1.0	0.927
Urban	233	108(46.4)	(0.7,1.4)		125(53.6)	(0.7,1.5)	
Education Level							
Completed Secondary Sch	328	141(43.0)	0.7	0.045	187(57.0)	1.5	0.045
Not Completed Secondary Sch.	143	76(53.1)	(0.5,1.0)		67(46.9)	(1.0,2.2)	
*Average Monthly Income*e							
>25000	231	107(46.3)	1.0	0.927	124(53.7)	1.0	0.927
<25000	240	110(45.8)	(0.7,1.5)		130(54.2)	(0.7,1.4)	
Medical illness							
Yes	64	35(54.7)	1.5	0.141	29(45.3)	0.7	0.141
No	407	182(44.7)	(0.9,2.5)		225(55.3)	(0.4,1.1)	
Presence of Health Facility							
No	46	22(47.8)	1.1	0.877	24(52.2)	0.9	0.877
Yes	425	195(45.9)	(0.6,2.0)		230(54.1)	(0.5,1.7)	
Distance of Health facilities to Respondents' house							
<5 km	284	138(48.6)	1.5	0.099	146(51.4)	0.7	0.099
>5km	117	46(39.3)	(0.9,2.3)		71(60.7)	(0.4,1.1)	
Perception of risk							
High risk	247	113(45.7)	1.0	0.926	134(54.3)	1.0	0.926
Low risk	224	104(46.4)	(0.7,1.4)		120(53.6)	(0.7,1.5)	

COR-Crude Odd Ratio

as the reasons for the inappropriate use of antibacterial agents [39, 41, 44].

Elderly people had a lower probability of lifetime use of antibacterials in this study. The fact that the majority of our respondents were less than 65 years of age may be an important reason for our findings. Similar to our findings, studies have reported higher inappropriate antibacterial agents use among people in younger age groups in Ethiopia [43], Portugal [51], Kalamoon, Syrian Arab [52] and Jordan [17]. In contrast, studies have reported increasing age to be correlated with increased odd of antibacterials self-medication [18, 53, 54].

This study reported an increased probability of lifetime use of antibacterial agents among the respondents with chronic medical illnesses. Some chronic medical illnesses may predispose people to recurrent infections or perceived symptoms of infections and hence increase antibacterials use. For example, people with diabetes mellitus are prone to recurrent infections, and this may increase both self-prescribed and physician prescribed antibacterials use. Carrasco-Garrido*et al* reported chronic illness as one of the predictors of medication use [55].

Low level of education was a predictor of antibacterial use among the respondents as those who did not complete secondary school were 1.7 times more likely to use antibacterial agents inappropriately than those who had completed secondary school. Individuals with a higher level of education are known to exhibit

Table 6. Predictors of antibacterial drugs use by respondents in Oyo State

Antibacterial drugs use Pattern	Variables	Categories	Adjusted odd ratio (95% CI)	p-value
Lifetime Antibacterial drugs use	Educational level (ref= completed secondary School)	Yes No	1.7 (1.3,2.3)	<0.001
	Age (ref= <65years)	Yes No	1.7(1.1,2.9)	0.043
	Chronic Medical illness(ref=Yes)	Yes No	2.0(1.3,3.0)	0.002
	Perception of risk (ref=high risk)	Yes No	1.2(0.9, 1.6)	0.150
Current Antibacterial drugs use	Gender (ref=male)	Yes No	0.8(0.6, 1.1)	0.800
	Age (ref= <65years)	Yes No	0.7(0.4, 1.2)	0.183
	Educational level (ref= completed secondary School)	Yes No	1.7(1.3, 2.3)	<0.001
	Perception of risk (ref=high risk)	Yes No	1.2(0.95, 1.6)	0.116
Past Antibacterial drugs use	Gender (ref=male)	Yes No	1.2(0.9, 1.6)	0.185
	Age (ref= <65years)	Yes No	1.4(0.9, 2.3)	0.188
	Educational level (ref= completed secondary School)	Yes No	0.6(0.4, 0.8)	<0.001
	Perception of risk (ref=high risk)	Yes No	0.8(0.6,1.0)	0.103

positive behaviours that may promote the rational use of medicine [16-19].

This study did not observe location as a determinant of inappropriate antibacterial agents use among our respondents as there was no significant difference between the rural and urban dwellers in the respective parameters. In addition to access to health facilities, urban dwellers may be influenced by a number of factors including availability of relevant information, habits and (negative) lifestyles, fund availability etc. On the other hand, rural dwellers may encounter poor access to health facilities, lack/difficult access to relevant medical information, etc. In either of the two circumstances, an individual may seek 'solution' to any perceived ailment by engaging in self-medication in addition to other options. However, while there may be the possibility of conflicting findings on the effects of locations on inappropriate antibacterial agents use, most studies reported a higher prevalence of inappropriate antibacterial agents use in the rural areas [19, 22, 51, 56].

An important limitation of our study was recall bias since it relied on information given by the respondents on the past use of antibacterials. Apart from forgetfulness, some respondents may not have provided true responses to some sensitive questions especially as it relates to prescription-only medications. Therefore, the prevalence reported in this study may be lower or higher than the actual prevalence of antibacterials used. However, the training of the research assistants, and uses of close-ended questions as much as possible, would have reduced recall bias in this study. Though not expected to have much effect on the study, the respondents who live in the rural communities but work in the urban communities might have given responses that may be similar to those in the urban communities. Poor identification of drugs used may be a limitation since they were mostly obtained from the patent medicine vendors.

The strengths of our study included the sample size and the fact that it was conducted in the rural and urban communities at the household level. It reported a better understanding of the inappropriate use of antibacterial agents in the communities. In addition, it highlighted the determinants of inappropriate antibacterials use and justified the need and how to direct the behavioural intervention.

In conclusion, the prevalence of inappropriate antibacterials use was high among the respondents. A similar pattern of antibacterials use was reported in the rural and urban communities, with the majority of antibacterial agents used been self-prescribed and obtained mainly from the patent medicine stores. Predictors of antibacterial agents use were age, educational level and chronic medical illness.

The recommendations include educational interventions aiming at behavioural modification for the public, and effective legislative strategies including the prohibition of sales of antibacterial agents without a prescription. Incorporation of patent medicine stores into the existing primary health care for proper monitoring of their practices is also suggested.

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Prevalence of cervical enamel projections on extracted teeth and their relationships with the reason for tooth extraction in a Nigerian population

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Abstract

Background: cervical enamel projections are considered to be a possible risk factor for the progression of periodontal disease into the furcation area in multi-rooted teeth. This is more likely as enamel projections lack true attachment, which exist between the alveolar bone and cementum, facilitated by periodontal ligament.

Objectives: To determine the prevalence of cervical enamel projections (CEP) in extracted teeth and compare this with two major indications for tooth extraction, dental caries and periodontal disease.

Methodology: Teeth extracted as a result of either periodontal disease or carious lesion at the Oyo State Government dental center Dugbe and the University College Hospital dental centre, both in Ibadan, Oyo State were collected and used for the study. Teeth were preserved in 10% formalin immediately after extraction and later soaked in a mixture of hydrogen peroxide and hypochlorite for 30 minutes before rinsing and autoclaving. Extracted teeth were then examined for the presence of CEP and the prevalence of CEP was compared based on the indication for tooth extraction.

Results: A total of 210 teeth were assessed, majority 24.8% being the upper left second molar and most of the teeth were extracted because of caries (63.3%). Eight of the teeth were found to have CEP, giving a prevalence rate of 3.8%. CEP was found to be present in 5 (3.8%) of the teeth extracted due to caries and in three teeth (3.9%) extracted due to periodontal disease.

Conclusion: The decision to surgically remove CEPs should be based on a careful assessment of individual cases as the number of teeth extracted due to carious lesion that had CEPs was the same more than that extracted as a result of periodontal disease.

Keywords: *Enamel projection, periodontal disease, dental caries, extracted teeth.*

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Résumé

Contexte: Les projections d'émail cervical sont considérées comme un facteur de risque possible de progression de la maladie parodontale dans la zone de furcation des dents à racines multiples. Cela est plus probable car les projections d'émail manquent de véritable attachement, qui existe entre l'os alvéolaire et le cément, facilité par le ligament parodontal.

Objectifs: Pour déterminer la prévalence des projections d'émail cervical (PEC) dans les dents extraites et les comparer avec deux indications principales pour l'extraction dentaire, la carie dentaire et la maladie parodontale.

Méthodologie: Des dents extraites à la suite d'une maladie parodontale ou d'une lésion carieuse au centre dentaire du gouvernement de l'État d'Oyo Dugbe et au centre dentaire du Collège Hospitalier Universitaire, toutes deux à Ibadan, dans l'État d'Oyo, ont été collectées et utilisées pour l'étude. Les dents ont été conservées dans du formol à 10% immédiatement après l'extraction et ensuite trempées dans un mélange de peroxyde d'hydrogène et d'hypochlorite pendant 30 minutes avant le rinçage et l'autoclavage. Les dents extraites ont ensuite été examinées pour la présence de PEC et la prévalence de PEC a été comparée sur la base de l'indication de l'extraction dentaire.

Résultats: Un total de 210 dents a été évalué, la majorité 24,8% étant la deuxième molaire supérieure gauche et la plupart des dents ont été extraites en raison de caries (63,3%). Huit des dents avaient une PEC, ce qui donne un taux de prévalence de 3,8%. La PEC s'est révélée être présente dans 5 (3,8%) des dents extraites en raison d'une carie et dans trois dents (3,9%) extraites en raison d'une maladie parodontale.

Conclusion: La décision de retirer chirurgicalement les PECs doit être basée sur une évaluation minutieuse des cas individuels car le nombre de dents extraites en raison d'une lésion carieuse qui avait des PECs était le même que celui extrait à la suite d'une maladie parodontale.

Mots-clés: *Projection de l'émail, maladie parodontale, carie dentaire, dents extraites* .

Introduction

Periodontal health has been defined by Lang and Bartold, as a state free from inflammatory periodontal disease that allows an individual to function normally and not suffer any consequences (mental or physical) as a result of past disease [1]. The authors further simplified the definition for practical clinical management of periodontal diseases, and periodontal health can be defined as a state free from inflammatory periodontal disease [1].On the other hand, periodontitis can be defined as a chronic multifactorial inflammatory disease associated with dysbiotic plaque biofilms and characterized by progressive destruction of the tooth-supporting apparatus [2].

The major features of the disease are clinical attachment loss, deepening of the gingival sulcus leading to periodontal pocket formation and bleeding on gentle probing. The disease is also associated with alveolar bone loss, which is assessed by the use of radiographs [2]. Gingivitis and periodontitis are considered as inflammatory conditions of infectious nature [3]. The primary aetiologic factor of periodontal disease is considered to be bacteria within dental plaque, which is a biofilm that accumulates on non-shedding hard surfaces and shedding soft tissue surfaces within the mouth [3-6]. The bacteria are believed to cause periodontal disease directly by the release of noxious substances that can degrade periodontal tissues and also indirectly by stimulating host immune-inflammatory response [3,5].

One of such cases is A*ggregatibacter Actinomycetemcomitans* (Aa) that produces leukotoxin, which causes apoptosis of leucocytes, the first line of host defense against bacterial invasion [3]. Lipopolysaccharide (LPS) is also produced by Gram negative bacteria, and it causes an increase in cytokine release from polymorphonuclear leucocytes, macrophages and fibroblasts [3].There are other factors that are considered to be secondary, but are important for the progression of periodontal disease. Some of these factors are local to the affected teeth and are considered important in the accumulation of dental plaque, which will eventually initiate the inflammatory change. These factors include oral hygiene, tooth positioning, tooth anatomy, calculus and smoking. Factors that are considered to be part of the tooth anatomy include cervical enamel projection (CEP), lingual grooves, root depressions and furcations [7].

These factors are considered to provide stagnation areas, which encourage accumulation, maturation and calcification of plaque without the patient being able to effectively remove it [6].If this assertion is true, then it can be assumed that teeth with these local factors will be more prone to periodontal disease, but this needs to be scientifically proven through studies. If this assertion is proven, then surgical removal of CEPs in order to prevent progression of periodoontal disease may then be justified [8]. Therefore, this study was to determine the prevalence of CEPs in relations to the indication for the extraction of such teeth.

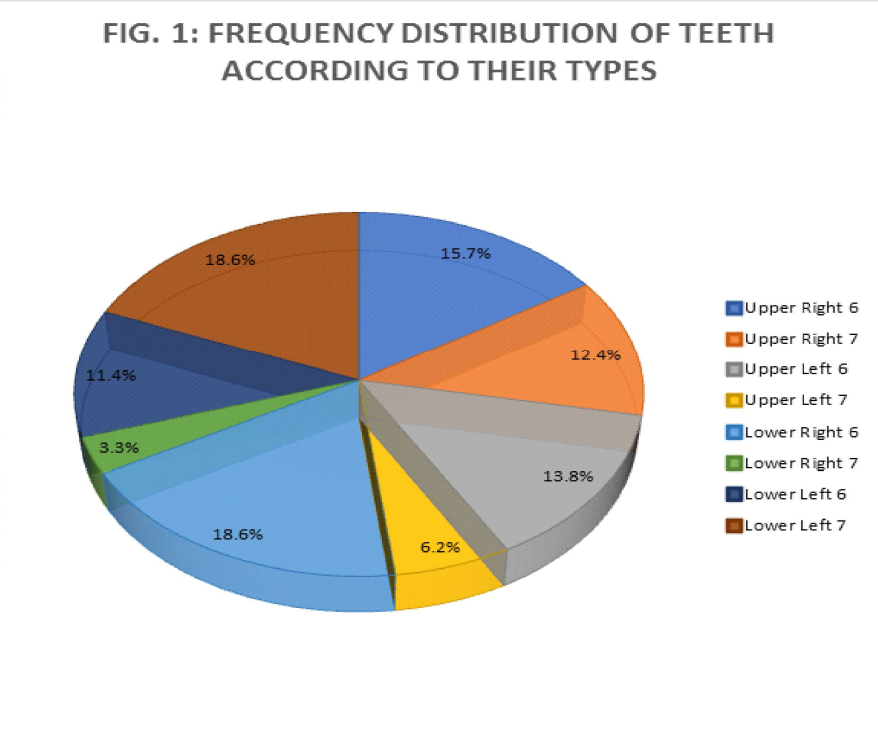
Material and methods

Extracted teeth were collected from two locations, Oyo State Hospital Management Board (OSHMB) Dental Centre, Dugbe, Ibadan and the out-patient section of the Department of Oral and Maxillofacial Surgery of the University College Hospital, Ibadan, Nigeria. Sample size was calculated to be 165 through the use of the computer program for Epidemiologic Analysis. The computer-based programming utilized a formula derived by Armitage and Berry [9]. Using the study of Oginni [10] on causes and pattern of tooth loss as reference, prevalence of extraction of teeth was considered as 12.3%. Deciduous teeth, teeth extracted as a result of other indications apart from periodontal disease or carious lesion or its sequelae, third molars and grossly mutilated teeth whose furcation areas were affected by the destruction of the crown were all excluded from the study. Ethical approval was sought and obtained from the UI/UCH ethical review board (UI/EC/17/0367) for the use of extracted teeth in this study.

Extracted multirooted teeth from the two dental facilities were collected and preserved in 10% formaline immediately after extraction and later soaked in a mixture of 10% hydrogen peroxide and 10% hypochlorite and 80% water for 30 minutes before rinsing and autoclaving. Each of the teeth was then examined for completeness of the furcation areas and the presence or absence of cervical enamel projections, which was considered to be present if there is a portion of enamel dipping towards the furcation area from the cemento-enamel junction (CEJ). Any observed calculus in the furcation area was manually removed using a scaler.

Statistical analysis

Collected data was entered into a personal computer and analysis done using Statistical Package for Social Sciences Inc (IBM SPSS Statistics 23). Data was presented in frequency tables and charts. Cross tabulation was used to compare the presence of CEP with the indication for extraction of the teeth, whether carious lesion or periodontal disease and



with the affected jaw, maxilla or mandible. Statistical significance was considered at $p < 0.05$.

Results

Two-hundred and ten teeth were collected and assessed for the presence of cervical enamel projection. The teeth consisted of 39 (18.6%) lower left second molars, 39 (18.6%) lower right first molars and 33 (15.7%) upper right first molars (Fig. 1). For ease of reporting, the teeth were broadly grouped together into upper (101/210) and lower (109/210) molars. The majority of the assessed teeth were extracted due to carious lesion (63.3%), which consisted of 57/133 upper molars and 76/133 lower molars. The remaining 77/210 (36.7%) were extracted as a result of periodontal disease (Table 1).

There were only eight (3.8%) of the extracted teeth that had cervical enamel projections, which were equally distributed between the lower and upper molars in the ratio 1:1. The remaining 202/210 (96.2%) had no enamel projection (Table 2). There were more teeth extracted as a result of caries (5/133) that had cervical enamel projections compared with those that were extracted due to periodontal disease (3/77), with a ratio of 1.7:1 (Table 3). There was no statistically significant relationship when the presence of CEP was compared withthe indication for extraction of the teeth and also with the affected jaw.

Table 1: Frequency distribution of teeth according to the reasons for their extraction

		Reasons for extraction		Total
		Carious lesion	Periodontal disease	
Type of teeth	Upper Molars	57	44	101
	Lower Molars	76	33	109
Total		133	77	210

p-value = 0.032, X^2 = 1,438

Discussion

Most of the assessed teeth were extracted secondary to carious lesion and its sequelae, which is in line with previous studies that had reported that more teeth are lost due to carious lesions than periodontal disease among Nigerians [11-13]. This is in contrast with previous studies that have reported a higher prevalence of tooth loss secondary to periodontal

Table 2: Frequency distribution of tooth type based on the presence of cervical enamel projections

		Cervical enamel projections		Total
		Present	Absent	
Type of teeth	Upper molars	4	97	101
	Lower molars	4	105	109
Total		8	202	210

P-value = 0.596, $X^2 = 0.369$

Table 3: Comparisons of reasons for teeth extraction with the presence of cervical enamel projection on the teeth

		Reasons for extraction		Total
		Carious lesion	Periodontal disese	
Cervical enamel projections	Present	5	3	8
	Absent	128	74	202
Total		133	77	210

P-value = 0.614, $X^2 = 0.861$

Fig. 2: A clinical photograph of an upper molar showing cervical enamel projection

disease than that which is due to caries [14,15]. Another possibility which could be responsible for this trend may be that many of the affected patients may either be presenting late, which preclude the possibility of routine restorative procedure in order to salvage the carious teeth or that the patients could not afford the cost of restorative procedure. The effect of cost of restorative procedure may be reduced through the health insurance scheme, which is gradually becoming more popular in the country and may help in reducing number of teeth lost due to carious lesions if more people enroll. These reasons are presumptuous and will need to be looked into through another study.

There was no jaw predilection in the distribution of the CEP, which is contrary to earlier studies that reported that mandible had higher incidence of CEPs compared with the maxilla [16-18]. Bhusari *et al* [17], reported that the prevalence of CEPs in the mandible was twice that found in the maxilla, while in this study there were the same number of CEPs in both the mandible and the maxilla. This could have been due to the differences in the population under study as Bhusari *et al* studied Indians, while the study by Zee and Bratthall [16], was conducted among Swedish population compared to this study that was carried out among Africans. Presumptuously, the difference may be considered as being due to anatomic or genetic variations, but a comparative study is necessary to confirm this assertion.

There were more teeth extracted as a result of carious lesion that had CEPs as those extracted as a result of periodontal diseases. This suggests that CEPs do not necessarily worsen the progression of periodontal diseases as earlier reported, which is contrary to previous studies [18,19]. Previous studies reported that CEPs contribute to initiation and progression of periodontal diseases, which if totally

true would have meant that more of those teeth extracted due to periodontal diseases would have had CEPs. It is possible that CEPs majorly contribute to the progression of the disease and not necessarily the initiation, which if it does, will make the rate of progression of periodontal disease worse in teeth with CEPs [7]. This is most likely the case as most, if not all cases of CEPs, are sub-gingivally located until exposed by gingival recession. Another reason that may be adduced could be due to the fact that prevalence of periodontal disease had been reported to be higher amongst Nigerians by previous studies, which did not take the prevalence of CEPs into consideration [15]. This may then mean that with or without CEPs periodontal disease prevalence is higher among Nigerians due to some other factors. The clinical implication of this finding is that the mere presence of CEPs among Nigerians might not be enough indication for surgical intervention, each case should be thoroughly assessed for merit and demerit before concluding on surgical intervention to eliminate CEPs in the bid to prevent periodontal disease progression.

Conclusion

The decision to surgically remove CEPs should be based on a careful assessment of individual cases as the number of teeth extracted due to carious lesion that had CEPs was more than that extracted as a result of periodontal disease.

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Pain perception and patients satisfaction with pain management among Caesarean section patients in Oyo State, Nigeria

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Abstract

Background: Post-operative pain remains one of the most prevalent problems in health care today. Post-Caesarean section pain is a common cause of acute pain in obstetrics, but pain relief and patient satisfaction are still inadequate in many cases because of under-recognition.

Purpose: This study assessed pain perception and patient's satisfaction with pain management among patients who had undergone caesarean section in selected hospitals in Oyo State, Nigeria.

Methods: This was a cross-sectional study conducted among 150 purposively selected patients who underwent Caesarean Section. Using a structured questionnaire, data was collected over a period of 4 weeks. Descriptive statistics and Chi square test were used to present the data on perception and satisfaction with post-operative pain management among the patients.

Results: The findings of the study showed that 46.0% of the respondents reported moderate level of pain after caesarean section, 79.3% reported that family and spouse support provided succour for pain while 52.0% disclaimed the assertion that negative attitude of health team had effect on pain perception., However, 60.0% were satisfied with the level of pain management,

Conclusion: The study concluded that there was a moderate level of pain perception among post caesarian patients and they were satisfied with the their pain management approach while family and spousal supports were major factors influencing pain perception among Caesarean section patients.

Keywords: *Patient; pain perception; pain satisfaction; caesarian section*

Résumé

Contexte : La douleur postopératoire demeure l'un des problèmes les plus courants dans les soins de santé aujourd'hui. La douleur post-césarienne est une cause fréquente de douleur aiguë en obstétrique, mais le soulagement de la douleur et la satisfaction des patientes sont encore insuffisants dans de nombreux cas en raison d'une sous-reconnaissance.

Objectif: Cette étude a évalué la perception de la douleur et la satisfaction des patients à l'égard de la gestion de la douleur chez les patients qui ont subi une césarienne dans certains hôpitaux de l'État d'Oyo, au Nigéria.

Méthodes: Il s'agit d'une étude transversale menée auprès de 150 patientes sélectionnés intention nellement qui ont subi une césarienne. À l'aide d'un questionnaire structuré, les données ont été recueillies sur une période de 4 semaines. Des statistiques descriptives et un test du chi carré ont été utilisés pour présenter les données sur la perception et la satisfaction à l'égard de la gestion de la douleur postopératoire chez les patientes.

Résultats: Les résultats de l'étude ont montré que 46,0% des répondantes ont signalé un niveau modéré de douleur après une césarienne, 79,3% ont déclaré que le soutien de la famille et du conjoint a fourni un secours à la douleur tandis que 52,0% ont réfuté l'affirmation selon laquelle l'attitude négative de l'équipe de santé a un effet sur la perception de la douleur. Cependant, 60,0% étaient satisfaites du niveau de gestion de la douleur.

Conclusion: L'étude a conclu qu'il y avait un niveau modéré de perception de la douleur chez les patientes post-césariennes et elles étaient satisfaites de leur approche de gestion de la douleur tandis que les soutiens familiaux et conjugaux étaient les principaux facteurs influençant la perception de la douleur chez les patientes ayant subi une section césarienne.

Mots-clés: *Patient; Perception de la douleur; Satisfaction de la douleur; Section césarienne*

Introduction

Pain is an experience which is ubiquitous yet at the same time quintessentially subjective. It is influenced by an incredible array of contextual factors including those in the spiritual, social, cultural, cognitive, emotional and bio-medical domains [1]. It is a primary sensation that serves to protect the human organism against further damage from external and internal occurrences and International Association for the Study of Pain also opined that it is "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage" [2,3].

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Furthermore, caesarean section (C-section) is a surgical procedure used to deliver a baby through incisions in the abdomen and uterus and researchers appoint that C-section represent the main cause of chronic pain among women [4]. Also, it was estimated that immediate postoperative pain incidence rate after C-sections was of high intensity and women's perceived quality of pain were poor [5].

Globally, the prevalence of C-section pain ranges from 50% to 75% of postoperative pain encountered by patients [6]. While, in United Kingdom, it was reported that 30% was the case of postoperative pain [7].

However, in sub- Saharan Africa, there are variations in C-section pain prevalence reported from one place to another. In Kenya, a study conducted by [8] showed that 60% of patients experienced pain postoperatively.

Tanzania, the pain following surgery accounted for 40% of all postoperative complications at Muhimbili National Hospital [9]. While, in Nigeria, it was reported that 95% of C-section patients experienc04ed various degrees of Post-operative pain [10].

In furtherance, C-section section pain can cause harm to mother and child in the immediate postoperative period and unrelieved pain can result in negative consequences affecting patients' psychological, physiological functions and complications which may be fatal prolonged hospital stay [11].

Moreover, maternal mortality after C-section has been estimated to be between 5.81 and 6.1 per 100,000 procedures and pain has been at the epicenter, contributing to this mortality [12]. According to Sujata *et al* [13] they opined that post – Cesarean pain management involve the use of Opioids while Intrathecal morphine, supplemented by paracetamol and Non Steriodal Anti Inflammatory Drugs, remain the gold standard because of its somatic effect.

Furthermore, patient satisfaction with post C- section pain management is inadequate despite the fact that post C-section pain is a common cause of acute pain among several surgical-related pain and it is generally underestimated [14,15]

Further, healthcare facilities can routinely use patient satisfaction evaluations to identify methods of practice improvement and better care provision [16]. It can thus be stated that patients' satisfaction with post-operative pain management depends on a number of variables including patients' expectations, intensity of pain experienced, promptness of acute pain service response, effectiveness of treatment and health-care professionals' attitude.

Similarly, the American Pain Society in Quality Assurance Standards for relief of acute pain specifies that patient satisfaction with pain management must be surveyed in clinical practice[17].

Lucidly, patients' satisfaction is an increasing concern of several health institutions at present, though not being the only factor, one can say that pain control is a fundamental aspect to evaluate satisfaction with the treatment received [18]. In Nigeria, especially in the southwest, there is a dearth of information on assessment of pain perception and patients' satisfaction with pain management among caesarean section patients. Also, from anecdotal experience patient are at the receiving end and their voices are not heard. As a result health professionals tend to neglect the extent of pain perceived making C-section patients to wallow in pain because of the fear to approach health care providers.

Therefore, there is a need to assess the perception and patients' satisfaction with pain management among caesarean section patients.

Methodology

This study adopted a descriptive cross sectional design. Ethical approval was obtained from the Research, Ethical Committee of the State Ministry of Health. This study was carried out in post-natal and lying in wards of the Adeoyo Maternity Teaching Hospital and Ring Road State Hospital in Ibadan Oyo State.

Adeoyo Maternity Teaching Hospital Yemetu was founded in 1927 as a general hospital to manage medical, surgical, gynecological and obstetrical cases but in 1986, more emphasis were placed on maternity care.The hospital comprises ten wards with of two hundred and sixty five (265) bed capacity]. The hospital has two lying wards, the two wards occupy fifty beds together, [twenty eight and twenty two beds respectively] for both normal delivery and caesarean section patients. Ring Road State Hospital Ibadan, was founded in 1974. The hospital comprises twelve wards with total beds of 245. The post caesarean section ward in this hospital has twenty two beds. The target population was pregnant women that had under gone caesarean section in the selected hospitals. The total number of post caesarean from the two hospitals over four months was extracted from their records and was used as total population for the study. In Adeoyo Maternity Teaching Hospital, their records showed that they had 160 caesarean section patients over a

period of four months in this order: 36, 41, 38 and 45 while the record of St Peter general Hospital, Aremo showed that they had 60 caesarean section patients over a period of four months in this pattern: 15, 13, 14 and 18

The sample size was determined using Taro Yamane sample size calculation formula
N = N/1+N (e2), Where n= sample size, N= Total population, N= 220, e = sampling error (0.05). (Glenn D 2013)
= 142 Adding 5% non-response rate =150
Total sample size =150
Data for this study was collected by using a structured questionnaire consisting of four sections; Section A: explored sociodemographic characteristics of the respondents, Section B: consisted of item assessing patient's pain Section C: consisted of items assessing factors affecting pain perception among caesarean section patients and Section D: consisted of items assessing patients' satisfaction to pain management. These three sections were on five-point Likert scale as follows: Strongly agreed, Agreed, Disagreed, Strongly disagreed and Not sure.

Validity of the instrument was established through face and content validity while reliability of the Instrument was established through a pilot study and the instrument yielded a Cronbach Alpha coefficient of 0.645 and then adjudged suitable for use in its present form.

Data Collection was done between August and December 2017 after ethical approval had been obtained from the State Ministry of Health Research Ethic Committee and further permission from the authority of the selected hospitals. Informed consent was also obtained; participation was strictly voluntary and respondents were free to participate or not in the study.

Data was collected by trained research assistants (Registered nurses) using a face-to-face approach at the participant's bedside or in a convenient venue after a minimum of 24 hours after surgical intervention. Using visual analogue scale (VAS) scale with a horizontal 10-cm line which was interpreted as follows; No pain 0; Mild pain (1-3); Moderate pain (4-6) and Severe pain (7-10), the questionnaires, were administered to the respondents and they were allowed to answer the questions according to their opinion in order to elicit response on the research topic without any interference.

Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 20. Descriptive analysis (i.e. frequency count percentages, bar charts, mean and standard deviations) and inferential statistics (Chi-square test) with the level of statistical significance set at 0.05.

Results

Findings from the study revealed that a total of 150 women participated in the study. Table 1 presents demographic characteristics of the respondents. The ages of the respondents ranged from 15 to 49 years with a mean of 30.53 with and 28% of the participants were within the age range 25 and 29 years. Majority (90%) were married while level of education revealed that 31.3% had OND. Religious background showed that 58.7% were Christians while and a large majority (71%) was Yoruba and 27.3% were traders (Table 1). Table 2, showed that

Table 1: Socio-demographic characteristics

Variables (n=150)	Frequency	Percentage
Age group (in years)		
15-19	8	5.3
20-24	27	18.0
25-29	42	28.0
30-34	30	20.0
35-39	18	12.0
40-44	15	10.0
45-49	10	6.7
Range	15 to 49 years	
Mean (±SD)	30.53 ± 8.21 years	
Marital status		
Single	11	7.3
Married	135	90.0
Divorced	4	2.7
Religion		
Christianity	88	58.7
Islam	59	39.3
Others	3	2.0
Tribe		
Yoruba	107	71.3
Hausa	27	18.0
Igbo	16	10.7
Level of education		
Illiterate	14	9.3
Primary	19	12.7
Secondary	31	20.7
OND	47	31.3
HND & above	39	26.0
Total	150	100.0

46.0% of the participants reported a moderate pain following post caesarean section. Furthermore, findings revealed that majority (60%) of the participants were satisfied with the level of pain management as shown in figure 2. In addition, respondents reported that family support (88.7%) and spouse support (79.3%) were influential in pain

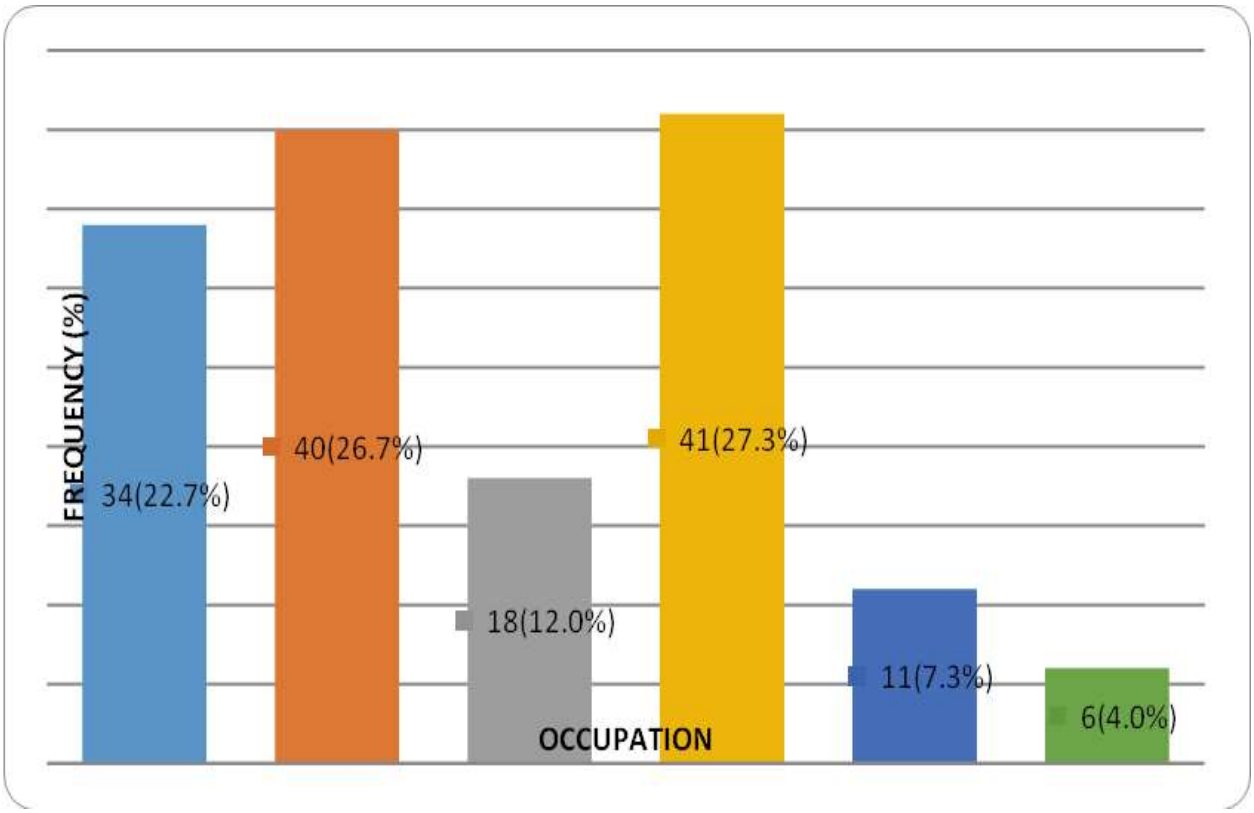

Fig.1: Occupation of the respondents showing

Table 2: Assessing the Level of Pain Perception among Respondents.

Statements (n=150)	No pain		Mild pain		Moderate pain		Severe pain	
	N	%	N	%	N	%	N	%
What was the likely level of your pain before the caesarean section	40	26.7	20	13.3	44	29.3	46	30.7
how severe was the level of pain perceived after caesarean section	6	4.0	54	36.0	69	46.0	21	14.0
Six hours after caesarean section what was the level of pain you perceived	32	21.3	54	36.0	52	34.7	12	8.0
What was the level of pain perception when you first sit up on bed after caesarean section	18	12.0	72	48.0	36	24.0	24	16.0
What was the level of pain perception 24 hours postoperatively when you first ambulate	20	13.3	53	35.3	60	40.0	17	11.3
What was the level of pain perceived after administering the prescribed analgesic when you ambulate	57	38.0	60	40.0	24	16.0	9	6.0
What was the level of pain before another dose of analgesic was administer	28	18.7	54	36.0	61	40.7	7	4.7
What was the level of pain perceived when you see the health worker team	61	40.7	53	35.3	23	15.3	13	8.7

management. Further, analysis revealed that there was no significant relationship between educational qualifications ($\div 2 = 13.15$, df = 12, $p>0.05$), number of previous delivery experience ($\div 2 = 19.90$, df = 12, $p>0.05$), patients' age ($\div 2 = 26.809$, df = 18, $p>0.05$) and severity of pain among patients with caesarean section (table 7, 8& 9).

Discussion of Findings

Findings from this study revealed that the ages of respondents ranged from 15years to 49years;

Table 3: Factors affecting pain perception among respondents

Statements (n=150)	SA N	%	A N	%	NS N	%	D N	%	SD N	%
Family support decreased pain perception	82	54.7	51	34.0	8	5.3	9	6.0	0	0.0
Your spouse support only decreased from pain perception	47	31.3	72	48.0	17	11.3	11	7.3	3	2.0
Types of Incision made increased pain perception	31	20.7	39	26.0	61	40.7	15	10.0	4	2.7
Death of fetus after surgery increased pain perception	38	25.3	40	26.7	48	32.0	15	10.0	9	6.0
Baby in special care baby unit had no effect on pain perception	33	22.0	51	34.0	42	28.0	15	10.0	9	6.0
Does level of your education affect your pain perception	28	18.7	27	18.0	40	26.7	35	23.3	20	13.3
Bad events after caesarean section had great impact on pain perception	45	30.0	59	39.3	29	19.3	12	8.0	5	3.3
Did premorbid condition e.g. DM HTN, increase your level of pain perception	28	18.7	30	20.0	66	44.0	17	11.3	9	6.0
Pain perceptions is the same in any form of child birth	21	14.0	21	14.0	33	22.0	33	22.0	42	28.0
Negative attitude of health team do not have effect on pain perception	14	9.3	31	20.7	27	18.0	39	26.0	39	26.0
Their approaches increased pain perception	22	14.7	42	28.0	32	21.3	41	27.3	13	8.7
How the nurse pronounced pain increased pain perception	21	14.0	32	21.3	60	40.0	24	16.0	13	8.7
Your financial status affected your pain perception	62	41.3	37	24.7	17	11.3	25	16.7	9	6.0

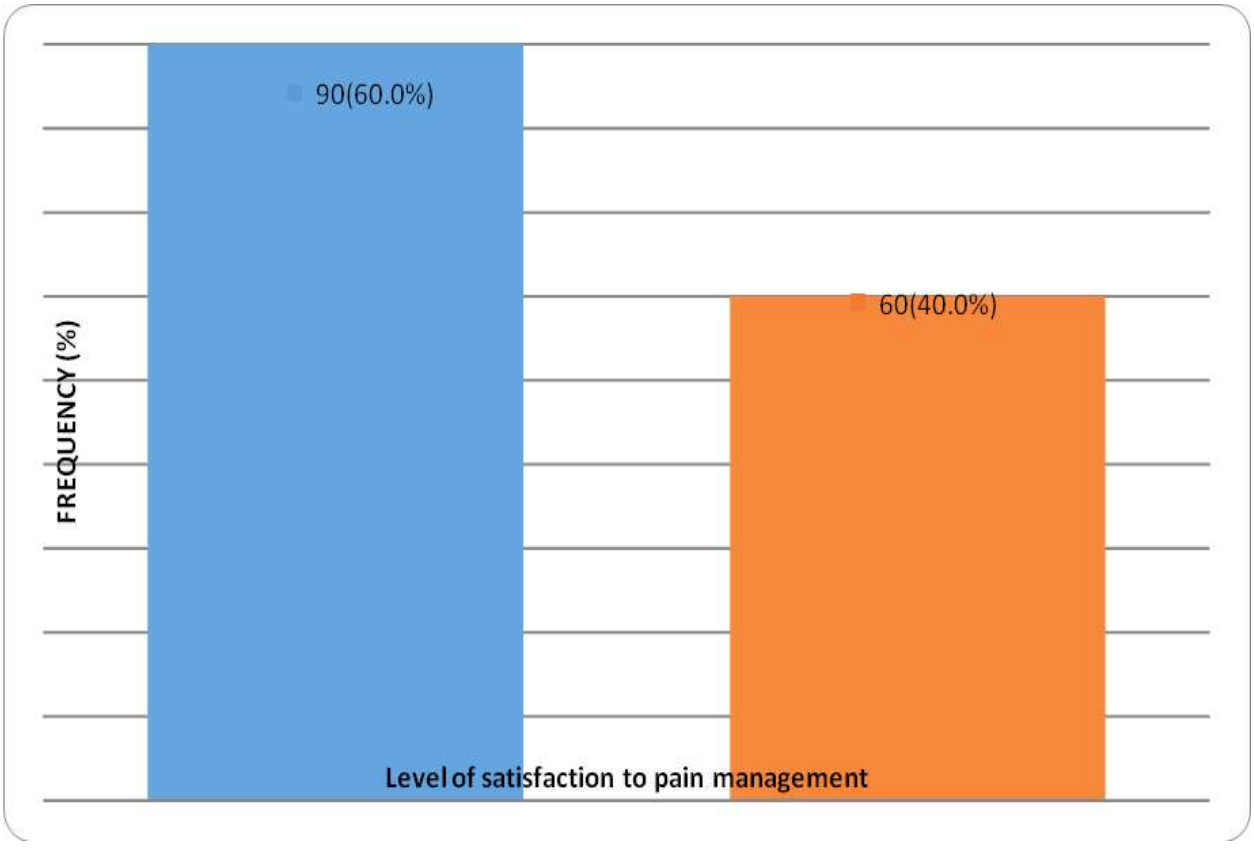

Fig.2: The patient level of satisfaction to pain

and the mean age was 30.53 ± 8.21 years (Table 1). This indicates that the women who participated in this study are adults within the reproductive age. Findings revealed that 46.0% of the respondents reported moderate level of pain after Caesarean section. This is similar to the findings of [19] who estimated that 50% of patients have inadequate pain relief recorded according to VAS (0-10).

The study revealed that 40.0% of the respondents reported that the level of pain perception

Table 4: Respondents' views on the level of satisfaction to pain management

Statements (n=150)	SS		S		NS		D		SD	
	N	%	N	%	N	%	N	%	N	%
Are you satisfied with the way your pain has been managed	52	34.7	76	50.7	8	5.3	7	4.7	7	4.7
Did nurses approaches to your pain management satisfy you	66	44.0	62	41.3	15	10.0	6	4.0	1	0.7
Are you dissatisfied with the way of managing your pain	2	1.3	6	4.0	18	12.0	60	42.7	60	40.0
Are you pleased with the way they administered your pain relief medication	63	42.0	55	36.7	15	10.0	12	8.0	5	3.3
Are you satisfied with the pain medication giving to you	64	42.7	63	42.0	5	3.3	10	6.7	8	5.3

Table 5: Respondents' opinions on the level of pain they expected before and after surgery.

Respondents' opinions on the level of pain before and after surgery	Frequency	Percentage
What was the level of pain you expected before going for surgery		
Mild	38	25.3
Moderate	46	30.7
Severe	66	44.0
What was the level of pain experienced after the surgery		
Mild	50	33.3
Moderate	81	54.0
Severe	19	12.7
Total	150	100.0

Table 6: Cross tabulation of educational qualifications and level of pain perception among caesarean section patients.

Respondents' Highest level of education	Respondents' level of pain perception				
	No pain	Mild	Moderate	Severe	Total
Illiterate	0(0.0%)	0(0.0%)	11(78.6%)	3(21.4%)	14(100.0%)
Primary six	0(0.0%)	4(21.1%)	7(36.8%)	8(42.1%)	19(100%)
WAEC or SSCE	0(0.0%)	0(0.0%)	21(67.7%)	10(32.3%)	31(100.0%)
OND	0(0.0%)	2(4.3%)	19(40.4%)	26(55.3%)	47(100.0%)
HND and above	1(2.6%)	4(10.3)	19(48.7%)	15(38.5%)	39(100%)
Total	1(0.7%)	10(6.7%)	77(51.3%)	62(41.3%)	150(100%)
$\chi^2 = 22.741$,	df = 12,	p-value=0.030	Remark: $p<0.05$		

when they first ambulated after 24 hours postoperatively were moderate. Also, 40.0%of the respondents reported that the level of pain perceived after administering the prescribed analgesic when they ambulated were mild, while 38.0% of them reported no pain. This supports the findings that the intensity of feeling the pain varies from patient to patient, depending on patient's pain threshold [20].

It was noted in the study that 36.0%of the respondents reported that the level of pain they perceived six hours after caesarean section were mild This agrees with Naccache *et al* [21], who submitted that women of childbearing age who had Caesarean section done may have different views about pain during childbirth. Also, many Caesarean section patients still suffer from moderate to severe postoperative pain [22].

Also, the study revealed that 48.0% of the respondents reported that the level of pain perception when they first sit up on bed after caesarean section were no mild. This supports [23],who reported that the intensity of pain ranges from none to mild

Table 7: Cross tabulation of number of previous delivery and level of pain perception among caesarean section patients.

Respondents' number of previous delivery	Respondents' level of pain perception				
	No pain	Mild	Moderate	Severe	Total
0	0(0.0%)	0(0.0%)	8(44.4%)	10(55.6%)	18(100.0%)
1	0(0.0%)	3(7.0%)	22(51.2%)	18(41.9%)	43(100%)
2	1(2.0%)	3(5.9%)	27(52.9%)	20(39.2%)	51(100.0%)
3	0(0.0%)	4(17.4%)	14(60.9%)	5(21.7%)	23(100.0%)
≥4	0(0.0%)	0(0.0%)	6(40.0%)	9(60.0%)	15(100%)
Total	1(0.7%)	10(6.7%)	77(51.3%)	9(60.0%)	150(100%)
$\chi^2 = 13.478$,	df = 12,	p-value=0.335	Remark: p>0.05		

Table 8: Cross tabulation of patients' age and level of pain perception.

Respondents' age	Respondents' level of pain perception				
	No pain	Mild	Moderate	Severe	Total
15-19	0(0.0%)	1(12.5%)	4(50.0%)	3(37.5%)	8(100.0%)
20-44	0(0.0%)	1(3.7%)	18(66.7%)	8(29.6%)	27(100%)
25-29	0(0.0%)	1(2.4%)	20(47.6%)	21(50.0%)	42(100.0%)
30-34	0(0.0%)	4(13.3%)	14(46.7%)	12(40.0%)	30(100.0%)
35-39	1(5.6%)	1(5.6%)	10(55.6%)	6(33.3%)	18(100%)
40-44	0(0.0%)	0(0.0%)	7(46.7%)	8(53.3%)	15(100%)
45-49	0(0.0%)	2(20.0%)	4(40.0%)	4(40.0%)	10(100%)
Total	1(0.7%)	10(6.7%)	77(51.3%)	62(41.3%)	150(100%)
$\chi^2 = 19.315$,	df = 18,	p-value=0.373	Remark: p>0.05		

discomfort to excruciating. Also, patients experience pain differently.

Findings revealed that family support and spoused support improved satisfaction with pain management. This concurs with [20] who opined that the intensity of feeling the pain varies from patient to patient, depending on, family and hospital staff support.

The study revealed that nearly half (46.7%) of the respondents reported that type of incision made increases pain perception; and this agrees with Suzanne *et al*, who opined that type of incision affect the patent pain perception [23].

The study also revealed that more than half of the respondents reported that death of fetus after surgery increased pain perception. Also, 69.3% of them reported that bad events after Caesarean section had great impact on pain perception. This supports Suzanne *et al*, who highlighted that occurrence of tragedy after birth can also affect patient pain perception.

Findings from the study also showed that 52.0% of the respondents disclaimed the assertion that negative attitude of health team do not have effect on pain perception. This agrees with Ismail *et al* [22], who identified that many patients still suffer from moderate to severe postoperative pain, and the cause of this problem is attributed to poor attitude of both health personnel and patients toward pain.

It was noted from this study that less than half of the respondents reported that their level of education do not affect their pain perception. This is in line with Niklasson *et al* [24], who reiterated that pain perception is multifactorial and a complex mixture of neural interactions that start with tissue damage (transduced and encoded by nociceptors), leading to activation of the ascending- and descending systems and a chain of events begins that involves both electrical and chemical activities. It is also activated by the influence of psychological and environmental factors. Acute pain should therefore be viewed as the initiation phase of an extensive, persistent nociceptive and behavioral cascade most often triggered by tissue injury, irrespective of level of education.

Findings also revealed that majority (60%) of the respondents were satisfied with the way their pain had been managed. This could be attributed to

the fact that adequate pain management after low abdominal surgery will improve maternal satisfaction, ameliorate maternal recovery and allow the parturient to nourish her new born child adequately and can reduce risk of thromboembolic disease and infections, which increase during pregnancy [15]. Thus, assessment of patient satisfaction is an important tool for monitoring the quality of care in hospitals [17].

The study revealed that 82.7% of the respondents were satisfied with their pain management. This could also be attributed to the fact that poor management of postoperative pain has been linked with reduced quality of life, and it interferes with physical therapy. Those consequences translate not only into reduced patient satisfaction but also an increased economic burden that is reflected in the length of hospital stays and number of patient readmissions for the treatment of uncontrolled pain [25].

It was noted in the study that (60.0%) of the respondents were satisfied with the level of pain management. This agrees with study conducted by Kolawole [10] on post-operative pain management following caesarean section in University of Ilorin Teaching Hospital (UITH), Ilorin, Nigeria. Their findings revealed that most of the patients (85.2%) still expressed satisfaction with the level of pain relief. Thus, satisfaction is a subjective feeling dependent upon patients' past experiences and future expectations. It is easy to assume that effective pain relief would correlate highly with patients' satisfaction with their pain management. However, earlier research has shown that patients may be highly satisfied with their pain management even when they have reported considerable levels of pain during their hospital stay. This imposes difficulty in interpreting the results of patient satisfaction surveys on pain management, and explanation needs to be sought for the high satisfaction scores even with inadequate pain relief [17].

Discussion of hypotheses

The analysis in table 7 revealed that there is no significant relationship between educational qualifications and level of pain perception among caesarean section patients ($\div 2 = 13.151$, df = 12, $p>0.05$). This is contrary to Niklasson [24], who stated that socio-demographic factors are important factors behind patient's perception of pain. Also, pain perception is multifactorial and a complex mixture of neural interactions that start with tissue damage (transduced and encoded by nociceptors), leading to activation of the ascending- and descending systems and a chain of events begins that involves both electrical and chemical activities. It is also activated by the influence of psychological and environmental factors [24].

The analysis in table 8 showed that there was no significant relationship between number of previous delivery and level of pain perception among caesarean section patients ($\div 2 = 19.899$, df = 12, $p>0.05$). This could be attributed to the fact that pain is always subjective. Each individual learns the application of the word, pain through experiences related to injury in early life. The impact of pain is evident at social, clinical, and regulatory levels [25].

The analysis in table 9 showed that there was no significant relationship between patients' age and level of pain perception ($\chi 2 = 26.809$, df = 18, $p>0.05$). This is contrary to Niklasson, who revealed that the way an older person responds to pain may differ from the way a younger person responds [24]. Because elderly people have a slower metabolism and greater ratio of body fat to muscle mass than younger people, small doses of analgesia agents may be sufficient to relieve pain in young person and these doses may be effective for longer periods. Hence, socio-demographic factors (such as age) are important factors behind patient's perception of pain.

Conclusion

Post-caesarean section pain is a common cause of acute pain in obstetrics, although pain relief and patient satisfaction are still inadequate in many cases. Post-operative pain remains one of the most prevalent problems in health care today and it has been acknowledged that this problem is under-recognized. The main responsibility of the nurses in pain management is to know how to assess pain by appropriate planning and implementing the adequate treatments. Nurses play an essential role in implementing pain management, empowered nurses are equipped with latest innovative knowledge,; skills and information and are able to provide safe and compassionate care for patients during their most vulnerable time in the Caesarean section. The dissemination of evidence –based pain management information is crucial in providing nurses with unbiased resources that could shape their knowledge and attitudes, an environment defined by an open communication and exchange of ideas would help to facilitate the knowledge growth of nurses and empower them in their workplace to provide expert nursing care. During the assessment of the effectiveness of pain management interventions, the nurse will need to monitor the adverse effects and advocate for the patient when the interventions are

ineffective in relieving pain. Hence, hospital management should establish pain management policy or standards.

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Impact of cocos nucifera l. on memory and oxidative stress in Swiss mice

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Abstract

Background: Coconut water (CW) is a sweet tasting refreshing drink obtained directly from the cavity (inner part) of coconut fruits. It is one the world's most versatile natural product with increasing evidence that supports its role in health and medicinal applications such as prevention of neuronal degeneration in people who are prone to developing Alzheimer's disease. This study aimed at investigating the effects of coconut water on spatial learning and memory via behavioral and biochemical assessments using mice.

Materials and methods: The experiment was performed in three phases viz. 7, 14 and 28 days. Animals were divided into six groups, where Group 1 received distilled water, Group 2 received Lipopolysaccharide (LPS) at 250 µg/kg body weight, while Group 3-6 received CW at 0.02, 0.05, 0.1, and 0.2 ml/20 g body weight respectively. The cognitive effect of CW was assessed using the Morris Water Maze model. Also, the levels of Malondialdehyde (MDA), glutathione (GSH) and nitric oxide (NO) were estimated by spectrophotometric method.

Results: In the cognitive assessment, the groups treated with CW for 7 days showed a significant reduction in latency time when compared with control and LPS groups. Malondialdehyde and NO levels were also significantly reduced in groups treated with CW for 7 days when compared with the LPS and control groups ($p<0.05$). However, there was a significant increase in GSH levels ($p<0.05$).

Conclusion: This study showed that Coconut Water may improve memory and reduce oxidative stress in laboratory mice.

Keywords: *Coconut water; Lipopolysaccharide; Morris water maze; Memory; Oxidative markers*.

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Résumé

Contexte: L'eau de coco (EC) est une boisson rafraîchissante au goût sucré obtenue directement de la cavité (partie intérieure) des fruits de noix de coco. Il s'agit de l'un des produits naturels les plus polyvalents au monde, avec de plus en plus de preuves confirmant son rôle dans la santé et les applications médicinales telles que la prévention de la dégénérescence neuronale chez les personnes sujettes au développement de la maladie d'Alzheimer. Cette étude visait à étudier les effets de l'eau de coco sur l'apprentissage spatial et la mémoire via des évaluations comportementales et biochimiques à l'aide de souris.

Matériaux et méthodes : L'expérience a été réalisée en trois phases, à savoir 7, 14 et 28 jours. Les animaux ont été divisés en six groupes, où le groupe 1 a reçu de l'eau distillée, le groupe 2 a reçu la lipopolysaccharide (LPS) à 250 µg / kg de poids corporel, tandis que le groupe 3-6 a reçu l'EC à 0,02, 0,05, 0,1 et 0,2 ml / 20 g de poids corporel respectivement. L'effet cognitif de l'EC a été évalué à l'aide du modèle de Labyrinthe d'Eau de Morris. De plus, les niveaux de malondialdéhyde (MDA), de glutathion (GSH) et d'oxyde nitrique (ON) ont été estimés par méthode spectrophotométrique.

Résultats: Dans l'évaluation cognitive, les groupes traités par EC pendant 7 jours ont montré une réduction significative du temps de latence par rapport aux groupes témoins et LPS. Les niveaux de malondialdéhyde et d'ON ont également été significativement réduits dans les groupes traités par EC pendant 7 jours par rapport au LPS et aux groupes témoins ($p <0,05$). Cependant, il y avait une augmentation significative des niveaux de GSH ($p <0,05$).

Conclusion: Cette étude a montré que l'EC peut améliorer la mémoire et réduire le stress oxydatif chez les souris de laboratoire.

Mots - clés : *eau de coco; Lipopolysaccharide; Le labyrinthe d'eau de Morris; Mémoire; Marqueurs oxydatifs.*

Introduction

Memory impairment during aging is believed to be a consequence of decline in neuronal function and increase in neurodegeneration. Accumulation of oxidative damage and reduction of antioxidant defense system play a key role in organismal aging and functional senescence [1].Oxidative stress is considered to be one of the main causal factors involved in the impairment of cognitive function [2,3].The cerebral cortex and hippocampus, which are believed to control cognitive and motor functions, seem to be sensitive to oxidative stress[4].

Coconut (*Cocos nucifera L.*) is an important fruit tree in the tropical regions and has been described as the most important and extensively grown palm tree worldwide. Every part of the plant is useful and, in many cases, human life would be impossible in its absence [5]. The fruit is the most marketable part; the inner part of the nut (endosperm tissue) is the edible part of the coconut fruit, and it is divided into two edible parts: a white kernel (coconut meat) and a clear liquid (coconut water) [6].Coconut water serves both as a tropical beverage and a traditional medicine [7].Current research on coconut water mainly focuses on areas of biochemical composition and preservation techniques [8]. Coconut water is useful in the treatment of many health problems, including dehydration, digestive disorders, fatigue, diarrhea, kidney stones and constipation [9]. Previous findings had shown some significant anti-aging, anti-carcinogenic and anti-thrombotic effects that contributed to the various health benefits [10].

However, no work has revealed the effect of coconut water on spatial memory and oxidative stress status. Hence, this work addressed the effect of coconut water on memory and oxidative stress.

Materials and methods

Chemicals and reagents.

Trichloroacetic acid, thiobarbituric acid, bacterial lipopolysaccharide (LPS) from *E.coli* 0111:B4, purified by phenol extract, L2630. All other chemicals used were of the analytical grade from Sigma Aldrich (Germany).

Animals

Adult mice weighing 18-20 g (12 weeks old) were used in all experiments, and the animals were procured from the Central Animal House, University of Ibadan, Ibadan. All mice were kept at room temperature (28-30 °C), under a 12/12 hour light/ dark condition. All animals had free access to food and water *ad libitum*.

Coconut water (Cocos nucifera L.) extraction

Fresh coconuts used were purchased from a local market in Badagry, Lagos State, Nigeria. Coconut water was collected from freshly opened coconut fruit. This was done by drilling to create an opening through the germinal pore and emptying the liquid into a sterilized beaker, and from there the administered quantity was drawn. Fresh coconuts water was used on every administration day.

Treatment regimen

After acclimatization of two weeks, the animals were randomly divided into 3 study groups (7, 14, and 28 days). Each study group has 6 sub-groups of 6 rats per group. Group 1 received distilled water, groups 2, 3, 4, 5 were treated with varying oral concentrations of only coconut water (0.02, 0.05, 0.1, and 0.2 ml/20 g body weight), respectively. Group 6 was treated with LPS (250 µg/kg *i.p*). Animals were treated accordingly for 7, 14 or 28 days, except for group 6 who only receive LPS once 4 hours prior to the final test session.Animals where handled in accordance to the guidelines of National Institute of Health (NIH) for laboratory animal care and use.

Cognitive assessment.

Behavioral test to assess learning and memory function was performed using the Morris water maze test[11].The maze we used was a circular black tub (diameter: 150 cm) filled with (41 cm) of water at a temperature of 22°–25°C. An escape platform (height: 14.5 cm, diameter: 4.5 cm) was then submerged 1 cm above the surface of the water in the north-eastern quadrant of the pool. White colourant was added to the water to make it opaque. The platform is almost invisible to the human eye, and the behavior of the animals confirmed that they did not see the platform. The room contained a number of extra-maze cues such as shelves, posters and other objects (e.g. light bulbs), to help in the formation of a spatial map. The location of the objects and the maze remained unchanged throughout the experiments. The mice had two training trials per day for 3 days during which they were placed in the water and expected to find the hidden escape platform (learning trial) and the time used in locating the platform was recorded (escape latency). The mice that did not find the platform within 60 seconds were placed on the platform for 10 seconds at the end of the trial. On the last day (24 hours after the last learning trial), the platform was removed (probe trial) and the length of time the mice spent to cross the region where the platform was originally placed were recorded (escape latency).

Experimental sample preparation

Preparation of brain tissues for biochemical assays.

After the behavioral tests, the mice from each group were euthanised through cervical dislocation and the brains were immediately removed and washed in potassium chloride, weighed and stored in the freezer at -20 ^{0} c. Thereafter, the whole brain was homogenized with 10 % w/v phosphate buffer (0.1 M, pH 7.4). Each brain tissue homogenate was centrifuged (10,000 rpm for 15 minutes) to obtain the supernatant for the different biochemical assays.

Determination of total protein

The protein concentration of the various supernatant was determined by means of the Biuret method [12].

Assessment of lipid peroxidation

Lipid peroxidation was determined by measuring the formation of thiobarbituric acid reactive substances (TBARS) present in the test sample [13]. Under acidic conditions, malondialdehyde (MDA) produced from the peroxidation of fatty acids reacts with the chromogenic reagent 2-thiobarbituric acid to yield a pink colored complex with maximum absorbance at 532 nm.

Estimation of Reduced Glutathione (GSH) Level

This was performed according to the method of Sedlak and Lindsay [14]. This method is based upon the development of a relatively stable yellow colored product when 5,5;-dithiobis-2-nitrobenzoic acid (DTNB; Ellman's reagent) is added to sulfurhydryl compounds of which glutathione comprises the bulk in tissues. The resulting chromophoric product possesses maximum absorbance at 412 nm.

Determination of Nitric Oxide Level

The procedure is based on the principle that sodium nitroprusside in aqueous solution at physiological pH spontaneously generates nitric oxide which interacts with oxygen to produce nitrite ions that can be estimated using Griess reagent. Scavengers of nitric oxide compete with oxygen, leading to reduced production of nitrite ions [15].

Statistical analysis

All the data are presented as mean ± Standard Error of Mean (S.E.M). One-way ANOVA with Newman-Keuls' post hoc test was performed using GraphPad Prism version 5.01 for Windows, GraphPad Prism (San Diego, California, USA). Significant value was set at $p < 0.05$.

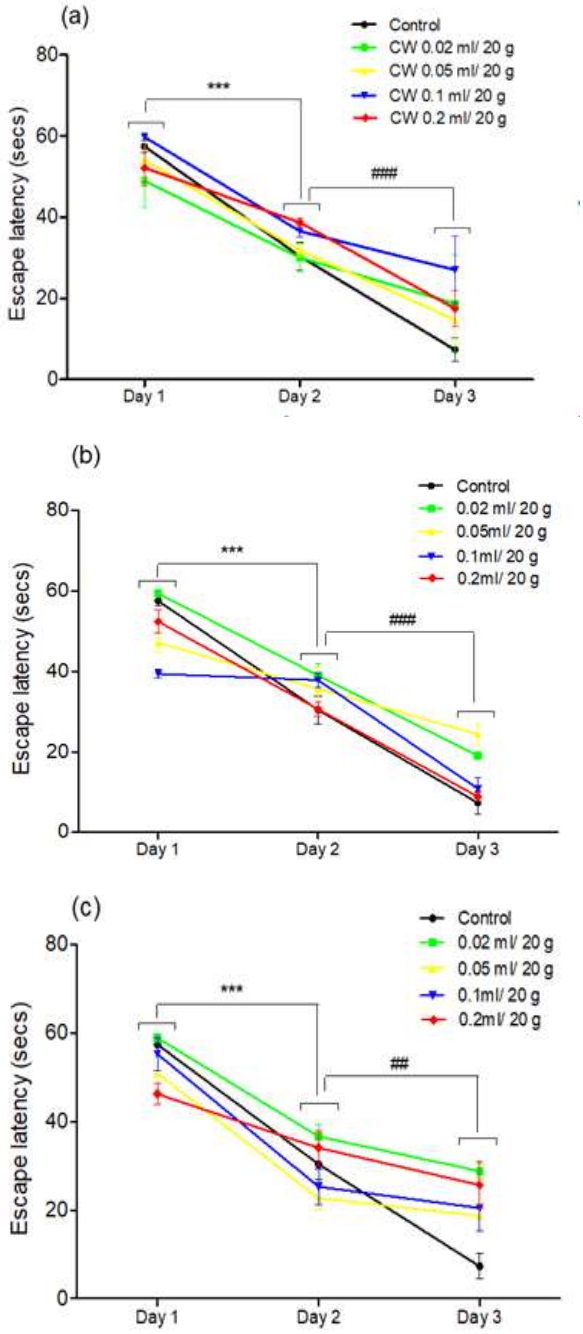

Figure 1: Effects of (a) 7 days (b) 14 days and (c) 28 days coconut water administration (0.02; 0.05, 0.1, 0.2 ml/ 20 g) on escape latency (learning trial) in Morris water maze test. Data

Results

Behavioral study

Effects of coconut water administration on escape latency in the learning trial

As shown in Figures 1(a-c), the results of the learning test (visible platform trial) of six trials to measure the time taken to locate the platform, after administration of coconut water at different doses for different days (7, 14 and 28 days), showed a significant reduction ($p<0.05$) along the days between the groups during the experimental period.

This shows the effect of trials on memory and spatial learning process. The result was averaged across two trials per day for 3 days.

Effects of coconut water administration on escape latency in the Probe trial

The results of the probe trial (non-visible platform trial) to measure the time taken to locate the platform (escape latency),showed that all doses (0.02,0.05,0.1,0.2 ml/20g) of coconut water administered for 7, 14 and 28 days,caused a decrease in latency time when compared with the lipopolysaccharide-treated group ($p<0.001$). In addition, 0.02, and 0.05 ml/20g doses of coconut water administered for 7 days showed a significant reduction in latency time in when compared control (Figure 2).

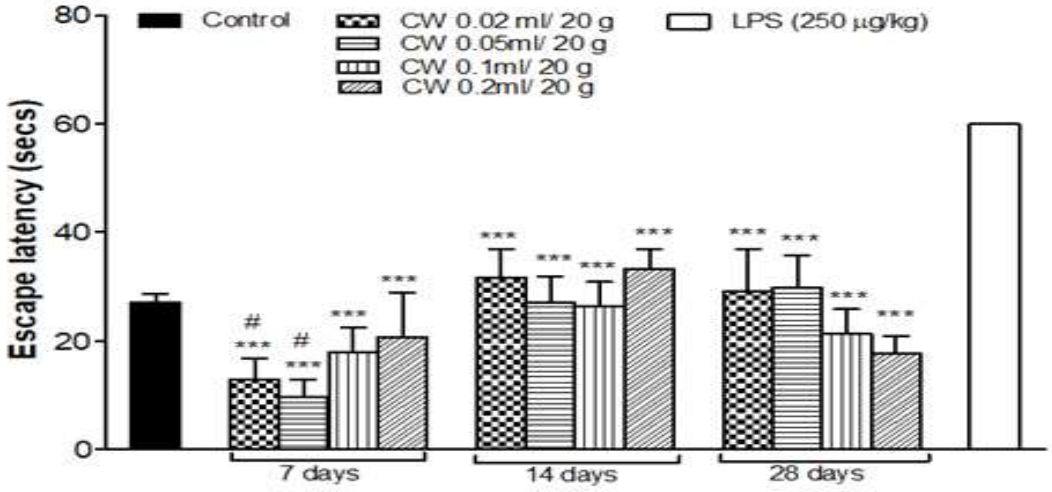

Figure 2: Effects of coconut water administration (0.02, 0.05, 0.1 and 0.2 ml/ 20 g, body weight) on escape latency (probe trial)in Morris water maze test after 7, 14 and 28 days in mice. Data are represented as means ± S.E.M (n=6). Statistical analysis was done by One Way ANOVA followed by Newman-Keuls Post Hoc test, *** represents $p< 0.001$ compared with LPS group; ; # represents $p< 0.05$ compared with control group.

Biochemical assays

Effects of coconut water administration on malondialdehyde level in the brain of mice

As shown in Figure 3, administration of coconut water (CW) for 7 days,at all doses, decreased malondialdehyde (MDA) levels when compared to LPS-treated group ($p<0.001$). Also, 14 days treatment with CW at all doses except 0.2ml/20g showed a decrease in MDA levels when compared with LPS-treated group ($p<0.001$). The 28 days treatment with CW at all doses showed a significant reduction in MDA levels when compared with LPS-treated group ($p<0.001$). All doses of CW for 7days, except 0.2ml/20g, showed a decrease in MDA levels when compared to control ($p<0.05$) while 0.02 ml/ 20 g of CW for 14days and 28 days also showed reduction in MDA levels when compared to control ($p<0.01$).

Effects of coconut water administration on reduced glutathione level in the brain of mice

As shown in figure 4, administration for 7 days at all doses, except 0.02ml/20 g of coconut water (CW), showed a significant increase inglutathione (GSH) level when compared to LPS-treated group ($p<0.05$). All CW treated doses for 14 days had a significant increase in GSH level when compared to LPS-treated group ($p<0.001$). However, 0.05ml/20g of CW showed a significant increase in GSH level when compared to control ($p< 0.001$). In the 28 days CW administration, all the doses showed increased GSH levels when compared to LPS-treated group ($p<0.01$), but only 0.2ml/20 g dose increased significantly ($p<0.05$) when compared to control.

Effects of coconut water administration on Nitric oxide level in the brain of mice

As shown in Figure 5, administration of coconut water (CW) for 7, 14 and 28 days, at all doses showed a significant decrease in the nitric oxide (NO) levels when compared to the LPS-treated group ($p<0.01$). However, 0.02ml/20g and 0.05ml/20g of 14 days treatment, and 0.02 ml/20 g for 28 days showed a

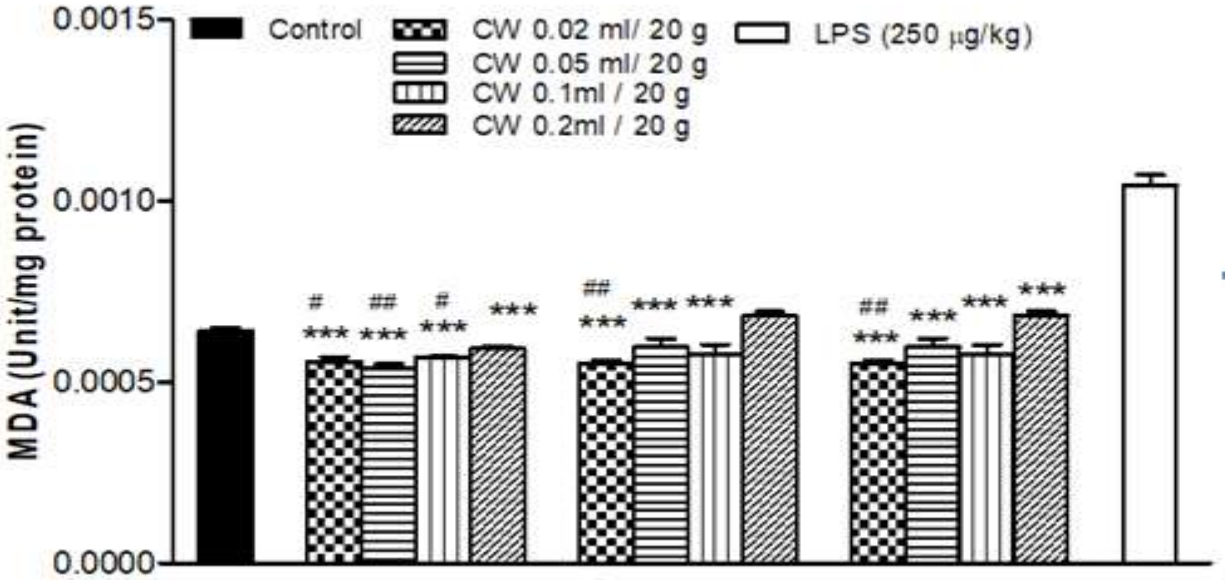

Figure 3: Effects of 7, 14 and 28 days coconut water administration (0.02, 0.05, 0.1, 0.2 ml/ 20 g) on MDA level in the brain of mice. Data are represented as means ± S.E.M (n=6). Statistical analysis was done by one-way ANOVA, followed by Newman-Keuls Post hoc test, $^{\#}p<0.05$, $^{\#\#}p<0.01$compared with control, ***p< 0.001 compared with LPS group

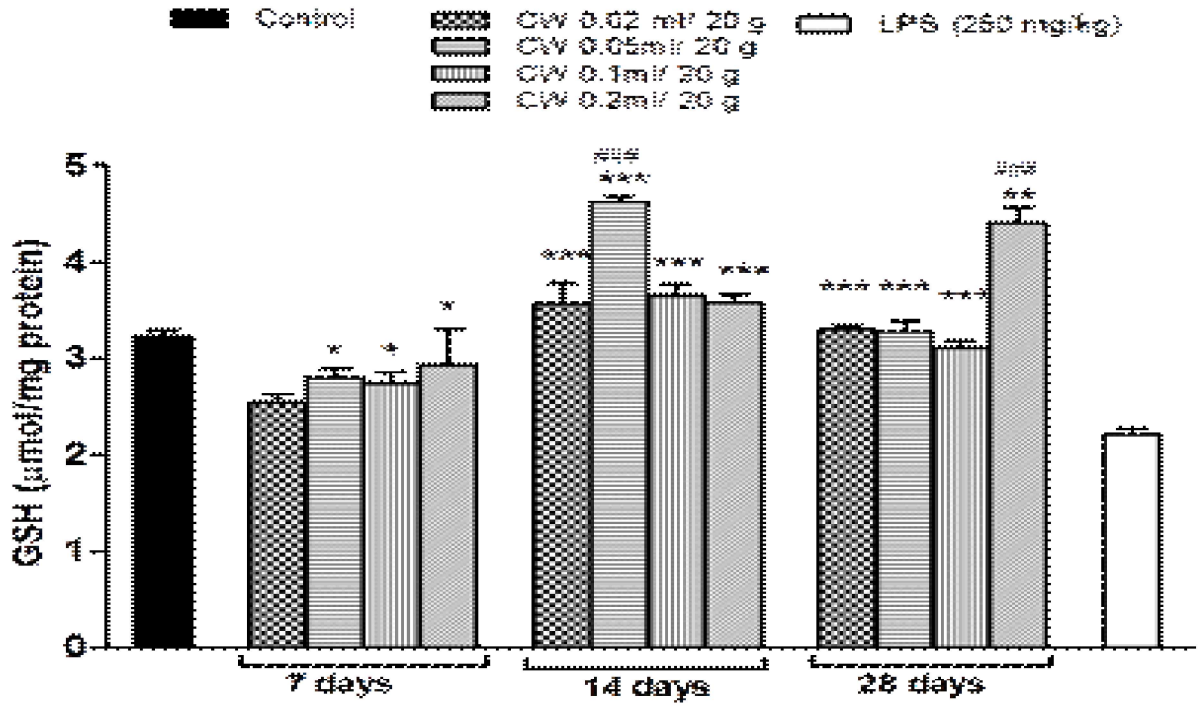

Figure 4: Effects of 7, 14 and 28 days coconut water administration (0.02, 0.05, 0.1, 0.2 ml/ 20 g) on GSH level in the brain of mice. Data are represented as means ± S.E.M (n=6). Statistical analysis was done by one-way ANOVA, followed by Newman-Keuls Post Hoc test, $^{\#\#\#}p< 0.001$ compared with control; *p< 0.05, **p< 0.01, ***p< 0.001 compared with LPS

decrease in NO levels when compared to the control group (p< 0.001).

Discussion

In this study, the effect of coconut water (CW) on spatial memory was investigated along with its effect

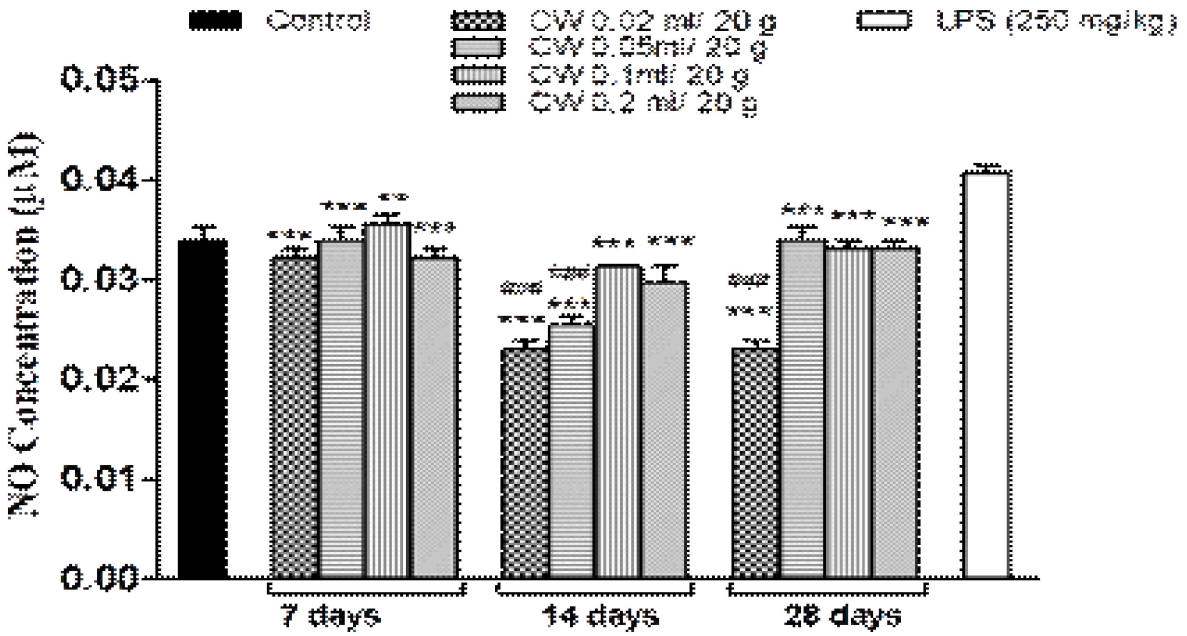

Figure 5: Effects of 7, 14 and 28 days coconut water administration (0.02, 0.05, 0.1, 0.2 ml/ 20 g) on NO level in the brain of mice. Data are represented as means ± S.E.M (n=6). Statistical analysis was done by one-way ANOVA followed by Newman-Keuls' post hoc test, $^{###}p< 0.001$ compared with control; $^{**}p< 0.01$, $^{***}p< 0.001$ compared with LPS.

on brain's oxidative stress status. The results were compared with lipopolysaccharide-induced (250 µg/ kg body weight) memory impairment in Morris Water Maze model. Also, levels of brain's malondialdehyde (MDA), glutathione (GSH) and nitric oxide (NO) were assayed to show the brain's oxidative stress status. The above objectives were necessary since it is expected that both positive behavioral and biochemical responses should suggest the neuroprotective and memory enhancing potential of coconut water, or vice versa.

Coconut water (*Cocos nucifera L.*) is an important and natural dietary antioxidant [16] known for its anti-inflammatory [17] and neuroprotective effect [18].Several studies have shown that lipopolysaccharide (LPS) can induce memory impairment [19-21].

The Morris Water Maze is a test of spatial and reference memory for rodents that relies on distal cues to navigate from a start point around the perimeter of an open swimming arena to locate a submerged escape platform [22,11]. The escape latency (seconds), which is the time taken to find and escape to submerged platform within 60 seconds was measured.

In the learning trial, it was observed that mice treated with CW had reduced escape latency, as training progressed from learning trial day 1 to 3, this indicated improved learning. Long- term memory is typically assessed in the test trial (probe trial) in which the platform had been removed.The reduction in escape latency in the groups administered with CW when compared with the control group, indicates aiding of learning and memory. This is in accordance with the reports of Morris that a decrease in escape latency is associated with learning potential (Morris, 1981). In addition, an increase in escape latency was observed in the LPS-treated group when compared with the CW groups suggesting that was able to induce memory loss.

Lipid peroxidation (LPO) is a free radical-mediated chain reaction that can inactivate cellular components [23].Malondialdehyde (MDA), which is a major end product and an index of lipid peroxidation, was assessed in this study. There was an increase in MDA level in the LPS-treated group when compared to CW and control groups. This is in accordance with previous work of Sharma *et al.,*[24], who also observed increase in MDA level in the whole brain of rodents following intraperitoneal injection of LPS. Since lipid peroxidation is a self-propagating process that will proceed until the substrate is totally consumed, high level of MDA can be correlated with a considerable

level of tissue damage in the LPS-treated group which was probably inhibited by a reduction seen in the coconut water treated group.

Glutathione (GSH) is an antioxidant and its depletion has been shown to occur in conditions of moderate or severe oxidative stress, and has been associated with increased susceptibility to cell damage [25].Oral administration of GSH has been shown to improve memory deficits [26]. Our study showed an increase in GSH concentration after administration of CW. In contrast, groups treated with LPS showed decrease in GSH concentration which indicates oxidative stress.

Nitric oxide (NO) is a short term free radical and an intracellular ligand depending on its concentration. It is produced through activation of inducible nitric oxide synthase which have been identified to be central mechanism alongside/ or NADPH oxidase in the triggering of oxidative stress and mediation of neurotoxicity [27]. Studies in experimental animals have well documented the synthesis of nitric oxide (NO) in the brain, and its role in a variety of neuronal functions including learning and memory processes,cortical arousal,nociception, food intake,penile erection,yawning, bloodvessel dilatation and immune response [28].However, higher levels of NO in the LPS-treated group, when compared with CW and control groups suggest impairment of memory. It has been previously shownthat a several-fold increasein NO concentration in the brain resulted in an impairment of retention of acquired task in rats[29]. Also, Garthwaite *et al.,*[28] proposed that excess formation of NO produced neurotoxicity due to accumulation of its toxic metabolite. Thus, the physiological effects of NO predominate when it is produced in sufficient amounts as shown in the CW and control-treated groups.

Coconut water in this study showed varying degrees of improvements in all the indices assessed compared to the control group and LPS-induced memory impairment and neuroinflammation. This may be attributed to the balance in oxidative stress status, in favor of the anti-oxidants in the brain of the mice.

In conclusion, our work is the first to report the effects of coconut water on spatial memory and brain's oxidative stress status in mice. Coconut water, not only a refreshing drink, has shown to display a potential memory enhancing activity in laboratory mice, and reduction of oxidative stress which has been implicated in many neurological diseases. Further work needs to be investigated to elucidate the role of CW in other forms of memory and cognition, neurodegenerative conditions and probable mechanisms involved.

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Oral health condition and practices as indicators of need for oral health promotion among elderly individuals in two rural communities in Ibarapa, Nigeria

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Abstract
Background: Targeting oral health promotion among elderly individuals in rural settings requires baseline information on their oral health condition and practices as oral conditions are highly influenced by behavioral factors, which are culturally related in such settings.
Aim: To determine the association between oral health condition and practices of elders in two rural communities in southwestern Nigeria.
Materials and methods: A total of 357 residents aged 60 years or older participated in this cross-sectional survey conducted in randomly selected clusters in Igboora and Idere in Ibarapa, Southwest Nigeria. Information on sociodemographic characteristics, oral health practices (tooth cleaning material, frequency of tooth cleaning, utilization of dental services) and oral hygiene status was obtained using interviewer-administered questionnaire. Information on oral conditions such as dental caries experience, tooth mobility and number of teeth present were obtained by conducting oral examination. Data obtained were analyzed with the Statistical Package for Social Sciences (SPSS).
Results: Of 357 participants, 183 (51.3%) had missing tooth/teeth, 157 (44.0%) had mobile tooth/teeth, 114 (31.9%) had decayed tooth/teeth and 343 (96.1%) had poor oral hygiene. About a third 122 (34.2%) of the participants had consulted a dentist previously, out of whom 120 (98.4%) reported that pain was the main reason for doing so. The main reason for not visiting the dentist was: "no problem with me as tooth problems and its eventual loss occur with ageing" 178 (75.7%). Less frequent tooth cleaning and poor oral hygiene were associated with presence of mobile tooth/teeth and incomplete dentition ($p<0.05$). Presence of mobile (OR=1.80, 95%CI:1.09,2.98, p=0.023), decayed (OR=1.81, 95%CI:1.09,3.00, p=0.022) or missing teeth (OR=5.24, 95%CI:3.05,8.98, $p<0.001$) were predictors of previous dental consultation.
Conclusion: Poor oral hygiene was highly prevalent among elders in the rural communities. Less frequent tooth cleaning and poor oral hygiene were associated with presence of mobile tooth/teeth and incomplete dentition. Presence of mobile teeth, decayed teeth and missing teeth were significant predictors of previous dental consultation.

Keywords: *Dental visits; elders; oral health practices; oral health promotion; oral hygiene*

Résumé
Contexte: Le ciblage de la promotion de la santé bucco-dentaire chez les personnes âgées en milieu rural nécessite des informations de base sur leur état de santé bucco-dentaire et leurs pratiques, car les conditions bucco-dentaires sont fortement influencées par des facteurs comportementaux, qui sont culturellement liés dans ces milieux .
Objectif: Pour déterminer l'association entre l'état de santé bucco-dentaire et les pratiques des aînés dans deux communautés rurales du sud-ouest du Nigéria.
Matériel et méthodes : Un total de 357 résidents âgés de 60 ans ou plus a participé à cette enquête transversale menée dans des grappes sélectionnées aléatoirement d'Igboora et d'Idere à Ibarapa, dans le sud-ouest du Nigéria. Des informations sur les caractéristiques sociodémographiques, les pratiques de santé bucco-dentaire (matériel de nettoyage des dents, fréquence de nettoyage des dents, utilisation des services dentaires) et l'état d'hygiène bucco-dentaire ont été obtenues à l'aide d'un questionnaire administré par intervieweur. Des informations sur l'état buccal telles que l'expérience de la carie dentaire, la mobilité dentaire et le nombre de dents présentes ont été obtenues en procédant à un examen oral. Les données obtenues ont été analysées avec le progiciel statistique pour les sciences sociales (SPSS).
Résultats : Sur 357 participants , 183 (51,3%) avaient des dents / dents manquantes, 157 (44,0%) avaient des dent / dents mobiles, 114 (31,9%) avaient des dents / dents cariées et 343 (96,1%) avaient une mauvaise hygiène buccale. Environ un tiers 122 (34,2%) des participants avaient consulté un dentiste auparavant, parmi lesquels 120 (98,4%) ont indiqué que la douleur était la principale raison de le faire. La

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principale raison de ne pas rendre visite au dentiste était: «aucun problème avec moi car les problèmes dentaires et sa perte éventuelle surviennent avec le vieillissement» 178 (75,7%) . Un nettoyage des dents moins fréquent et une mauvaise hygiène buccale étaient associés à la présence de dents mobiles et d'une dentition incomplète (p <0,05). Présence de dents mobiles (OR = 1,80, IC à 95%: 1,09 - 2,98, p = 0,023), cariées (OR = 1,81, IC à 95%: 1,09-3,00, p = 0,022) ou manquantes (OR = 5,24, IC à 95% : 3,05-8,98, p <0,001) étaient des prédicteurs d'une consultation dentaire antérieure.

Conclusion: Une mauvaise hygiène buccale était très répandue chez les aînés des communautés rurales . Un nettoyage des dents moins fréquent et une mauvaise hygiène bucco-dentaire étaient associés à la présence de dents mobiles et d'une dentition incomplète. La présence de dents mobiles, de dents cariées et de dents manquantes étaient des prédicteurs importants de la consultation dentaire précédente.

Mots-clés: *visites dentaires; aînés; pratiques de santé bucco-dentaire; promotion de la santé bucco-dentaire; hygiène buccale*

Introduction

The elderly population is an important target for oral health promotion because of vulnerability occasioned by disadvantages in accessing oral health care [1,2]. Worrisome though, is the high prevalence of periodontal diseases, which are common causes of tooth loss among elders in Nigeria [3] and absence of oral health promotion programme put in place for them. In addition, many of these elders require a form of dental treatment or the other [3]. Similar findings on the high need for dental treatment have been documented in Poland [4] and among Brazilian elders [5].Elders in these countries and in the developed world may resort to homes and health institutions to take over their health care and oral health can be promoted among them. On the other hand, in Nigeria, very few homes and institutions for older people exist in rural communities, translating to most of the elders being responsible for their up keep and oral health. Promoting oral health at the community level, therefore, becomes important and mandates baseline information about the oral health of elders, which is sparse in our environment.

Accessible population based studies were conducted about the oral health status of elders over a decade ago in semi urban and urban regions of the country [3,6,7].The studies [3,7] showed that poor oral hygiene and periodontal disease were highly prevalent among elderly individuals. Other studies [8,9] assessed the oral health practices of the elderly and found that chewing stick was the main tooth cleaning aid [8,9] and 59.9% cleaned their teeth more than once daily [9]. In addition, 61% of the elders used traditional tooth cleaning agent which could have adverse effects on oral tissues [8] and many (65.7%) had not consulted the dentist [9]. None of these studies [3,7-9] associated the oral health practices with the oral conditions of the elders thus necessitating this study. This becomes important as oral conditions have been found to be highly influenced by the behavioral factors, which are beliefs and culture related [7]. In addition, healthy oral practices have been documented as a strong factor in preserving oral health [10]. In view of the prevalent periodontal disease among the Nigerian populace it becomes important to investigate how oral health practices to oral conditions of elders as baseline information for planning oral health promotion programmes among them.

Some studies [4,11,12] in other parts of the world have however, reported that suboptimal oral health practices were associated with poor oral health status and consequential higher prevalence of edentulism. It is not known if this is the case in our environment especially in rural communities.

Although suboptimal oral health practices were reported among the elders in urban settings [9,13,14] sparse information is available on the older people resident in rural Nigeria. Focusing on the elders in rural communities and promoting oral health among them may help to reduce health inequalities prominent in the region. This will go a long way in reducing the prevalence of oral diseases and invariably tooth loss; conditions associated with poor economic status and low literacy level [15]. Invariably, poor socioeconomic and educational levels are typical attributes of a rural community. This study therefore determined the association between oral health condition and practices of elders in two rural communities in southwestern Nigeria.

Materials and methods

The study sites for the cross-sectional study were Igboora and Idere, the two rural communities in Ibarapa Central Local Government of Oyo State, Nigeria with a total population of 103,243 [16]. The population of elders in this LGA as at the 2006 population census was 6,742 [16]. Igboora is the headquarters of Ibarapa Central Local Government of Nigeria in which exists a community oral health clinic to serve the residents of this community and its environs. Idere is an adjacent town whose residents patronize the community oral health clinic at Igboora. The sample size for this study was calculated using a power of 90%, an accepted degree

of error of 5% and a prevalence of 33.6% of good oral hygiene practice exhibited by elders in a study conducted previously in the same Oyo state [9].A minimum sample size of 172 was obtained per study site and served as the basis of recruitment of study participants in each of the study sites. The Ibarapa Central LGA comprises 10 political wards which were considered as clusters; the sampling unit for this study. The list of wards within each LGA served as the sampling frame. There are seven wards in Igboora and three in Idere. The elders recruited for this study were selected from two randomly selected clusters each from the two communities by balloting using sealed envelopes.All (361) the elders (residents aged 60 years or older) residing in the houses within the selected clusters were approached for the study. Included in this study were 357 consenting elders, who had no form of communication barrier and in whom oral examination could be performed. Excluded from the study were elders who were ill or those who were not available at the time of the study. Ethical approval for the study was obtained from the joint University of Ibadan and University College Hospital (UI/UCH) Institutional Ethical Review Board.

Data collection

Data for the study was collected using structured interviewer administered questionnaires translated into Yoruba, the local language of the community, by an independent bilingual expert whose first language was English. The questionnaire was back translated into English language independently by a team of experts versed in both English and Yoruba languages. All confusing questions were modified and a pretest of the questionnaire was conducted among 40 elderly residents of the two communities in a cluster not selected for the main study.

The questionnaire assessed information on the socio-demographic characteristics, oral hygiene measures of the participants and their utilization of dental services. The socio-demographic characteristics obtained included age, gender, marital status, religion and occupation. The dates of birth of the participants who were not literate were estimated based on major events that had occurred within the community and in Nigeria. Occupation was categorized as skilled workers, unskilled workers and dependents according to a modification of the Office of Population Census and Surveys (OPCS) classification, which had been modified for our environment [17]. Oral hygiene measure was assessed by questions on tooth cleaning aid and frequency of tooth cleaning. Utilization of dental services was evaluated by asking if they had ever been to the dentist. If they answered affirmatively, they were asked for the reasons why they consulted the dentist. If they had not visited a dentist, they were asked why they had not done so. Other questions asked related to their use of tobacco and if they had ever experienced tooth exfoliation without any history of trauma.

Two trained research assistants, one being an indigene, administered the questionnaires. Two trained and calibrated dentists conducted oral examinations using sterile plain mouth mirrors and World Health Organisation (WHO) probes. Tooth mobility was assessed with Millers mobility index [18] and oral hygiene was assessed with the Simplified Oral Hygiene Index of Greene and Vermillion [19]. Assessment of dental caries was done according to the World Health Organization basic oral health survey [20]. Presence or absence of dentures or other dental prostheses was charted as present or absent. Oral examinations were conducted with the participants seated on benches or chairs outside their houses and natural lighting served as source of illumination. The participants with oral complaints were referred appropriatelyto the Community Oral Health Care Centre located within the General Hospital, Igboora. All participants were educated on good oral hygiene practices after data collection. Duplicate examinations were conducted on twenty consenting elders to determine the inter examiners' variability.

Data management

Data collected was entered into a computer and analyzed using the Statistical Package for Social Sciences (SPSS) version 22. For the purpose of data analysis, age, marital status and educational level were recoded into binary variables to reduce the number of empty cells. Age was regrouped into three: 60 – 64 years, 65 – 74 years and $\geq$75 years. Marital status was recoded as "married" or "others". The category "others" included participants who were divorced and those who were separated or single. Educational level was dichotomized as "no form of formal education" and "at least primary education"; which is also regarded as "at least sixth grade". Primary school education was used being the basic form of education in the country.

Quantitative variables were summarized using means and standard deviations while frequencies were generated for categorical variables. Chi square statistics was used to evaluate associations between categorical variables. Logistic regression was done to identify predictors of frequency of tooth cleaning and consultation with the dentist. Only significant variables at the bivariate analysis were entered into the analysis with dental

Table 1: Association between socio-demographic characteristics and frequency of tooth cleaning of the elders

Socio-demographic characteristics	Frequency of daily tooth cleaning n (%)		Total n (%)	P value
	< Twice	≥ Twice		
Sex n = 357				
Men	113 (70.2)	48 (29.8)	151 (100.0)	0.789
Women	135 (68.9)	61 (31.1)	196 (100.0)	
Age (years) n = 357				
60-64	89 (57.1)	67 (42.9)	156 (100.0)	< 0.001*
65-74	85 (72.6)	32 (27.4)	117 (100.0)	
75-100	74 (88.1)	10 (11.9)	84 (100.0)	
Marital status n = 357				
Married	142 (63.7)	81 (36.3)	223 (100.0)	0.002*
Others	106 (79.1)	28 (20.9)	134 (100.0)	
Educational qualification n = 357				
At least sixth grade	77 (48.1)	83 (51.9)	160 (100.0)	< 0.001*
None	171 (86.8)	26 (13.2)	197 (100.0)	
Occupation n = 357				
Skilled	14 (29.8)	33 (70.2)	47 (100.0)	< 0.001*
Unskilled	165 (76.0)	52 (24.0)	217 (100.0)	
Dependents	69 (74.2)	24 (25.8)	93 (100.0)	
Religion n = 349				
Christianity	61 (67.8)	29 (32.2)	90 (100.0)	0.876
Islam	182 (70.5)	76 (29.5)	258 (100.0)	
Others	0 (0.0)	1 (100.0)	1 (100.0)	

*statistically significant

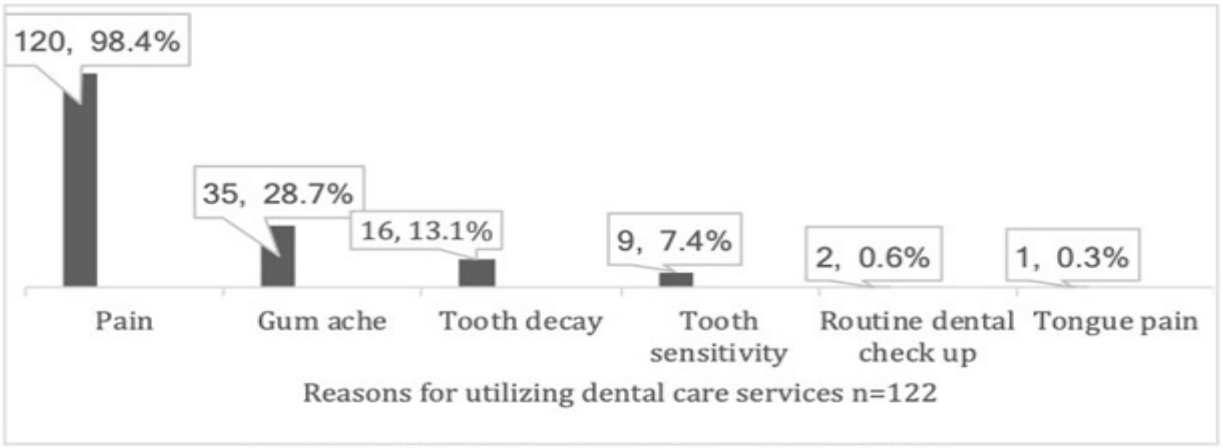

Figure 1: Reasons for utilizing dental care services mentioned by the elders

consultation as dependent variable and positive history of previous dental visit as reference. Frequency of tooth cleaning was the dependent variable and twice or more cleaning of the teeth used as reference in the logistic regression for predictors of frequency of tooth cleaning. Level of significance was at a cut off level of < 5%. Kappa statistics was used to assess inter examiners' variability.

Results

Table 1 shows that of the 357 participants, 196 (54.9%) were females. The age of the participants ranged from 60 to 100 years and the mean (SD) age was 68.4 (± 9.0) years. Many, 223 (62.5%), were married and 258 (72.3%) were Muslims. The participants were mainly unskilled workers or dependents. Inter examiners' variability for the oral

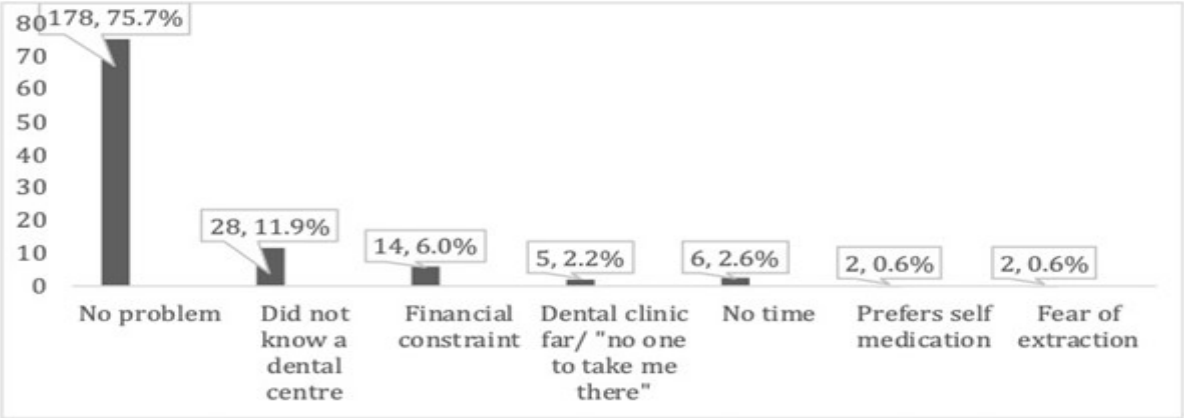

Figure 2: Reasons for non-utilization of dental services mentioned by the elders

Table 2: Association between socio-demographic characteristics and oral examination findings

Socio-demographic characteristics	Mobile tooth/teeth		Missing tooth/ teeth		Decayed tooth/teeth	
Sex	Yes (%)	No (%)	Yes (%)	No (%)	Yes (%)	No (%)
Men	78 (48.4)	83 (51.6)	76 (47.2)	85 (52.8)	57 (35.4)	104 (64.6)
Women	79 (40.3)	117 (59.7)	107 (54.6)	86 (45.4)	57 (29.1)	139 (70.9)
	$X^2 = 2.378$	p = 0.123	$X^2 = 1.931$	p = 0.165	$X^2 = 1.625$	p = 0.202
Age (years)						
60-64	50 (32.1)	106 (67.9)	58 (37.2)	98 (62.8)	61 (39.1)	95 (60.9)
65-74	59 (50.4)	58 (49.6)	63 (53.8)	54 (46.2)	30 (25.6)	87 (74.4)
75-100	48 (57.1)	36 (42.9)	62 (73.8)	22 (26.2)	23 (27.4)	61 (72.6)
	$X^2 = 16.891$	p < 0.001*	$X^2 = 28.685$	p < 0.001*	$X^2 = 6.621$	p = 0.036*
Marital status						
Married	82 (36.8)	141(63.2)	102 (45.7)	121 (54.3)	69 (30.9)	154 (69.1)
**Others	75 (56.0)	59 (44.0)	81 (60.4)	53 (39.6)	45 (33.6)	89 (66.4)
	$X^2 = 12.523$	p < 0.001*	$X^2 = 7.247$	p = 0.007*	$X^2 = 0.268$	p = 0.604
Educational qualification						
None	99 (50.3)	98 (49.7)	121 (61.4)	76 (38.6)	45 (22.8)	152 (77.2)
At least sixth grade	58 (36.3)	102 (63.7)	62 (38.8)	98 (61.3)	69 (43.1)	91 (56.9)
	$X^2 = 7.028$	p = 0.008*	$X^2 = 18.164$	p < 0.001*	$X^2 = 16.710$	p < 0.001*
Occupational class						
Skilled	13 (27.7)	34 (72.3)	12 (25.5)	35 (74.5)	21 (44.7)	26 (55.3)
Unskilled	93 (42.9)	124 (57.1)	111 (51.2)	106 (48.8)	66 (30.4)	151 (69.6)
Dependents	51 (54.8)	42 (45.2)	60 (64.5)	33 (35.5)	27 (29.0)	66 (71.0)
	$X^2 = 9.643$	p = 0.008*	$X^2 = 18.994$	p < 0.001*	$X^2 = 4.104$	p = 0.128

**Statistically significant; ** Elders who were either divorced, separated or single*
X^2 – Chi square

examination was 0.81 to 0.90 (OHI-S – 0.81, tooth mobility – 0.88 and dental caries – 0.90) indicating almost perfect agreement between the examiners [20].

Tooth cleaning aids used by the participants included: chewing sticks, 197 (55.2%), toothbrushes, 94 (26.3%), both chewing sticks and tooth brushes, 58 (16.2%) and hands/fingers, 8 (2.3%). Many, 200 (56.0%), cleaned their teeth once daily, 109 (30.6%)

did so twice or more often and 48 (13.4%) participants did not clean their teeth regularly. Twenty-one (5.9%) participants presently use tobacco in any form.

consulting the dentist are as shown in Figure 1. Only two participants consulted the dentist for routine dental checkup.

Figure 2 shows the reasons provided by the participants who did not visit the dentist, with the

Table 3: Association between frequency of tooth cleaning, previous dental visits and oral condition

Variables	Frequency of daily toothcleaning		P value	Previous dental visit		P value
	Once or less n (%)	Twice or more n (%)		Yes n (%)	No n (%)	
Mobile tooth						
Yes	125 (79.6)	32 (20.4)	< 0.001*	75 (47.8)	82 (52.2)	< 0.001*
No	123 (61.5)	77 (38.5)		47 (23.5)	153 (76.5)	
Decayed teeth						
Yes	76 (66.7)	38 (33.7)	0.431	53 (46.5)	61 (53.5)	< 0.001*
No	172 (70.8)	71 (29.2)		69 (28.4)	174 (71.6)	
Missing teeth						
Yes	146 (79.8)	37 (20.2)	< 0.001*	97 (53.0)	86 (47.0)	< 0.001*
No	102 (58.6)	72 (41.4)		25 (14.4)	149 (85.6)	
Oral hygiene						
Poor	242 (69.7)	105 (30.3)	0.510	118 (34.0)	229 (66.0)	0.694
Fair	6 (60.0)	4 (40.0)		4 (40.0)	6 (60.0)	

Table 4: Logistic regression analysis of relationship between previous dental consultation and oral examination findings

Variable	Categories of variable	ß	OR	95% CI	p value
Mobile teeth	Yes**	0.586	1.80	1.09 - 2.98	0.023*
	No				
Decayed teeth	Yes**	0.591	1.81	1.09 - 3.00	0.022*
	No				
Missing teeth	Yes**	1.655	5.24	3.05 - 8.98	<0.001*
	No				

**Statistically significant, ** - Reference category for comparison, OR – Odds ratio, CI – Confidence Interval, ß - beta coefficient, Nagelkerke R^2- 0.254.*

Table 5: Logistic regression analysis of relationship between frequency of tooth cleaning and oral examination findings

Variable	Categories of variable	ß	OR	95% CI	pvalue
Mobile teeth	Yes**	0.611	1.84	1.10 – 3.08	0.020*
	No				
Missing teeth	Yes**	0.820	2.27	1.38 – 3.74	0.001*
	No				

**Statistically significant, ** - Reference category for comparison, OR – Odds ratio, CI – Confidence Interval, ß - beta coefficient, Nagelkerke R^2- 0.094.*

A total of 122 (34.2%) participants had consulted a dentist previously and pain was the main reason (120, 98.4%) for doing so. Other reasons for

main reason being “no problem with me as tooth problems and its eventual loss occur with ageing”, 178 (75.7%). Others reasons included”did not know

of any dental center", financial constraint and "no one to take me there" distance.

A total of 183 (51.3%) participants had at least a missing tooth and 2 (1.1%) were completely edentulous. The mean (SD) number of missing teeth was 6.4 (± 7.2) among edentulous participants. Only 7 (3.8%) of the edentulous elders had partial denture. A total of 163 (45.7%) participants reported self-exfoliation of at least one tooth. Also, noted on oral examination was that 157 (44.0%) participants had mobile tooth/teeth. The number of mobile teeth ranged from 1 to 10 teeth with a mean (SD) of 1.4 (±2.2) mobile teeth per participant. One hundred and fourteen (31.9%) had at least a decayed tooth. The number of decayed teeth ranged from 1 to 9 and the mean (SD) was 0.7 (±1.4). Many (343; 96.1%) of the participants had poor oral hygiene.

The proportion of participants aged 60-64 years who cleaned their teeth at least twice a day was higher than that of participants aged 65 years or older with the same frequency of tooth cleaning ($p < 0.001$) (Table 1). A higher proportion of elders currently married cleaned their teeth regularly compared to elders in other marital classes i.e. divorced, separated or single ($p = 0.002$) (Table 1). Table 1 also showed that participants with a minimum of sixth grade level of education cleaned their teeth more frequently than those without any form of formal education, $p < 0.001$. Participants who were skilled workers also cleaned their teeth more frequently than unskilled participants and dependents (70.2% vs. 24.0% vs. 25.8%, $p<0.001$) (Table 1).

Higher proportions of participants aged at least 75years had mobile teeth (57.1% vs. 50.4% vs. 32.1%, $p<0.001$), and missing teeth (73.8% vs. 53.8% vs. 37.2%, $p = 0.007$) than participants in the two other age groups (Table 2). Mobile tooth/teeth ($p < 0.001$) and missing tooth/teeth ($p = 0.007$) were more frequently found in elders who were divorced, separated or single compared to those who were married (Table 2). Higher proportions of elders with no formal education had mobile andmissing teeth compared to others but a lower proportion of the former had decayed teeth (Table 2).

Less frequent tooth cleaning was associated with presence of mobile tooth/teeth ($p < 0.001$) and incomplete dentition, $p < 0.001$ (Table 3). Previous consultation with the dentist was associated with presence of mobile tooth/teeth ($p < 0.001$), decayed teeth ($p < 0.001$) and missing teeth, $p < 0.001$ (Table 3).

More participants with mobile teeth ($p = 0.028$) and decayed teeth ($p = 0.028$) had poor oral hygiene compared to those without those oral conditions. Participants who had missing teeth were five times more likely to have consulted a dentist previously than those without missing tooth (OR = 5.24, 95%CI: 3.05, 8.98, $p < 0.001$). Other predictors of previous dental consultation were presence of mobile tooth/teeth (OR = 1.80, 95%CI: 1.09, 2.98, $p = 0.023$) and decayed tooth/teeth (OR = 1.81, 95%CI: 1.09, 3.00, $p = 0.022$) (Table 4).

Table 5 shows that participants who engaged in twice or more daily tooth cleaning were less likely to have mobile teeth ($p =0.020$) or have incomplete dentition ($p = 0.001$)

Discussion

The findings of this study showed that the elders in the two rural communities had suboptimal oral health status and oral hygiene practices. It also established that poor oral hygiene practices were significantly associated with poor oral health status. The biodata of the studied elders revealed that three-quarters of the elders had no formal education and most belonged to either the unskilled or dependent occupational classes. This finding is similar to previous biodata noted among residents of a rural community [14].This study, which was conducted in a rural community, is the first major attempt at documenting the association between oral health status and oral hygiene practices of elders in such region of the country. The method was cross-sectional, which allowed a snapshot of the oral hygiene practices of the older people in the community. A major limitation of the study, however, was the inability to screen the participants for systemic diseases. These diseases could be confounders in the overall oral health status of the participants. Participants who were ill were excluded, however, those without symptoms, which is typical in diseases like hypertension could have been included in the study.

Many of the elders used chewing stick as their tooth cleaning aid, in agreement with previous studies in Nigeria [8,9]. The perceived benefits of chewing sticks, which has been centuries long in many African countries as well as the scientific confirmation of its beneficial effects [21] may explain the consistency in findings. On the other hand, contrasting reports have been reported in Cameroun [4] and India [13] where toothbrushes and fingers were the major tooth cleaning aids respectively [4,13]. Differences in the studies may be attributed to the varying perceptions and beliefs of the studied population.

Only a third of the elders engaged in the recommended minimum of twice daily tooth cleaning as similarly reported by Taiwo *et al*. [9] in Nigeria and also by authors in other countries [4,13,14]. The proportion of the elders engaging in twice or more frequent daily cleaning of their teeth noted in the present study (30.5%) was however higher than that noted in Cameroun (4.9%) [4] and India (2.3% - 10.8%) [13,14]. A higher proportion (34.7%) was however, reported in Poland [12] a more developed country. In agreement with other findings [22], elderly individuals who were older than 75 years and those without formal education cleaned their teeth less frequently. Formal education and younger age have been documented as significant factors influencing good oral health practices [22]. Observed in this study was the small proportion (5.9%) of the study participants that used tobacco in any form, which is similar to findings by other authors [14]. This is a probable reflection of lifestyle from adulthood that lingered into old age.

Over 90% of the elders examined in this study had poor oral hygiene as similarly reported in the sub urban region of the state where the present study was conducted [3]. Contrasting findings was reported in Cameroun where 41.4% had obvious plaque and 12.7% had abundant plaque [4]. Furthermore, almost half of the study participants had mobile teeth and reported self-exfoliation of their teeth without history of trauma.All the aforementioned are signs and symptoms of periodontal disease, a common cause of tooth loss in the elderly population [13]. Not surprising, almost one half of the participants in the present study had at least a missing tooth similar to findingsin urban Nigeria (47.7%) [23]. Lower prevalence rate than this have been observed in Spain (20%) [11] while a higher rate (over 90%) was reported among the elders in Poland [12]. Only a few of the elders with tooth loss had denture to replace the missing teeth and none of those that were completely edentulous had one. The reason for this will have to be investigated but may be related to the poor education, socio-economic status and oral health awareness of the cohort. In addition, accessibility to dentures and other tooth replacement options should be considered in these communities.

It is worrisome that there is a high prevalence of tooth loss as well as signs of periodontal disease in the present study.The probable factor could be suboptimal frequency of tooth cleaning that is contributory to the features of periodontal disease in this study. In addition, the wrong use of chewing sticks could have been an important causative factor [9].This is most likely, as a previous study [9] noted, because chewing of the sticks was given more prominence by users rather than the actual tooth cleaning process that removes plaque in a population where chewing sticks were the predominant tooth cleaning aids [9]. Also observed is the significant association between the poor oral hygiene and tooth mobility, missing teeth and decayed teeth. The significant association between poor oral hygiene practices and presence of oral diseases further corroborated this. This is in agreement with previous reports by others [11,12]. Thus, the findings from the present study further adds to the body of knowledge on the role of poor oral hygiene as causative factor of many oral conditions. This clearly shows an overwhelming need for oral hygiene prophylaxis and health promotion among the elders in view of the prevalent symptoms and signs of periodontal disease among them.

Almost 35% of the elders in this study had been to the dentist, similar to report from previous studies [9,14]. A much lower proportion (19.8%) was documented by Agrawal *et al.* [13] in Madhya Pradesh, India. The location of a Community Oral Health Care Centre within this community may be responsible for the "seemingly fair" utilization of dental care services by the elders in this study. However, in developed countries such as Poland, over 70% of the elders were observed to have consulted the dentist within a year preceding the study [24].

Pain was the main reason for utilizing dental services in agreement with other studies [14,24], but different from reports by Agrawal *et al*. [13] where dental prosthesis was the major reason for the consultation. Not perceiving a need was the main reason for non-utilization of dental services as the elders associated having dental problem to presence of pain. This association of dental utilization and dental pain has been reported by others [9].

Furthermore, those who had not been to the dentist also believed that tooth problems and eventual loss were normal occurrences associated with aging, which is noteworthy and consistent with what others had found [9,12]. This perception may have affected the elders' meticulousness with routine oral hygiene measures, consequentially, predisposing them to periodontal disease. In addition, the erroneous beliefs may have played a significant role in the non-utilization of dental services, which was only accessed when there was a problem.

This became more apparent with the fact that oral diseases were significant predictors of dental consultation in this study. An explanation for this could be the perception that dental consultations take place only in the presence of oral diseases as well as the strong belief that oral diseases occur with age. These two factors coupled with pain being a major reason for dental consultation is suggestive that without complication of oral diseases, this group of elderly individuals will not seek dental consultation.

These findings have provided baseline information illustrating the need for oral health promotion among the elderly individuals in the rural community. In addition, it highlighted the need for oral prophylaxis due to the prevalent symptoms and signs of periodontal disease, a highly preventable disease in this community. Moreover, subsidizing the cost of this procedure for the elders at the Community Oral Health Care Center as well as provision of mobile dental services should be considered. Further studies into how oral diseases impact on the quality of life of elders in rural communities will be of enormous benefit in addition to this baseline information for holistic planning, monitoring and evaluation of any intervention. In addition, further studies utilizing periodontal probes to determine attachment loss and pathological periodontal pocketing, which were not assessed in the present study, will be advantageous.

Conclusion

Poor oral hygiene was highly prevalent among elders in the rural communities. Less frequent tooth cleaning and poor oral hygiene were associated with presence of mobile tooth/teeth and incomplete dentition. Presence of mobile teeth, decayed teeth and missing teeth were significant predictors of previous dental consultation.

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Correlates of treatment outcome among hospitalized multidrug resistant tuberculosis patients co infected with HIV at a Specialist treatment center in South Western Nigeria

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Abstract

Background: The synergistic effect between multidrug resistant Mycobacterium tuberculosis (MDR-TB) and HIV remains a public health challenge in the management of co infected patients. Various researchers have documented the treatment outcome of patients with MDR-TB but few studies have explored the correlates of treatment outcome among MDR-TB patients co-infected with HIV. This study aimed to identify the correlates of treatment outcome among hospitalized MDR-TB patients during the intensive phase of treatment.

Method: A retrospective review of records of MDR-TB patients admitted at a specialist treatment center in Oyo State from 2012 – 2016 was conducted. Descriptive statistics such as frequencies, proportions and relevant summary indices were obtained while bivariate analysis was done using chi square test to identify factors associated with treatment outcome. Predictors of treatment outcome were identified by fitting a binary logistic regression. All statistical significance was set at 5%.

Result: A total of 141 patients had complete records within the study period with mean age of 36.3±11.6 years. Prevalence of MDR-TB/HIV co-infection was 12.1% with the highest proportion among those aged 45 years above and females. Over 80% of the respondents had a favorable outcome, however among the HIV co infected patients, there was a higher proportion with unfavorable outcome (23.5% vs 14.5%). In addition, females were found to be about six times more likely to experience unfavorable outcomes than their male counterparts (A.O.R:5.7; 95% C.I:1.51-20.7).

Conclusion: A high prevalence of MDR-TB/HIV coinfection rate was seen. Although majority of the patients had good treatment outcome, MDR-TB/HIV co infected patients as well as females had poorer treatment outcome. The management of these patients need to be optimized during hospitalization.

Keywords: *Treatment outcome, drug resistance, HIV, tuberculosis*

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Résumé

L'effet synergique entre la tuberculose multirésistante Mycobacterium tuberculose (TB-MR) et le VIH reste un défi de santé publique dans la prise en charge des patients coinfectés. Divers chercheurs ont documenté les résultats du traitement des patients atteints de TB-MR, mais peu d'études ont exploré les corrélats des résultats du traitement chez les patients TB-MR coinfectés par le VIH. Cette étude visait à identifier les corrélats des résultats du traitement chez les patients hospitalisés pour TB-MR pendant la phase intensive du traitement.

Un examen rétrospectif des dossiers des patients atteints de TB-MR admis dans un centre de traitement spécialisé dans l'État d'Oyo de 2012 à 2016 a été effectué. Des statistiques descriptives telles que les fréquences, les proportions et les indices de synthèse pertinents ont été obtenues tandis qu'une analyse bivariée a été effectuée en utilisant le test du chi carré pour identifier les facteurs associés au résultat du traitement. Les prédicteurs du résultat du traitement ont été identifiés en ajustant une régression logistique binaire. Toute la signification statistique a été fixée à 5%.

Un total de 141 patients avait des dossiers complets au cours de la période d'étude avec un âge moyen de 36,3 ± 11,6 ans. La prévalence de la co-infection MDR-TB / VIH était de 12,1%, la proportion la plus élevée étant observée chez ceux âgés de 45 ans et plus et les femmes. Plus de 80% des répondants ont eu une issue favorable, cependant parmi les patients coinfectés par le VIH, il y avait une proportion plus élevée avec une issue défavorable (23,5% vs 14,5%). De plus, les femmes étaient six fois plus susceptibles de connaître des résultats défavorables que leurs homologues masculins (AOR: 5,7; IC à 95%: 1,51-20,7).

Une prévalence élevée du taux de co- infection MDR-TB / VIH a été observée. Bien que la majorité des patients aient eu de bons résultats de traitement, les patients coinfectés par la TB-MR / VIH et les femmes ont eu de moins bons résultats de traitement. La prise en charge de ces patients doit être optimisée lors de l'hospitalisation.

Mots-clés: *Résultat du traitement, résistance aux médicaments, VIH, tuberculose*

Introduction

Multidrug resistant Mycobacterium tuberculosis (MDR-TB) remains a threat to the control of tuberculosis (TB) worldwide and this is further exacerbated by the increasing prevalence of co infection with HIV and the resulting consequence of high mortality [1]. The HIV epidemic and the emergence of anti-TB drug resistance represent serious threats for achieving the Stop TB partnership's goal of eliminating TB as a public health problem by 2050. HIV infection remains the strongest risk factor for the development of active TB- both drug susceptible and drug resistant TB and has been associated with many MDR-TB outbreaks [2].

HIV and MDR-TB are a deadly combination and contribute immensely to increased TB burden and high mortality rates in sub Saharan Africa. This synergism has made it more difficult to achieve successful control of TB, as therapy is less effective, associated with more adverse events and more costly [2,3]. Inadequate treatment of MDR-TB can lead to worse patient outcomes while increasing the risk of outbreaks and development of XDR-TB [3].

In 2016, WHO estimates that there were 600 000 new cases with resistance to rifampicin – the most effective first-line drug – of which 490 000 had MDR-TB with only 54% of them successfully treated [2]. According to the WHO, measured treatment outcomes for TB patients are divided into two. 1) Successful outcomes which includes patients meeting the definition of cure or treatment completion and 2) Unsuccessful outcomes including patients meeting the definition of death, default, failure, or transferred out.

A review paper revealed that treatment success was associated with overall duration of treatment, number of effective drugs in the regimen and with use of later generation fluoroquinolones [4]. HIV co-infection further complicates MDR-TB treatment because of the overlapping toxicities of antiretrovirals and second-line TB drugs, lack of knowledge about drug-drug interactions, and multiple potential causes of clinical deterioration during treatment [5].

In Nigeria, the National TB Control Program has adopted an in-patient approach to allow for better adherence, adequate monitoring of adverse reactions, regular sputum smear and culture examination, provision of antiretroviral treatment (ART) to HIV co-infected patients and multi-disciplinary attention to the patients. The National MDR-TB treatment protocol employs that all bacteriologically confirmed MDR-TB patients receive intensive phase for 4 months in the hospital, followed by 20 months of continuation phase in the community [6]. Currently, there are 29 MDR treatment centers in Nigeria. Of the six that are located in South West Nigeria, three are in Oyo State while Lagos, Osun and Ogun states have one respectively.

A Nigerian study which explored the end of intensive phase treatment outcomes of hospitalized MDR-TB patients in a national cohort, found that about 15% of all registered MDR-TB patients died in this period and the major factor found to be associated with these deaths was reduced baseline CD4 count among HIV patients [7]. In another study conducted in Luthiana to explore the overall survival of registered MDR-TB patients over a 6 year period (2002-2008) reported that HIV positivity among other factors like older age, alcohol use, being smear positive at time of diagnosis were strong predictors of poorer survival [8]. A Moldovian study also reported that among 273 individuals started on MDR-TB treatment, HIV status (OR 6.7, 95% CI 2.7–16.5) and positive history of in-carceration (OR 2.5, 95% CI 1.4–4.47) were significantly associated with an unfavorable outcome [9].

Various researchers have looked at the treatment outcome of patients with MDR-TB irrespective of HIV status [10-15] but few studies have explored the correlates of treatment outcome among MDR-TB patients co infected with HIV and those HIV-naive. This study therefore aimed to identify and compare the predictors of treatment outcome among hospitalized MDR-TB patients who are HIV co infected and those HIV naïve.

Methods

This study involved retrospective review of records of a cohort of MDR-TB patients admitted at one of the specialist treatment center in Oyo State, South Western, Nigeria over a five-year period (2012 – 2016). Patients admitted into the specialist treatment center were referred from satellite directly observed treatment(DOTs) centers following confirmation of MDR-TB using GeneXpert/RIF assay kits in line with the WHO guidelines. HIV testing was done with determine rapid KIT and confirmed with Enzyme Linked Immune Sorbent assay (ELISA) diagnosis on all patients admitted into the MDR-TB facility. In addition, blood sample (5mls) was withdrawn from each patient on admission and hepatorenal function was assessed by measuring Sodium, Potassium, Chloride, Bicarbonate, Total Bilirubin,

Alkaline Phosphate, thymidylate synthase (TS) Protein, Urea, Creatinine and Albumin using standard techniques as described by Ige *et al* [16].

A structured abstraction form was developed to extract information from the patient records. This form contained 3 sections which include socio demographic characteristics, past history of TB including drug regimen, clinical characteristics and laboratory reports. Two trained research assistants retrieved information from these records over a period of 6 weeks. Primary outcome variable in this study was the treatment outcome which was classified as favorable (patients that were discharged to DOTs centers) and unfavorable (patients who died or discharged against medical advice). The secondary outcome was MDR-TB/HIV co-infection rate, which was measured by proportion of MDR-TB who had HIV at admission into MDR-TB specialist care centre.

Data was entered using Microsoft Excel and analyzed using STATA v 14.1. Descriptive statistics such as frequencies, proportions and relevant summary indices were obtained for socio demographic variables, previous TB history while bivariate analysis was done using chi square test to identify factors associated with favorable or unfavorable treatment outcome among MDR-TB/ HIV co infected or non co-infected patients. Predictors of treatment outcome were identified by fitting a binary logistic regression model. All statistical significance was set at 5%. In addition, a geographical map using Health Mapper was produced to identify the spatial distribution of patients admitted into this specialist center.

Ethical approval for this study was obtained from the Oyo State Ministry of Health and verbal approval from the Medical Director of the specialist center.

Results

A total of 144 patients were admitted between the study period but 3 were excluded due to incomplete documentation. However, the remaining 141 were included in analysis with a mean age of 36.3±11.6 years and a male to female ratio of 0.6:0.4. About half (51.8%) of the 141 patients were aged 35 years and above while 12.1% were between 15 and 24 years.

Figure 1 is a map of Nigeria showing where patients come to assess the health facility in Oyo State. This map shows that majority of the patients come from the South West, South East, North Central and South South with some pockets in northern Nigeria respectively.

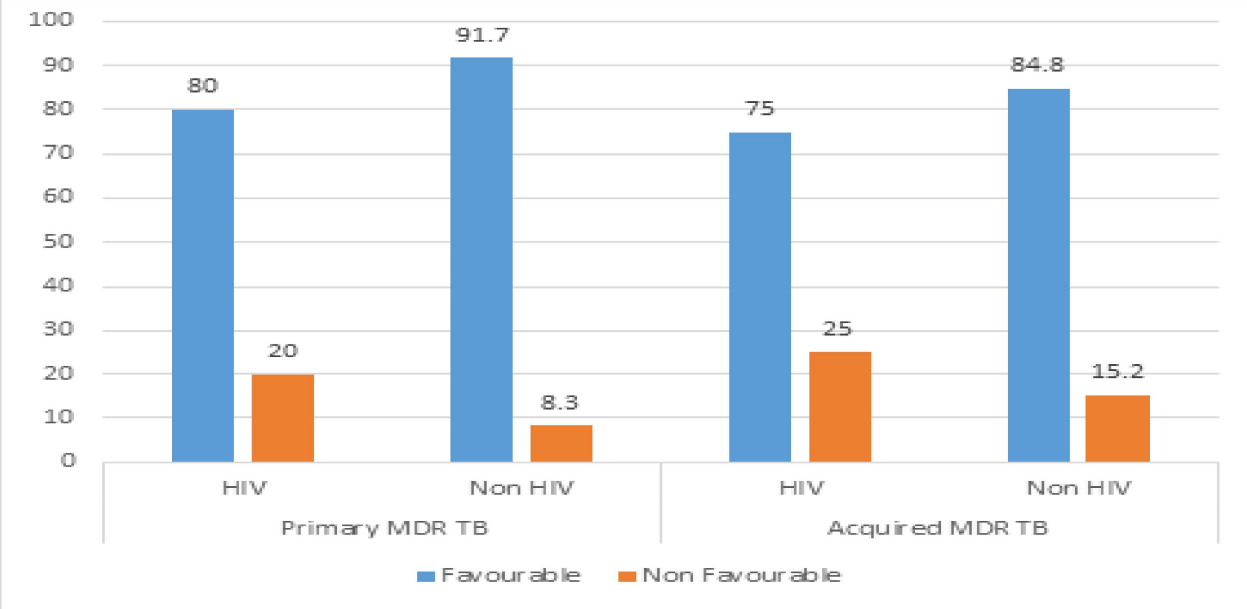

Fig. 1: Proportion of multidrug resistant patients by type of MDR-TB, HIV status and treatment outcome

About 90% of the patients had ever been treated for TB with majority of them having failed the 6 months' regimen. Sputum smear for AFB was positive in 74.4 % of all MDR-TB patients admitted within the review period. The prevalence of MDR-TB co infection with HIV among these patients was 12.1% with the highest proportion among those in the age group 25-34 years and females. (Table 1)

Table 1: Sociodemographic and Baseline Characteristics of MDR-TB by HIV Status

	MDR-TB/ HIV +ve	MDR-TB/ HIV -ve	Total	χ^2	P-value
Age (years)					
15-24	0(0.0)	17(13.7)	17(12.1)		
25-34	7(41.2)	44(35.5)	51(36.2)	4.8	0.18
35-44	4(23.5)	40(32.3)	44(31.2)		
45 years and above	6(35.3)	23(18.5)	29(20.6)		
Sex					
Male	8(47.1)	82(66.1)	90(63.6)		
Female	9(52.9)	42(33.9)	51(36.2)	2.3	0.12
Ever been previously treated for TB					
Yes	13(76.5)	116(93.5)	129(91.5)		
No	4(23.5)	8(6.5)	12(8.5)	5.4	0.01
Category of patient					
New	6(35.3)	12(9.7)	18(12.8)		
Failed 6 months					
Regimen	11(64.7)	96(77.4)	107(75.9)	10.1	0.01
Relapse/Default	0(0.0)	16(12.9)	16(11.3)		
Total	17(12.1)	124(87.9)	141(100.0)		
BMI(n=121)					
Normal	5(31.2)	55(52.4)	60(49.6)	1.45	0.01
Underweight	9(56.2)	49(46.7)	58(47.9)		
Overweight	2(12.5)	1(1.0)	3(2.5)		
Baseline Smear (n=133)					
Positive	8(53.3)	91(77.1)	99(74.4)	3.95	0.04
Negative	7(46.7)	27(22.9)	34(25.6)		

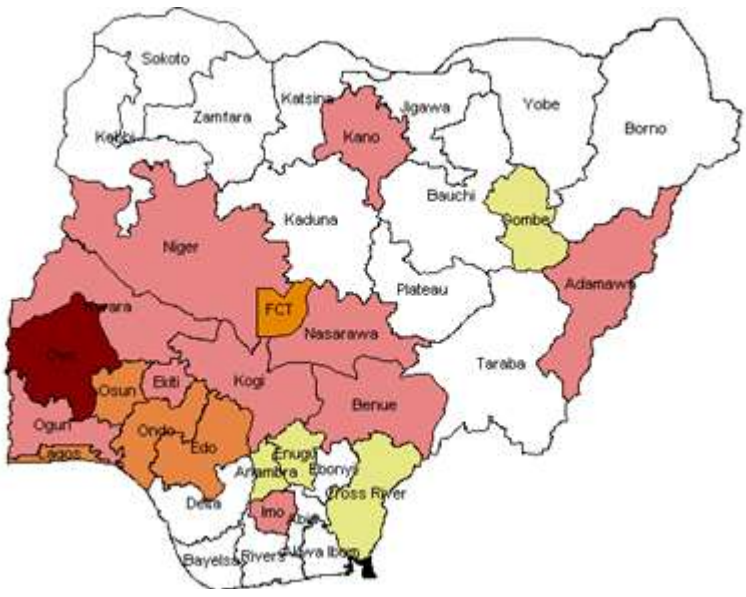

Fig.2: Map of Nigeria showing spatial distribution of patients being admitted into the specialist center in Oyo State, 2012-2016

More so, a higher proportion of MDR-TB patients with HIV (76.5%) had been treated for TB however a higher percentage of MDR-TB who had never been treated for TB had HIV (23.5% vs 6.5%)($p<0.05$). Concerning the nutritional status of the respondents as measured by their BMI, a similar

Table 2: Selected characteristics of multidrug resistant tuberculosis patients by treatment outcome

Selected Characteristics	Treatment Outcome				
	Favourable N(%)	Unfavourable N(%)	Total N(%)	χ^2	p-value
Age (years)					
15-24	15 (88.2)	2(11.8)	17(12.1)		
25-34	42(82.4)	9(17.6)	51(36.2)	1.52	0.67*
35-44	39(88.6)	5(11.4)	44(31.2)		
45 years and above	23(79.3)	6(20.7)	29(20.6)		
Sex					
Male	80(88.9)	10(11.1)	90(63.8)		
Female	39(76.5)	12(23.5)	51(36.2)	3.81	0.05
Ever been previously treated for TB					
Yes	104(83.9)	20(16.1)	124(87.9)		
No	15(88.2)	2(11.8)	17(12.1)	0.21	0.64*
Category of patient					
New	16(88.9)	2(11.1)	18(12.8)		
Failed 6 months Regimen	90(84.1)	17(15.9)	107(75.9)	0.41	0.93*
Relapse/Default	13(81.2)	3(18.8)	16(11.3)		
BMI(n=121)					
Normal	53(88.3)	7(11.7)	60(49.6)		
Underweight	51(87.9)	7(12.1)	58(47.9)	0.40	0.81*
Overweight	3(100.0)	0(0.0)	3(2.5)		
Baseline Smear(n=133)					
Positive	89(89.9)	10(10.1)	99(74.4)		
Negative	29(85.3)	5(14.7)	34(25.6)	0.53	0.46
HIV Status					
Reactive	13(76.5)	4(23.5)	17(12.1)		
Non-Reactive	106(85.5)	18(14.5)	124(87.9)	0.92	0.33*
Total	119(84.3)	22(15.6)	141(1000)		

*Fischers Exact p-value

proportion of all MDR-TB patients were either normal (49.6%) or overweight (47.9%) but about 60% of HIV co-infected patients were underweight ($p<0.05$). In addition, about one fifth of the respondents co-infected with HIV had a negative sputum smear on admission (46.7%) as compared to 22.9% who were HIV naive.

Over eighty percent of the respondents had a favorable outcome, however among the HIV co infected patients there was a higher proportion with poor outcome as compared to the HIV naïve patients (23.5% vs 14. 5%).$p>0.05$ In addition, females were found to have a higher proportion of people with poor outcomes as compared to males (23.5% vs 11.1%). This was found to be statistically significant. Conversely, a higher proportion of those aged 45 years and above (20.7%), ever been previously treated for TB (16.1%), underweight (12.1%), patients with negative smear at admission and those who had relapse/defaulted treatment (18.8%) had poor treatment outcomes. However, these were not statistically significant, $p>0.05$. (Table 2)

Figure 2 also shows that among patients with primary MDR TB, a higher proportion of those co infected with HIV had poor outcome (20.0%) as compared to HIV naïve patients with primary MDR TB (8.3%). This was also similar among patients with acquired MDR TB. However, the proportion of patients with poor outcome among HIV naïve MDR TB patients was higher in those that had acquired MDR TB (15.2%) than primary MDR TB (8.3%)Following the fitting of a logistic regression model to identify independent predictors of treatment outcome among hospitalized MDR-TB, being female was the only predictor of poor treatment outcome. (Table 3)

Table 4 also shows some biochemical profile pertaining to the hepato-renal function of the admitted patients at baseline. This table shows slight differences in profiles between HIV positive patients

Table 3: Predictors of Treatment Outcome

Predictor	Odds Ratio	95% Confidence Interval	P-value
Age			
15-24	1		
25-34	0.92	0.15-5.44	0.93
35-44	2.84	0.34-23.4	0.33
>45	0.50	0.07-3.26	0.46
Gender			
Female	5.7	1.51-20.7	**<0.01**
Male	1		
AFB at Baseline			
Positive	1		
Negative	0.56	0.15-2.02	0.37
Ever been treated for Tuberculosis			
Yes	1		
No	1.3	0.14-12.4	0.80
HIV Status			
Reactive	0.7	0.11-4.45	0.16
Non-Reactive	1		

Table 4: Hepato renal profile of MDR TB patients admitted by HIV Status and Treatment Outcome

Parameter	MDR-TB/HIV +ve			MDR-TB/HIV – ve		
	Favourable (n=13) Mean(SD)	Unfavourable (n=4) Mean(SD)	T/p-value	Favourable (n=103) Mean(SD)	Unfavourable (n=16) Mean(SD)	T/p-value
Sodium	132.6±4.7	133.5±3.1	0.47	134.9±6.4	132.5±6.0	0.64
Potassium	3.8±0.5	3.9±0.2	0.24	3.8±0.5	3.4±0.7	0.31
Chloride	98.2±3.3	97.2±3.5	0.81	96.1±5.8	88.6±23.8	0.00
Bicarbonate	23.0±2.2	22±3.7	0.41	22.6±1.7	22.5±1.7	0.97
Total Bilirubin	0.75±0.4	0.75±0.4	0.91	0.5±0.67	0.7±0.5	0.86
Alkaline Phosphate	131.5±100	69.2±9.5	0.06	74.5±33.5	82.8±34.8	0.64
TS Protein	6.1±1.0	5.7±0.7	0.93	6.0±0.47	6.0±0.43	0.26
Urea	26.6±5.2	22.5±11.2	0.07	26.0±7.1	28.3±6.9	0.84
Creatinine	1.5±2.3	0.87±0.41	0.40	0.9± 0.97	0.8±0.19	0.48
Albumin	4.4±0.9	3.6±0.2	**0.039**	4.3±0.5	4.4±0.7	0.39

as well as effect on treatment outcome. Lower levels of albumin was the only parameter seen to be associated with poor treatment outcome among HIV co infected patients ($p<0.05$)

Discussion

Multi drug resistant tuberculosis patients co infected with HIV pose significant public health concerns. This study revealed a relatively high rate of MDR-TB/HIV co infection of 12.1% and poorer treatment outcomes among these group of people. This was higher than 8.6% reported in a study conducted in the same setting as this study.[15] However, the MDR-TB/HIV co infection rate in this study was lower than 19.1% reported from another study conducted in a sister MDR-TB facility.[16] This may be due to the fact that the other study reviewed records obtained from a reference laboratory while this present and latter study reviewed individual case records of patients. This shows the possible weakness in the linkage system between hospital and laboratory services.

Furthermore, this study revealed that there was an association between patients with acquired MDR-TB, poor nutritional status and positive sputum smear on admission and being HIV positive. These findings were in contrast to reports from

another study where prior history of TB was found to be the only predictor of HIV positivity among MDR-TB patients though this study was conducted among HIV positive patients alone thus might not be generalizable.[16,17]. In addition, this later study was conducted about a decade ago thus suggesting that there seems to be a change in trend in the pattern of risk factors predisposing MDR-TB patients to HIV.

The findings from this study that MDR-TB/ HIV co-infected patients had poorer treatment outcomes was in keeping with findings from similar study in Nigeria which used a national cohort (2010 to 2012) to explore the end of intensive phase treatment outcomes of hospitalized MDR-TB patients and reported exactly the same pattern of results [7]. Fifteen percent of the hospitalized patients died within intensive phase of treatment in both studies reflecting the level of care at these treatment sites. This shows that the trend in the intensive phase treatment outcome of hospitalized MDR-TB patients has not changed in the last five years which suggests a call for action.

Treatment success rates were higher in this study as in most other studies which reported a success rate ranging 56% to 77% [18-22]. This variation could be due to the fact that most of these studies followed up MDR-TB patients for a longer period of time and even till the end of treatment. This shows that despite the success achieved in hospitalized treatment, the ambulatory management is very imperative as most patients tends to die or fail to complete treatment. This can further cause the sustained transmission of resistant strains in the community.

Findings from this study showed that being a female was the only predictor of treatment outcome among the hospitalized MDR-TB patients. Although HIV infection was not associated with poor treatment outcome in this study, a higher proportion of MDR-TB/HIV co infected patients had poorer treatment outcomes. Other investigators have found both similar and contrary findings in sub Saharan countries including South Africa [9,21,22]. A systematic review by Orenstien *et al* reported that differences in population characteristics, including prevalence of HIV and proportion of patients previously treated for TB did not lead to significantly different outcomes [21]. In addition, a retrospective review of records in Peru in 2014, HIV infection and previous episode of TB among other factors were found to significantly increase mortality rates among MDR-TB patients [23]. This varying findings could be due to the representativeness of the study population sampled. One major limitation of this study could have been the number of cases retrieved and admitted within the study period.

This study also points out that this treatment site in Oyo State might be over stretched as it serves the majority of the southern part of Nigeria and some pockets in the northern geopolitical zones. This calls for capacity building in the northern part of Nigeria as well as establishing treatment centers so as to better manage patients with MDR-TB who require hospitalized intensive phase of management.

Conclusion

MDR-TB/ HIV co-infection rate was relatively high in this treatment center. Poorer treatment outcomes occur in those who are co infected with HIV and being female was a major predictor of poor treatment outcomes. Management of female MDR-TB/HIV patients should be optimized in treatment centers.

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Prevalence and predictors of kidney dysfunction amongst pregnant women with pre-eclampsia in three selected major hospitals in Abeokuta, South West Nigeria

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Abstract

*Background:*Maternal mortality rate in Nigeria is still high and a major cause of this in our environment is eclampsia related.The kidney plays essential role in the adaptive physiology of normal pregnancy and in the patho-physiology of preeclampsia.There is thus the need to determine the magnitude of its dysfunction in the setting of pre-eclampsia in our practice.

*Objectives***:** To determine the prevalence and determinants of kidney dysfunction among pregnant women with preeclampsia attending selected major antenatal clinics in Abeokuta, south western Nigeria.

*Methodology:*This is a descriptive cross sectional study carried out in three health facilities in Abeokuta i.e. Federal Medical Centre, State Hospital, Ijaiye and Oba Ademola Maternity Home. Ninety pregnant subjects with preeclampsia and 90 apparently healthy pregnant controls were recruited consecutively at the ante-natal clinics over a six-month period. Their biodata and clinical history were documented using a structured proforma. Participants' blood pressure, urinalysis, blood chemistry and Kidney ultrasound scan were carried out

Results: A total of 10 out of the 90 women with preeclampsia had kidney dysfunction giving a prevalence of 11.1%. The mean estimated glomerular filtration rate of the women with preeclampsia without Kidney dysfunction was 108.7±26.0ml/min/ 1.73m^2 and while those with Kidney dysfunction had a mean of 38.6 ±9.2ml/min/1.73m^2. On logistic regression, generalized edema and a previous history of preeclampsia were significantly associated with kidney dysfunction (p value <0.05).

Conclusion: Prevalence of kidney dysfunction among women with preeclampsia was found to be significant in this study. Observed predictors included having generalized edema and a previous history of preeclampsia. It is recommended that periodic routine screening of pregnant women for latent and active kidney disease be encouraged in our practice.

Keywords;*Kidney, dysfunction, pregnancy, pre eclampsia,*

Résumé

Contexte: Le taux de mortalité maternelle au Nigéria est toujours élevé et une cause majeure de cela dans notre environnement est liée à l' éclampsie . Le rein joue un rôle essentiel dans la physiologie adaptative de la grossesse normale et dans la patho- physiologie de la prééclampsie. Il est donc nécessaire de déterminer l'ampleur de son dysfonctionnement dans le cadre de la pré- éclampsie dans notre pratique.

Objectifs **:** Pour déterminer la prévalence et les déterminants de la dysfonction rénale chez les femmes enceintes atteintes de prééclampsie fréquentant les principales cliniques prénatales sélectionnées à Abeokuta, dans le sud-ouest du Nigéria.

Méthodologie: Il s'agit d'une étude descriptive transversale réalisée dans trois établissements de santé à Abeokuta, à savoir le Centre Médical Fédéral, l'Hôpital de l'État, Ijaiye et Oba Ademola Maternity Home. Quatre-vingt-dix sujets enceintes atteints de prééclampsie et 90 témoins enceintes apparemment en bonne santé ont été recrutés consécutivement dans les cliniques prénatales sur une période de six mois. Leur bio-données et leur histoire clinique ont été documentées à l'aide d'un formulaire structuré . La tension artérielle, l'analyse d'urine, la chimie sanguine et l'échographie rénale des participants ont été effectuées

Résultats: Au total, 10 des 90 femmes atteintes de prééclampsie présentaient une dysfonction rénale, soit une prévalence de 11,1%. Le taux de filtration

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glomérulaire moyenne estimée des femmes atteintes de prééclampsie sans dysfonction rénale était 108,7 ± 26.0ml / min / 1,73 m^2 et tandis que ceux avec un dysfonctionnement rénal avait une moyenne de 38,6 ± 9.2ml / min / 1,73 m^2. Lors de la régression logistique, un œdème généralisé et des antécédents de prééclampsie étaient significativement associés à une dysfonction rénale (valeur p <0,05).
Conclusion: La prévalence de la dysfonction rénale chez les femmes atteintes de prééclampsie s'est avérée significative dans cette étude. Les prédicteurs observés comprenaient un œdème généralisé et des antécédents de prééclampsie. Il est recommandé que le dépistage périodique régulier des femmes enceintes pour les maladies rénales latentes et actives soit encouragé dans notre pratique.

Mots-clés ; *rein, dysfonctionnement, grossesse, prééclampsie,*

Introduction

Preeclampsia is defined as a condition that occurs after 20 weeks of pregnancy and characterized by new onset hypertension, proteinuria (urine dipstick e" $1^{+,}$ or urine protein > 0.3g in a 24 hour urine collection), and/or oedema [1].This condition is characterized by placental insufficiency, vasoconstriction, endothelial dysfunction and resultant activation of the coagulation cascade [2]. It is one of the most common complications of pregnancy and also a major cause of maternal and perinatal morbidity and mortality globally, affecting millions of women annually [3,4].

The impact of this disease is felt more severely in developing countries like Nigeria where, unlike other more prevalent causes of maternal mortality (e.g. hemorrhage, sepsis and unsafe abortion), medical interventions for preeclampsia may be ineffective as most cases present late [5]. The problem is further compounded by the unpredictable nature of the disease coupled with the burden of chronic kidney disease in a number of these patients.

Studies have shown an increased risk of chronic kidney disease (CKD) and end-stage kidney disease (ESKD) in women with previous pre-eclampsia [6].A meta-analysis showed that women with previous preeclampsia had a four-times increased risk of microalbuminuria 5–10 years after a preeclamptic pregnancy compared with women without previous preeclampsia [7]. A population based study from Norway suggested that women who had had preeclampsia were at 4-to-5 times increased risk of ESKD during a 35-year follow-up period after excluding confounding factors[8]. Wang *et al* also noted an increased risk of CKD and ESKD in women with previous preeclampsia [9].

There are few reports on the assessment of kidney dysfunction among pregnant women with preeclampsia especially in developing countries. It is expected that findings from this study will assist in identifying general, or peculiar determinants of kidney dysfunction, if any, of this condition in our local practice and find ways of limiting the trend.

We therefore set out to determine the prevalence and determinants of kidney dysfunction among pregnant women with preeclampsia and without preeclampsia attending the antenatal clinics.

Materials and methods

The study was conducted in the Antenatal Clinics (ANCs) of the Federal Medical Centre, State Hospital Ijaye and Oba Ademola Maternity Hospital, Abeokuta, all in Ogun state, Nigeria.

All pregnant women attending ANCs of the hospitals were eligible for the study. Consecutively presenting pregnant women with preeclampsia were selected as study subjects. While the controls were apparently healthy pregnant women who had no preeclampsia or eclampsia and were also booked (registered) pregnant women in the various ANCs.

Ethical clearance for the study was obtained from the Health Research Ethical Committee (HREC) of the Federal Medical Center, Abeokuta, and medical directors of the other hospitals through their ethical service units. Informed consent was also obtained from all pregnant women who participated in the study. Only women who gave informed consents participated in the study.

The study was a descriptive cross-sectional design.The inclusion criteria for the subjects were:(i)pregnantwomen with preeclampsia defined as new onset of hypertension, proteinuria and/or oedema); (ii), gestational age $\geq$ 20weeks old, (iii). Women aged $\geq$18 years old.

Exclusion criteria for the subjects were: (i) presence of chronic hypertension i.e. documentation of hypertension before pregnancy (ii). presence of chronic kidney disease in the woman before pregnancy (iii). pregnant women with preeclampsia who declined to participate in the study.

The sampling frame consisted of all the registered pregnant women at the selected government health facilities in Abeokuta during the period of the study. All the pregnant women

registered during the period of the study were screened for preeclampsia from the antenatal clinics. On each day of the antenatal clinic, pregnant women with preeclampsia were recruited. This was done on daily basis from January 2015 to June 2015 till the required sample size was achieved without recruiting an individual more than once. Ninety pregnant women with pre-eclampsia were recruited for this study while another group of ninety apparently healthy pregnant women were recruited as controls.

The study participants were interviewed using a pre-tested, interviewer–administered, semi-structured questionnaire. Among others, the instrument recorded the socio-demographic variables and obstetrics history. All patients were assessed for elevated blood pressure and presence of oedema. The researcher measured the blood pressure of the participants by using a standardized mercury column sphygmomanometer. Changes in systolic blood pressure(SBP) and diastolic blood pressure(DBP) from booking values were also computed. Weight of each subject and control was measured in kilograms to the nearest decimal point, using beam type scale without the subject wearing heavy clothes or shoes. Weight gain from booking level and at subsequent ante natal clinic visits to ascertain changes in weight were documented as well.

Investigations such as urinalysis, electrolytes, serum urea, creatinine, cystatin C, fasting lipid profile, and kidney ultrasound were carried out. About ten ml of blood was taken from the patients for investigations such as electrolytes, serum urea, creatinine, cystatin C, fasting lipid profile, phosphates, calcium and uric acid. Each study participant was given a sterile container and educated on how to collect a clean catch sterile sample into separate bottles. The samples were taken to the laboratory for urinalysis using dipstix, and also for microscopy, culture and sensitivity.Proteinuria was defined as the presence of 1+ or more of protein on urinary dipstix while glycosuria was defined as the presence of 1+ or more of glucose on urinary dipstix [10,11].

The participants were divided into pregnant women with preeclampsia and without preeclampsia. Kidney function was compared in both groups. The determinants of kidney dysfunction were also determined.

GFR was estimated using cystatin C based formula[12]as MDRD or other formula for detecting estimated GFR using serum creatinineare falsely low in pregnancy.

$$GFR = \frac{100}{\text{Serum Cystatin C (mg/dL)}}$$

Serum level of cystatin C have a superior diagnostic accuracy for pre eclampsia compared to those of serum creatinine. Cystatin C was determined in plasma using enzyme-linked immunosorbent assay (human cystatin C ELISA assay, Alpco Diagnostics, New Hampshire, USA).

Participants with evidence of kidney damage and or GFR < 60ml/min were regarded as having kidney dysfunction according to the definition by the National Kidney Foundation [13]. On the basis of the estimated GFR, participants were grouped using the Kidney Disease Outcomes Quality Initiative (NKF KDOQI™) staging as follows;

- Stage 3a: eGFR between 45 to 59 mL/min per 1.73 m^2
- Stage 3b: eGFR between 30 to 44mL/min per 1.73m^2
- Stage 4: eGFR between 15 to 29 mL/min per 1.73 m^2
- Stage 5: eGFR of < 15 mL/min per 1.73 m^2 or end-stage kidney disease

All subjects and controls had kidney ultrasound scan with emphasis on the kidney dimensions and its structures looking for evidence of renal impairment. The kidney ultrasound was performed at the Radiology Unit of the Federal Medical Centre, Abeokuta by the same radiologist, using a 3.5-5MHz probe. (Sonix SP, Ultrasonix Medical Corporation Canada).

Data analysis

Data were entered and analyzed using Statistical Package Social Science(SPSS), version 20. Descriptive statistics (frequencies, proportions and percentage) was used to display independent variables like the sociodemographic characteristics of the study participants, their pregnancy and medical history amongst others. The prevalence of kidney dysfunction was determined by calculating the proportions of those with abnormal eGFR values divided by the total number of women with preeclampsia. Chi square test was used for comparing categorical variables and t-test for continuous variables.The level of statistical significance for all tests was set as p-value <0.05. In contingency tables where there were cells with less than 5 observations, the Fischer exact test was used. Furthermore, independent variables with p<0.05 were fitted into a binary logistic regression model to examine the influence of these variables on predicting the development of kidney dysfunction among women with preeclampsia.

Results

A total of 180 pregnant patients were recruited into this study. The socio-demographic characteristics of the study population are as presented in Table 1. The mean age of participants was 30.3 ± 6.6 years among women with preeclampsia while it was 30.2 ± 5.0 years among women without preeclampsia. However, this difference in mean age was not statistically significant (p=0.056).

had 2 or more children while 32 (35.6%) women without preeclampsia had 2 or more children. Likewise, 55 (61.1%) women without preeclampsia had 2 to 4 pregnancies while 42 (46.7%) women with preeclampsia had 2 or more children (p=0.016).

A higher proportion of women with preeclampsia were found to have generalized oedema (38, 42.2%), leg swelling (52, 57.8%), headache (32, 35.6%) as compared to women without

Table 1: Socio-demographic characteristics of the study participants

Characteristics	Preeclampsia *Yes*	Total *No*	p-value *N (%)*		
Mean Age	30.3±6.6	30.2±5.0		t=0.254	0.056
	N (%)	*N (%)*		X^2	
Age					
18-25	22(24.4)	11(12.2)	*33(18.3)*	6.16	0.046
26-35	46(51.1)	61(67.8)	107(59.5)		
36-45	22(24.4)	18(20.0)	40(22.2)		
Marital Status					
Never Married	6(6.7)	1(1.1)		3.42	0.118
Married	84(93.3)	89(98.9)			
Level of Education					
No formal Education	3(3.3)	2(2.2)	5(2.8)	2.00	0.581*
Primary	11(12.2)	12(13.3)	23(12.8)		
Secondary	42(46.7)	34(37.8)	76(42.2)		
Post-secondary	34(37.8)	42(46.7	76(42.2)		
Occupation					
Self Employed	28(31.1)	14(15.6)	42(23.3)	11.2	0.061
Civil servant	23(25.6)	18(20.0)	41(22.8)		
Business/Trader	28(31.1)	49(54.4)	77(42.8)		
Unemployed	11(12.2)	9(10.0)	20(11.1)		
Area of Residence					
Urban	87(96.7)	88(97.8)	175(97.2)	0.20	0.650*
Rural	3(3.3)	2(2.2)	5(2.8)		
Total	90(50.0)	90(50.0)	180(100.0)		

**Fischer's Exact Tests*

Majority of the participants had at least secondary school education (152, 84.4%) with only (5, 2.8%) having no formal education. A higher proportion of women with preeclampsia were either self-employed (28, 31.1%) or civil servants (23, 25.6%) as compared to 15.6% and 20% among women without preeclampsia respectively. A higher proportion of women without preeclampsia were business women/traders (54.4%) as compared to 31.1% among women with preeclampsia. This difference in proportions did not reach any statistical significance (p=0.061).

Table 2 shows the reproductive and pregnancy history of the participants. A higher proportion of women with preeclampsia (35, 38.9%)

preeclampsia. All these signs/symptoms were found to be statistically associated with pre- eclampsia ($p<0.05$) as shown in Table 2

Table 3 shows the median and interquartile range of blood pressures and weight changes amongst the women with preeclampsia. The median systolic and diastolic blood pressure were higher in the women with pre-eclampsia when compared to those without pre eclampsia. Also, the median changes in diastolic pressure at booking and preeclampsia were significantly different among women with kidney dysfunction and normal kidney function, $p<0.05$.

Based on the eGFR staging and KDOQI guideline, 10 (11.1%) of the women with

Table 2: Reproductive and pregnancy history of study participants

Characteristics	Preeclampsia Yes N (%)	No N (%)	Total N (%)	X^2	p-value
No. of children before index pregnancy					
0	28 (31.1)	30 (33.3)	58 (32.2)	0.221	0.895
1	27 (30.0)	28 (31.1)	55 (30.6)		
≥2	35 (38.9)	32 (35.6)	67 (37.2)		
No. of pregnancies before index pregnancy					
0	1 (1.1)	6 (6.7)	7 (3.9)	10.067	0.016*
1	33 (36.7)	23 (25.6)	56 (31.1)		
2 –4	42 (46.7)	55 (61.1)	97 (53.9)		
≥5	14 (15.6)	6 (6.7)	20 (11.1)		
Headache					
Yes	32 (35.6)	16 (17.8)	48 (26.7)	7.273	0.007
No	58 (64.4)	74 (82.2)	132 (73.3)		
Leg swelling					
Yes	52 (57.8)	7 (7.8)	59 (32.8)	51.058	<0.001
No	38 (42.2)	83 (92.2)	121 (67.2)		
Convulsion					
Yes	9 (10.0)	2 (2.2)	11 (6.1)	4.744	0.029*
No	81 (90.0)	88 (97.8)	169 (93.9)		
Blurring vision					
Yes	13 (14.4)	2 (2.2)	15 (8.3)	8.800	0.003*
No	77 (85.6)	88 (97.8)	165 (91.7)		
Generalized edema					
Yes	38 (42.2)	1 (1.1)	39 (21.7)	44.812	<0.001*
No	52 (57.8)	89 (98.9)	141 (78.3)		
Total	90 (50.0)	90 (50.0)	180 (100.0)		

**Fischer's Exact Test*

Table 3: Table showing the median (50th percentile) and IQR (25th, 75th) values in selected parameters among study participants

Parameter	Preeclampsia Yes Median(IQR=Q1,Q3)	No Median(IQR=Q1,Q3))	p-value for Median Test
Mean Systolic Blood Pressure (mmHg)			
At booking	135 (110,150)	110 (100, 120)	<0.001
At diagnosis of preeclampsia	180 (160,190)	110 (100,120)	<0.001
Change in Systolic Blood pressure	30 (10,60)	10 (5, 15)	<0.001
Mean Diastolic Blood Pressure (mmHg)			
At booking	88 (70,90)	70 (60,80)	<0.001
At diagnosis of preeclampsia	110 (95.5,120)	70 (65,80)	<0.001
Change in Diastolic Blood pressure	20 (10,30)	10 (5,15)	<0.001
Mean Weight (Kg)			
At booking	65 (60,72)	65 (60,72)	0.765
At diagnosis of preeclampsia	69 (67,80)	70 (65,80)	0.655
Change in weight	6 (4,9)	5 (2,8)	0.503

**Q1= 25th percentile, Q3= 75th percentile*

Table 4: Pattern of kidney dysfunction among participants

	Women with preeclampsia N=90	Women without preeclampsia N=90	Total N=180	*F*	p-value
CKD Staging	N (%)	N (%)	N (%)		
Stage 3a CKD(45-59ml/min)	1 (1.1)	0 (0)	1 (0.6)	29.762	<0.001
Stage 3b CKD(30-44ml/min)	7 (7.8)	0 (0)	7 (3.9)		
Stage 4/Advanced(15-29ml/min)	2 (2.2)	0 (0)	2 (11.1)		
Stage 5 ESKD (< 15ml/min)	0 (0)	0 (0)	0 (0)		

**Fischer's Exact Test*

Table 5: Predictors of kidney dysfunction among women with preeclampsia

Characteristic	B	OR	95%CI	p-value
Age of respondent				
18-25*	1			
26-35	-0.324	0.72	0.0-9.39	0.801
36-45	0.785	2.19	0.1-26.2	0.535
Generalized Edema				
Yes*	1			
No	2.284	0.10	0.0-0.60	0.0124*
History of pre eclampsia				
Yes*	1			
No	2.18	0.11	0.0-0.55	0.007*
Family History of Kidney disease				
Yes*	1			
No	2.042	0.13	0.0-2.33	0.166

preeclampsia had eGFR < 60ml/min which is suggestive of kidney dysfunction while none of the women without preeclampsia had biochemical evidence of kidney dysfunction. This was found to be statistically significant (p <0.001) (Figure 1).

Table 5 displays the result of fitting a logistic regression model to identify independent predictors of kidney dysfunction among women with preeclampsia. Women with generalized oedema (OR: 0.10, 95%CI: 0.0-0.60) and those with previous history of preeclampsia (OR: 0.11, 95%CI: 0.0-0.55) were more likely to have kidney dysfunction, p<0.05

Discussion

The mean age (30.3 ± 6.6 years) among the subjects in this study was slightly higher than the mean age of the pregnant women with preeclampsia, 27.0 ± 4.9 that was reported by Kooffren *et. al* [14] and 28.3 ± 5.5 by Ogunlaja *et. al* [15] in their studies.Also in a population-based prospective study by Magnussen *et. al* [9] the mean ages for the subjects and controls were 25.4 ±4.5 and 23.3±4.5 respectively which were also lower to the mean age of the participants in this study. These lower ages that were recorded in the aforementioned studies added to the fact that preeclampsia could probably occur at any reproductive age group, unlike the advanced age previously cited [16]. Other major factors now advanced to be acting in concert with this are the pregnancy and marital histories respectively [17].

A positive family history of hypertension had been implicated in the development of preeclampsia and as recorded in this study, 18 (20%) of women with preeclampsia had a positive family history of hypertension. This finding was similar to what was reported by Kooffreh[16]where 18.6% of women with pre-eclampsia had family history of hypertension. In a case-control study of 190 patients with pre-eclampsia and 373 control subjects, Qui [18] assessed maternal family history of chronic hypertension in relation to preeclampsia risk. They found that women with both maternal and paternal

history of hypertension (odds ratio=2.6) had a statistically significant increased risk of preeclampsia. It might therefore be suggested that family history of hypertension and diabetes reflects genetic and behavioral factors whereby women may be pre disposed to an increased risk pre-eclampsia [18].

In a similar pattern, a positive family history of diabetes mellitus had been implicated in the development of preeclampsia and as recorded in this study, 10% of women with preeclampsia in this study had a positive family history of diabetes mellitus. Sanchez *et al* [19] in a case-control study of 169 women with pre eclampsia and 201 controls that assessed the maternal parental history of chronic hypertension and diabetes in relation to preeclampsia risk among Peruvian women reported that women with a positive parental history for diabetes had a 3.4-fold increased risk of preeclampsia. It might also be useful to adequately elicit a family history of diabetes in pregnant women in order to possibly identify those at risk of developing pre-eclampsia.

Women with a history of previous preeclampsia are at increased risk of preeclampsia and other adverse pregnancy outcomes in subsequent pregnancies. The magnitude of this risk is dependent on gestational age at time of disease onset, severity of disease, and presence or absence of preexisting medical disorders. Singh *et al*[20] reported that women with previous history of preeclampsia had a four to five fold risk of developing hypertensive disorder in pregnancy in their subsequent pregnancies. As recorded in this study, 17 (18.9%) women with preeclampsia had a previous history of preeclampsia.

The prevalence rate of kidney dysfunction in this study was found to be 11% amongst the women with preeclampsia while none of the women without preeclampsia had kidney dysfunction based on the GFR cut off of $<$60ml/min/1.73m^2. Prakash et al[21] in a similar study done in India to analyze the clinical spectrum of renal manifestation of preeclampsia in pregnant women found a prevalence of 20% of kidney dysfunction among 106 women with preeclampsia. Williams [22] also reported that about 20% of women who develop preeclampsia for the first time during pregnancy have kidney dysfunction.The higher figures in the aforementioned studies might be due to the criteria used to assess the renal functions as well as the markers of kidney dysfunction used.Women with a history of pre eclampsia also have a 4-5 fold increased risk of chronic kidney disease compared to women with no history of pre eclampsia. It is postulated that persistent albuminuria after delivery is suggestive of an irreversible kidney damage during the pre-eclamptic pregnancy [23].

Furthermore, women with pre-eclampsia with generalized oedema had an increased risk of developing CKD, as seen in this study This might be reflective of the severity of the glomerulopathy secondary to the level of the serum albumin.

In this study, it was observed that there were significant changes in blood pressure at booking and at diagnosis of pre-eclampsia, this similar finding was also made by Mammaro and Vikse respectively [23,24]. They further postulated that this was a risk marker for kidney damage in preeclampsia.

. This study has shown that kidney dysfunction is an important occurrence amongst women with preeclampsia attending three major antenatal clinics in Abeokuta, south western Nigeria. The prevalence of kidney dysfunction among women with preeclampsia in this study was 11.1%. The determinants of kidney dysfunction in the women with preeclampsia in this study included history of preeclampsia in previous pregnancy, family history of kidney disease, baseline kidney function as reflected by the estimated glomerular filtration rate using cystatin C. Likewise, there is a need for routine screening for kidney diseases in pregnant women attending antenatal clinics.

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Evaluation of knowledge and technique of shade selection among Nigerian dentists: a pilot study

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Abstract
Aim: To assess and evaluate knowledge of tooth shade selection and the techniques for shade matching among Nigerian dentists.
*Method***:**The study was a pilot within the south west region of Nigeria with proposed follow up to cover all six geo-political zones. It was a questionnaire based cross-sectional study with practicing dentists as participants. Dentists from government tertiary and secondary facilities were recruited along with private dental practitioners. Data pertaining to bio data and shade selection techniques were obtained from participants. Data was analysed using the statistical package for social sciences version 23.(p value ≤ 0.05)
*Result***:**One hundred and four respondents(48 males, 56 females) participated in the study.Dentists that were aware of standard protocols for tooth shade selection were 56 out of 104. Eighty-seven percent of the dentists responded that natural light is the most accurate while 94% claimed they select tooth shade under natural light. Those that involved their patients and colleagues in shade selection were 73% and 14% respectively. Proportion of respondents who agreed that the background colour could affect tooth shade was 86%. However, 37% always asked patients to remove lipstick before tooth shade selection. Seventy-one dentists reported selecting shade by merely looking at the tooth and suggesting a shade.Vita shade guide (70%) was the most employed.
*Conclusion:*The knowledge on proper shade selection procedure is fairly high amongst the dental practitioners in Nigeria. Adherence to the standard protocols and guidelines for tooth shade selection is still generally low amongst the clinicians.

Keywords:*Shade selection, Shade guide, Tooth colour, Standard protocols,*

Résumé
Objectif: Pour examiner et évaluer les connaissances sur la sélection de la teinte des dents et les techniques de correspondance des teintes chez les dentistes nigérians.
Méthode: L'étude était un projet pilote dans la région sud-ouest du Nigéria avec un suivi proposé pour couvrir les six zones géopolitiques. Il s'agissait d'une étude transversale basée sur un questionnaire avec des dentistes praticiens comme participants. Des dentistes des établissements publics tertiaires et secondaires ont été recrutés ainsi que des dentistes privés. Les données relatives aux données biologiques et aux techniques de sélection des nuances ont été obtenues auprès des participants. Les données ont été analysées à l'aide du progiciel statistique pour les sciences sociales version 23. (valeur p d" 0,05)
Résultat: Cent quatre répondants (48 hommes, 56 femmes) ont participé à l'étude. Les dentistes qui connaissaient les protocoles standard pour la sélection de la teinte des dents étaient 56 sur 104. Quatre-vingt-sept pour cent des dentistes ont répondu que la lumière naturelle est la plus précise tandis que 94% ont affirmé qu'ils sélectionnaient la teinte des dents sous la lumière naturelle. Ceux qui ont impliqué leurs patients et leurs collègues dans la sélection des teintes étaient respectivement de 73% et 14%. La proportion de répondants qui ont convenu que la couleur de fond pouvait affecter le pare-dents était de 86%. Cependant, 37% ont toujours demandé au patient de retirer le rouge à lèvres avant la sélection du pare-dents. Soixante et onze dentistes ont déclaré avoir choisi la teinte simplement en regardant la dent et en suggérant une teinte. Le teintier Vita (70%) était le plus employé.
Conclusion: Les connaissances sur la procédure de sélection de teinte appropriée sont assez élevées chez les dentistes du Nigeria. L'adhésion aux protocoles et directives standard pour la sélection de la teinte des dents est généralement faible parmi les cliniciens.

Mots-clés: *Sélection de teintes , Guide de teintes , Couleur des dents , Protocoles standard,*

Introduction

Matching restoration and tooth shades is imperative with the increased aesthetic awareness of dental patients [1-3]. The quality and acceptance of dental restoration is to large extent affected by the ability of such restorations to restore both function and aesthetics [2,3]. Aesthetic outcome of any restoration depends largely on the shade match of the restoration

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and the natural adjacent teeth and adaptation to the surrounding tissue [4]. Tooth shade matching remains a challenge despite the huge advances in the production of shade guides and restorative materials over the years.

This is probably because of the complexity involved such as surface texture, metamerism, different shades of the incisal, middle and cervical third of the tooth among other [5,6]. Subjective assessment of the shade of natural dentition is still the most commonly used method up to date.[7-9] However, the use of instruments either as a shade guide or as an adjunct to the conventional visual method is been popularised [10,11]. The subjective method is a comparison between natural tooth and multiple standard guide usually made from a range of tooth shade tabs of ceramic or resin [6,7].These are known as shade guides, in which Vital classical™ type is the most commonly used of them [9].

There are several factors that influence tooth shade selection during restorative procedures[3]. The type of shade guide used may affect the outcome of shade selection procedures [9]. The Vita classical guide has been reported to be deficient in its coverage compared to the 3D master guide [12]. Other factors that have been reported to affect tooth shade matching include age, gender, and colour vision abilities of the operator; and the light source and background colour of the operatory. The level of experience of the operator is also said to be an important factor during shade selection [2,9]. The influence of operator experience is controversial [12,13].

In addition to the type of shade guide and operator influence, non-adherence to standard protocols of shade selection may possibly lead to poor results. These protocols have been shown to correlate with better and more reproducible results.The protocols include seating of patient uprightly, shade selection under natural light, removal of background colour such as lipstick, wetting of teeth and shade guide, placement of shade guide below/above the tooth, not looking at the teeth more than 7seconds at a time and involvement of patients among others. It has been demonstrated in the past that training in tooth shade selection and professional experience had a positive impact on the ability of clinicians to correctly match tooth shades [4].

The aim of this present study is to evaluate the level of knowledge of dental practitioner in South Western Nigeria about tooth shade selection. And the technique of tooth shade matching employed by these dentists. The findings from this study may be used to design educational modules for dentists in tooth shade matching as a component of continuing dental education.

Materials and method

The study was a pilot within the south west region of Nigeria with proposed follow up to cover all six geo-political zones. It was a questionnaire based cross-sectional study with practicing dentists as participants. Dentists from government tertiary and secondary facilities were recruited along with private dental practitioners. Subjects were randomly selected including House officers, Post graduate trainees, General dental practitioners, Dentists in private dental clinics and the Consultants. The self-designed adapted questionnaire administered to the participants in this zone will be extended to the other regions for completion in the follow up study. The first part of the questionnaire consists of the socio demographic data, specialty of the participant, year of practice, designation and place of practice. The second part included questions to assess the knowledge of tooth shade selection and standard protocols for shade selection while the last section contained questions on the technique of tooth shade selection used by the subjects.

To assess the knowledge of shade selection, the participants were asked if they had seen shade guide before, where they saw it whether in the clinic, textbook or online, if they had used shade guide before, how often they used it, which type did they see or use. Likewise, they were asked if they had seen or used digital shade guide before and where they saw it and which brand. To evaluate the participants' technique of shade selection, the questions they were asked included: awareness of standard protocols, time they normally select tooth shade, under which light source did they carry out shade selection, did they consider removing background colour, wet shade guide, wet teeth and how often. They were also asked about the positioning of the shade guide when matching the shade.

In order to reduce data entry errors, check codes were incorporated into the database and the data was cleaned to ensure consistency of responses. Unanswered questions or blank responses during data entry were treated as missing variables. Data collected was analysed using the statistical package for social sciences Version 23.Frequencies and percentages were calculated for qualitative variables. Data were compared across the cadre of the participating subjects using descriptive statistics.(p value ≤ 0.05)

Results

There were 104 respondents of which 48 (46.2%) were males and 56 (53.8%) were females. Majority of the respondents (84%) were from teaching hospitals, 12% from state government hospitals while remaining 4% were private practitioners (Figure 1) Although all the respondents claimed to have seen a shade guide before only 96% of them have used the shade guide before. (Table 1)

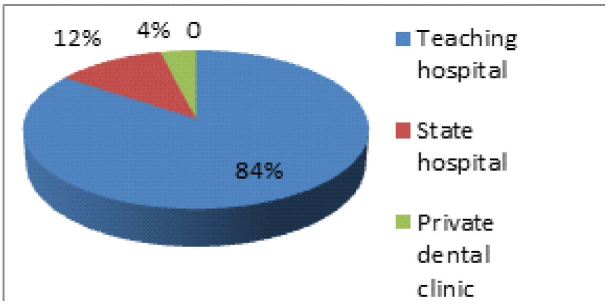

Fig. 1: Frequency distribution of respondents' facility

Table 1: Frequency of th use of shade guide by dentists

	Frequency	Percentage
Dentists that have used shade guide	100	96
Dentists that have not used shade guide	2	1.9
Dentist that were not sure	1	0.97
Missing data	1	o.97
Total	104	100

Majority (87%) of the dentists responded that natural light is the most accurate while 94% claimed they select tooth shade under natural light.(Table 2) Majority of the participants (86%) claimed to have selected shade before starting procedure while the remaining few do so during or after the procedure.(Figure 3)

Majority of the respondents (73%) selected tooth shade with input from their patients while 14% involved their colleagues(Table 2) 74% of the dentists matched the tooth shade by placing the shade guide beside the tooth, 17.3% placed it below the tooth while others placed it above the tooth or no specific position (Figure 4).

A large proportion of respondents (86%) agreed that the background colour could affect toothshade. (Table 3) However, a lower proportion (37%) always asked patient to remove lipstick before toothshade selection. (Table 3) The percentage of participant who never or rarely considered selecting shade for different part of the tooth was 53% while 21% always or often do it. (Table 3). About 71% reported selecting shade by merely looking at the tooth and suggesting a shade (Table 3).

Discussion

This present study assessed the knowledge of standard protocols used in visual tooth shade selection and evaluating the technique practiced by the dental practitioners against it.

All the respondents in this study claimed to have seen a shade guide before of which large proportion (96%) claimed to have been involved in

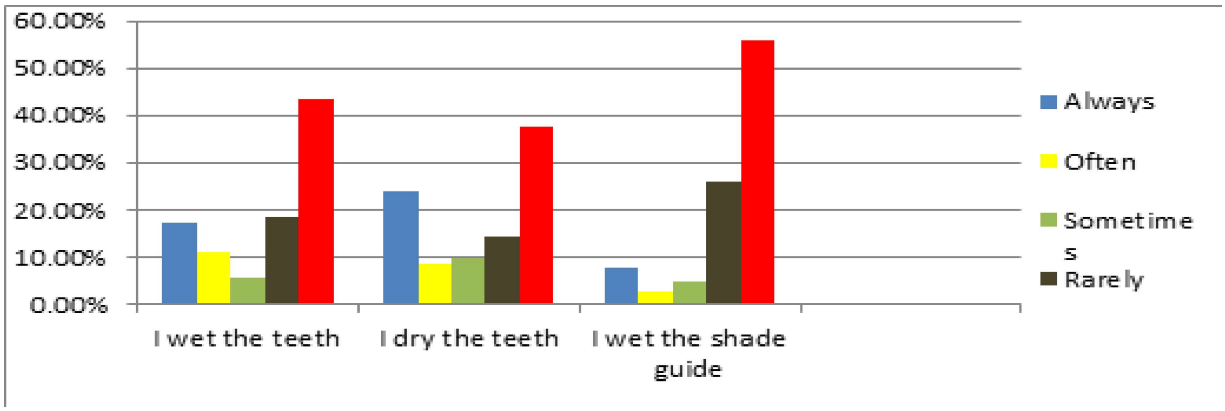

Fig. 2: Frequency distribution of dentists that wet/dry tooth or shade guide during shade selection

Fifty six (54%) dentists are aware of standard protocols or guidelines for tooth shade selection. (Table 2) The proportion of respondents who reported that they do not wet the shade guide or the teeth was 57% and 45% respectively. (Figure 2)

shade selection exercise with the use of shade guide. This closely agreed with the result of Esan et al[2]in which 100% of the participants had either often or rarely involved in shade selection. This may not be unconnected with the fact that every under graduate

Table 2: Conformity of participants to some standard Protocols for shade selection

Awareness of shade selection protocol	Dentists that thought background colour affect shade selection	Light condition considered the most accurate	Light condition under which shade selection was done	Involvement of third party and patient in shade selection
Yes (53.85%)	Yes (85.6%)	Yellow light (0.96%)	Yellow light (1.92)	Doing it alone (3.8%)
No (36.5%)	No (1.9%)	Fluorescent (2.88%)	Fluorescent (0.96)	Do it with Colleague
(13.5%)				
I'm not sure	I'm not sure	Corrected light	Corrected light	Do it with patient
(7.6%)	(5.8%)	(3.85%)	(0%)	(73.1%)
Missing data	Missing data	Natural light	Natural light	Do it with colleague /
(1.92)	(1.92%)	(86.5%)	(94.2%)	Patients (8.7%)
Total (100%)	Total (100%)	Sunlight (3.85%)	Sunlight (0%)	Missing data (1.0%)
		Missing data (1.92%)	Any light (0.9%)	Total (100%)
		Total (100%)	Missing (1.92%)	
			Total (100%)	

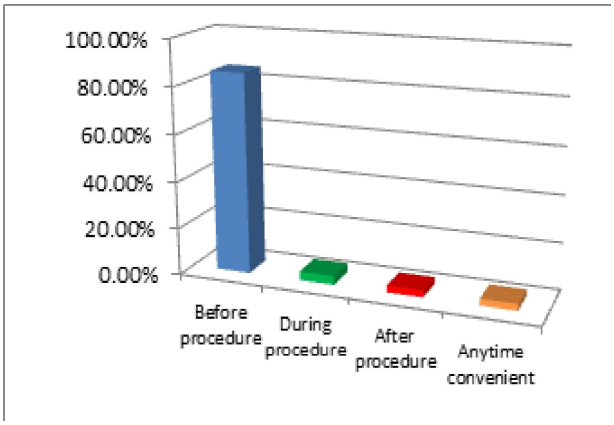

Fig. 3: Frequency distribution of timing of shade selection by the respondent

The various shade guides that were used by the dentists include Vita classical shade guide™, 3D master™, acrylic shade guide and Ashade shade guide.™ However, vita classical shade guide was the most frequently employed; which was the similar report in the literature [13]. Vita classical shade guide has been in existence for many years and most dentists tend to be more familiar with it than the newer ones since change is always difficult to effect. More so, it is probably considered simple to use since there are not many tabs.

An appreciable numbers of the dentists were aware of the standard protocols or guidelines for tooth shade selection. Barely half, (55%) of the respondents in this study reported to wet the teeth prior to shade selection, this is in sharp contrast to

Table 3: Frequency of dentists experience in matching shade guide on different tooth portions and removal of background distractions

Response	Remove lipstick during shade selection		Consideration of shade selection for different part of the tooth		Attempted shade selection by mere looking at the teeth	
	frequency	Percentage	frequency	percentage	frequency	percentage
Always	38	36.54	11	10.6	4	3.85
Often	14	13.46	11	10.6	7	6.73
Sometimes	14	13.46	25	24.0	40	38.46
Rarely	20	19.23	19	18.3	23	22.15
Never	16	15.39	36	34.6	24	23.08
Missing data	2	1.92	2	1.9	7	6.73
Total	104	100	104	100	104	100

student, house officers and junior residents would pass through conservative dentistry unit during the training where shade selection is often done.

the result of the study by Iqbal *et al* [3]who reported that 96% of their participants always wet the teeth before shade matching procedure. Wetting of tooth as well as the shade guide to mimic the tooth that is

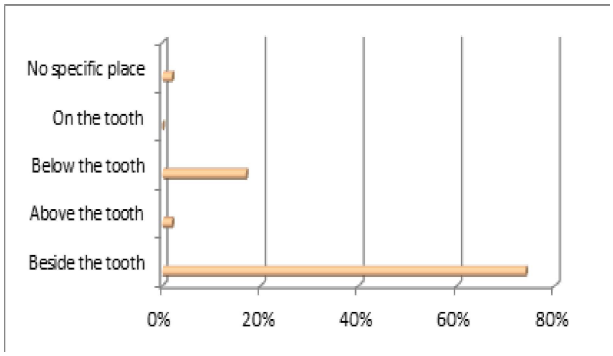

Fig: 4: Frequency of the placement of shade guide on tooth during shade selection

naturally bathed by the saliva is important to minimize error in shade selection. It has been said that shade is better determined when the teeth are most hydrated because enamel dehydration reduces its translucency by about 82% thereby confusing the operator [14].

Large proportion (87%) of the dentists in our study believed that natural light is the most accurate for shade selection and 94% also practiced this. This experience is similar to the result gotten by Esan *et al* [2] who reported that 85% of their respondent believed that tooth selection is best done under natural day light. However, majority of their respondents actually performed their teeth shade selection under dental light. Natural day light between 10am-2pm has been proposed to be the best for selection of tooth shade, although corrected light with colour temperature between 5500K- 6000K produces similar result. But in many clinics, natural day light is not readily available except patient is moved towards the window which may not be convenient. And if corrected light is not available the operator may end up using the dental light.

Regarding the background colour, bright colour background such as coloured lipstick, bright colour clothing, coloured eye glasses and even the colour of operatory may significantly affect the selection of appropriate shade due to metamerism (object presenting different colours under different conditions). Therefore, it is advisable to remove coloured lipstick and cover the patient's clothe with grey bib during shade matching procedure. A substantial number (86%) of the dentists agreed that the background colour could affect toothshade selection. In practice, a lesser proportion (52%) always or often asked female patient to remove lipstick before tooth shade selection is done. This is in close agreement with the study of Iqbal *et al* [3] who reported that 66.5% of the practitioners said they never ask the female patient to remove lipstick. Shade selection before the procedure of tooth preparation for restoration when the operator and the patient are not yet fatigued is assumed to be the best. The findings from this study showed that most of the participant (86%), claimed to select toothshade before the start of the procedure which is not too different from the findings of Avni*et al* [13] who reported that 72.4% of the clinicians do shade selection prior to any operative procedure, nevertheless; Iqbal *et al* [3] reported lower percentage (39%). Selecting the final shade prior to the tooth reduction has been said to be scientific in nature to obtaining an aesthetic prosthesis [13] and it has been recommended in the literature as well [15].

From this study, majority of the practitioners selected tooth shade with contribution from their patients. This is in line with the study by Avni*et al* [13] who said the majority of the dentists population in their study involved the patients and the dental surgery assistants in shade selection. However, we found out in this present study that only few dentists (23%) involved their colleagues or sought opinion of others as opposed to the results of Iqbal *et al* [3] in which more than half of their participants believed that second opinion is very important. Seeking the opinion of others especially the patient, will go a long way in satisfying the aesthetic need of the patient since visual shade selection is subjective and patient is the one who wears the prosthesis. Some dentists prefer doing the shade matching alone with the assumption that probably as a professional, their own judgement may be more accurate than that of the patient.

The correct positioning of the shade guide outlined in the protocols for shade selection is the placement of the shade guide above or below the tooth and not beside to avoid binocular effect. Contrary to this, the current study found that majority of the dental practitioner matched the tooth shade by placing the shade guide beside the tooth while only few place it above or below as recommended. This finding and others necessitate the need for continuous education in shade matching technique in dental schools and post graduate training.

Despite the good knowledge of shade selection displayed by the respondents, large number (75%) said to have been selecting shade for restorations without the use of shade guide but by simply looking at the tooth and suggesting an appropriate shade. This act of shade selection without

using shade guide however was not influenced by year of practice or designation of the dentists in the study. This ideology could be attributed to the fact that some clinicians believe that they are conversant with common tooth shade and hence can correctly suggest a shade that will match.

Though not reflected in any of the figures or tables, there tend to be a trend which showed that the knowledge demonstrated by the dental practitioners in government hospitals(Teaching hospitals and the state hospitals) about the standard protocols for tooth shade selection appeared to be better than the private dental practitioners. On the other hand, there appeared to be no difference in the technique used and the adherence to the recommended guidelines for tooth shade selection across these dentists of different designations.

Conclusion

Within the limitation of this present study being a regional study not representative of the national survey, it was concluded that

1. The knowledge on proper shade selection procedure is fairly high amongst the dental practitioners in Nigeria.
2. Adherence to the standard protocols and guidelines for tooth shade selection is still generally low amongst the clinicians.

Recommendations

Apart from the theoretical teaching of the standard protocols to follow in shade selection, practical sessions and workshops should be organized for dentists both in the government and private settings from time to time.

In view of the significance of aesthetics in overall wellbeing of an individual, more emphasis should be made during training of the undergraduate and post graduate students on the adherence to standard protocols guiding shade selection.

The outcome of the completion of this study across the six geopolitical zones will help in validating and enriching more the knowledge of the toothshade selection in general.

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The practice of obtaining consents for dental care among dental practitioners in Nigeria

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Abstract

Objective: To assess the preferences and practices of Nigerian dental practitioners in obtaining consent for dental care.

Materials and method: A self-administered questionnaire was completed by a cross-section of Nigerian dentists to elicit information regarding consent before treatment. The types of consents and procedure types for which the dentist obtained consents from the dental patients prior to performing elective dental procedures on them were elicited. The data was analyzed using SPSS version 21 and the test of significance was set at ≤0.05.

Result: There were 190 respondents, comprising 106 (55.8%) males and 84 (44.2%) females all of whom acknowledged that consent taking is an integral ethical requirement prior to dental treatments. Majority [178 (93.4%)] felt informed consent is an essential aspect of treatment but, only 117(61.6%) had ever obtained written consents from their patients; 82 (70.1%) for surgical procedures while 9(7.7%) and 11 (9.4%) for pulp therapy/advanced conservation and fixed orthodontic therapy, respectively. There were statistically significant associations between obtaining a written consent from the patients/parents and (i) the institutions of practice (ii) dental specialties and (iii) professional status.

Conclusion: Obtaining informed consent for dental procedures, especially in non-invasive procedures, is not yet sufficiently practiced by Nigerian dentists. There is therefore a need to emphasize the importance of obtaining written informed consent over verbal or/and implied consent.

Keywords: *Written Consents; Dentists; dental procedures; patients' right; ethics*

Résumé

Objectif : Pour évaluer les préférences et la pratique des praticiens dentaires nigérians dans l'obtention du consentement pour les soins dentaires.

Matériel et méthode **:** Un questionnaire auto-administré a été rempli par un échantillon représentatif de dentistes nigérians afin d'obtenir des informations concernant le consentement avant le traitement. Les types de consentement s et types de procédures pour lesquelles le dentiste a obtenu les consentements des patients dentaires avant d'effectuer des interventions dentaires électives sur eux ont été susciter. Les données ont été analysées à l'aide de SPSS version 21 et le test de signification a été fixé à ≤ 0,05.

Résultat: Il y avait 190 répondants, comprenant 106 (55.8%) mâles et 84 (44.2%) femelles qui ont tous reconnu que la prise de consentement est une exigence éthique intégrale avant les traitements dentaires. La majorité [178 (93,4%)] a estimé le consentement éclairé est un aspect essentiel du traitement, mais, seulement 11 7 (6 1,6 %) avaient déjà obtenu le consentement écrit de leurs patients ; 82 (70,1%) pour les procédures chirurgicales tandis que 9 (7,7%) et 11 (9,4 %) pour la thérapie pulpaire/conservation avancée et la thérapie orthodontique fixe, respectivement. Il y avait des associations statistiquement significatives entre l'obtention d'un consentement écrit des patients / parents et (i) l'institution de la pratique (ii) les spécialités dentaires et (iii) le statut professionnel.

Conclusion**:** L'obtention d' un consentement éclairé pour les procédures dentaires, en particulier dans les procédures non invasives, n'est pas encore suffisamment pratiquée par les dentistes nigérians . Il est donc nécessaire de souligner l'importance d'obtenir un consentement éclairé écrit par rapport au consentement verbal ou/et implicite.

Mots-clés: *Consentements écrits; Dentistes; procédures dentaires; droit des patients; éthique*

Introduction

The medical practice has ethics that guide the profession and one of such is to protect the right of the patient [1]. These rights are captured in the Belmont report [2] which provides guidelines for researches involving human treatment and are therefore applicable to clinical practice. According to the Belmont report [2], informed consent; that is,

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a patient's written or oral agreement that is given after he or she has received sufficient information about the diagnostic or therapeutic procedure that is planned is a necessary part of showing respect for all persons, stating that all subjects to the degree that they are capable, should be given the opportunity to choose what shall or shall not happen to them. This necessary information is explained in words that the patient can understand and should include the nature of any proposed treatment [1, 3-7].

In dental practice, consent gives patients the right to participate in decisions concerning their wellbeing as well as avails the dentist opportunity to share information that will help improve their quality of life [8]. Also, obtaining informed consent will also decrease the dental practitioner's liability from claims associated with miscommunication [9] and will establish rapport between the dentist and his patient [6,10]. There should be communication between the dental professional and patients on the nature of treatment, reasonable alternatives to the decided treatment option, relevant risks, benefits and possible uncertainties of the preferred decision and subsequent acceptance by the patient. Though most of the dental treatments sought by patients are not life threatening it is advisable that a duly signed informed consent is obtained by dental practitioners before commencement of any procedure, since occurrence of casualties cannot be predicted.

Most dental professionals know that informed (written) consent is an integral part of dental treatment yet it is interesting to note that many dentists still do not transform this knowledge into practice [1, 6-14]. This shows that dentists may well be aware of the need and importance of patients' rights but the question is whether they incorporate these rights in their practices. Though few studies [15-18] have been conducted in Nigeria, these were either limited to the tertiary institutions or had a small sample size. This study therefore aims at assessing the practice of obtaining consent for dental care among Nigerian dental practitioners. The gaps in knowledge and practice identified from this study would duly be addressed by re-educating dental practitioners thereby instituting good standards of dental practice.

Materials and methods

This was a cross-sectional study carried out among Nigerian dentists practicing in various dental facilities in Nigeria during a programme organized by the Nigerian Dental Association. Information was obtained using a self-administered questionnaire designed by the authors and pretested among ten Nigerian dentists working in a tertiary health institution in Nigeria. The questionnaire was in two parts. The first part sought information on the respondents' personal details; sex, age as at last birthday, years of practice grouped into 0-10 years, 11-20 years, 21-30 years and 31-40 years, specialty and institution of practice. The second part elicited information from the dentists regarding obtaining pre-treatment consent and the types of consent obtained from dental patients prior to performing elective dental procedures on them. Information on the procedure types for which the dentist obtained informed consent was also elicited.

Ethical consideration

Ethical approval for the study was obtained from the Health Research and Ethics Committee of the University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria. Consent was sought and obtained from the dental practitioners.

Data analysis

The data collected were analyzed using IBM Statistical Package for Social Sciences (SPSS) version 21.0. Continuous variables were expressed as means with standard deviation or frequencies with accompanying percentages. Chi-square test was used to determine association Statistical significance was set at $p<0.05$.

Results

Two hundred and ten questionnaires were administered of which 190 were duly completed giving a response rate of 91.4%. More than half, 108(56.8%) of the respondents were in the 31-40 age group. There were more males106 (55.8%) than females 84 (44.2%)

Majority 118(62.1%) of the respondents were resident doctors (specialists-in-training) while 28(14.6%) were consultants (specialist dentists). The mean duration of years of practice of all respondents was 8.86 ± 6.90 years, the range was between 1 year to 35 years, when categorized those that had practiced for ten years and below were the majority (70%). One hundred and fifty (78.9%) practiced in a tertiary (teaching) hospital, 146 (76.8%) were either consultants (specialists) or in training as residents to be specialists. Table 1 All the participants acknowledged that consent taking is an integral ethical requirement prior to dental treatments. In response to the type of consent they would prefer to obtain during treatment, majority 107 (56.3%) of the respondents chose informed written consent alone and 37.4% chose informed consent in combination with other types. However, other types of consents sought and obtained during

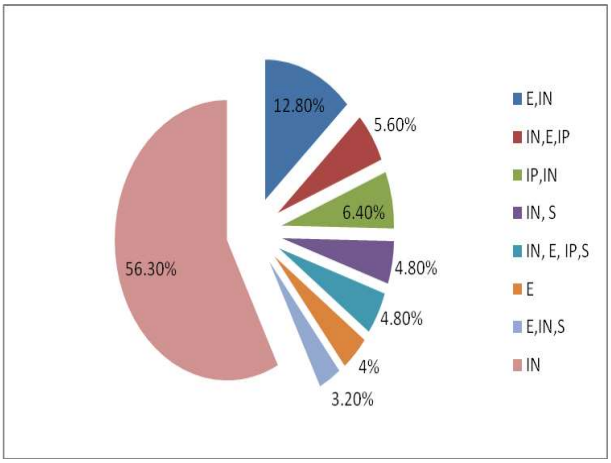
Table 1: Socio-demographic characteristics of the participants

	n (%)
Age group (years)	*n=190*
20-30	46 (25.3)
31-40	108 (56.8)
41-50	14 (10.9)
51-60	3 (2.3)
61-70	1 (0.5)
Not indicated	16 (8.4)
Sex	*n=190*
Males	106 (55.8)
Females	84 (44.2)
Years in practice (years)	n=190
0-10	133 (70.0)
11-20	38 (20.0)
21-30	8 (4.2)
31-40	4 (2.1)
Not indicated	7 (3.7)
Professional status	*n=190*
Consultant/specialist	28 (14.7)
Resident doctors/specialists-in-training	118 (62.1)
Dental officer	18 (9.5)
Dental interns (house officers)	20 (10.5)
Youth corps member	2 (1.1)
Lecturer	1 (9.5)
Not indicated	3 (1.6)
Dental specialty	*n=190*
General dental practice	16 (7.9)
Oral and Maillofacial surgey	17 (8.9)
Oral Medicine	2 (1.1)
Oral Pathology	10 (5.3)
Orthodontics	46 (24.2)
Paediatric Dentistry	6 (3.2)
Periodontology	7 (3.7)
Prosthodontics	3 (1.6)
Conservative dentistry	30 (15.8)
Community Dentistry	5 (2.6)
Specialty not indicated	48 (25.3)
Institution of practice	*=190*
Teaching hospital	150 (78.9)
General hospital	16 (8.4)
Private sector	22 (11.6)
Not indicated	2 (1.1)

dental treatments by the participants were expressed (verbal), implied, surrogate consents and various combinations. See details in figure 1.

The practice of obtaining consents among the subjects

One hundred and seventeen (61.6%) had obtained written consents from their patients. Among those who had obtained written consent, 82 (70.1%) were for surgical procedures, while 9 (7.7%) and 11 (9.4%) for pulp therapy/advanced conservation and fixed orthodontic therapy, respectively. Fifteen (12.8%) Dentists did not remember the procedures they obtained consent for. When gender, years of practice, institution and professional status were



compared in obtaining written consent (p=0.13, p=0.37, p=0.02 and p=0.03 respectively) See Table 2

Table 2: Relationship between some demographic variables and obtaining written consent

	Written consent	
	Yes	No
Sex		
Male	67 (63.2)	29 (27.4)
Female	50 (59.5)	31 (36.9)
		p=0.13
Years in practice		
0-10	87 (65.5)	40 (30.1)
11-20	23 (56.7)	11 (28.9)
21-30	4 (50.0)	4 (50.0)
31-40	3 (50.0)	2 (50.0)
		p=0.37
Institution		
Teaching hospital	101 (67.6)	43 (29.7)
Private sector	10 (45.5)	10 (45.5)
General hospital	6 (37.5)	7 (43.8)
		p=0.02*
Professional status		
Consultant/specialist	12 (42.9)	12 (42.9)
Resident doctors/specialist-in-training	86 (72.9)	27 (22.9)
Dental officer	6 (35.5)	11 (64.7)
Dental interns (house officers)	10 (50.0)	10 (50.0)
Youths corps member (Post-intern)	2 (100)	0
		p=0.03*

**p<0.05 significant*

Discussion

In this present study, all the respondents acknowledged that consent taking is an integral ethical requirement prior to dental treatments and agreed that informed consent is necessary. However, it was observed that obtaining consent was not a consistent practice among the practitioners. This corroborates the report on Brazilian practitioners where only 14.5% of them consistently obtained written informed consent [14]. However, only 117 (61.6%) of our study population had ever obtained written consent from their patients. This finding is consistent with those of dental practitioners in developing countries [1,8,9,11,14], where obtaining written consent was not a common practice. However, this present study reported higher values than the 51.3%, 48.7% and 37.4% reported on Bulgarians [8] private practitioners in India [11] and specialists in Brazil [14], respectively, but comparable to the 63.6% reported on General Dental Practitioners in India [9].

In most practices in Nigeria, it is generally assumed that a patient who visits the dentist voluntarily sits on the dental chair and opens his or her mouth to be examined, has given consent; implied consent. A study [16] conducted among dental undergraduates in Ibadan Nigeria regarding record keeping and another study [18] carried out on quality of care of paediatric dental patients using dental records in Port Harcourt, Nigeria, revealed that the most frequently unrecorded data was written consent. There is therefore the need to sensitize and teach the importance of obtaining consent among dental students and practitioners. It should be noted that though oral informed consent may be ethical and may suffice for non-invasive procedures it may not even be admissible in a court of law [1, 18].

Several studies conducted among dentists [8, 11, 18-21] revealed that informed consent was majorly obtained for surgical procedures. This was corroborated in the present study, where over 70% of those who obtained informed consent did so for surgical procedures. A tenth of those who responded in affirmative to the use of informed consent did for fixed orthodontic therapy. This may be because though orthodontic treatment is mostly sought to enhance aesthetics, there may be bony and irreversible alterations during the course of treatment. Sometimes, to achieve optimal orthodontic treatment outcome there is the need for invasive surgical procedures.

It is expected that dentists working in tertiary institutions will be more aware of the importance of obtaining consents and practicing it. This was observed in this study, where there was a statistically significant difference between those in tertiary hospitals and those in other sectors seeking written consents. This could be because those in teaching hospitals are either undergoing specialist training or are consultants who most likely have postgraduate qualifications and would have undergone rotations in oral and maxillofacial surgery where consent / permission is sought and obtained before invasive procedures compared to practitioners in private sectors or secondary (General) health institutions. However, approximately two thirds of the dentists in the tertiary institutions had ever obtained written consents from the patients. This observation could mean that the practice of obtaining informed consent from patients by dental practitioners in Nigeria is lagging behind.

In the present study it was observed that the older the practice year of the dentists, the less likely they were to seek and obtain a written consent. This could be that the practicing younger dentists are more enlightened or mindful of the consequence of not obtaining (written) consent. The converse was reported by Gupta *et al* [11], where they reported that the knowledge on informed consent showed significant association with qualification and years of work experience. There was a statistically significant difference between those that practiced for fewer years and the older practicing dentists. The dentists in the tertiary hospitals significantly obtained written consents from their patients compared to private sectors or general hospitals (secondary health institutions) and this observation could be due the high standards of practice in the teaching hospitals. This finding supports the observation by Gupta *et al* [11].

It is then necessary that more continuous education is channeled into the concept of informed consent and its practice for Nigerian dentist especially those practicing in the non-tertiary facilities for improved oral health care services. There is an enormous need therefore for dental practitioners to improve their knowledge and practice of obtaining informed consent for dental procedures.

Recommendation

Written informed consent should be sought and obtained for all dental procedures and this may be accomplished by including a standard structured consent form in the patient's clinical notes.

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Tooth brushing skills and oral hygiene practices in a selected group of Nigerian children

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Abstract

Objective: To assess tooth brushing skills and oral hygiene practices of a group of primary school children

Methods: This was a cross-sectional study conducted among a selected sample of school children. An interviewer-administered questionnaire was used to collect information on socio-demographics and oral hygiene practices. While brushing, the toothbrush grips, techniques used, tooth surfaces brushed and tongue brushing were assessed. The duration of tooth brushing was also noted. These data were analyzed using IBM SPSS Version 22 and the test of significance was set at ≤ 0.05.

Results: One hundred and ten children comprising 51 (46.4%) males and 59 (53.6%) females were assessed. Their mean age was 10.79 ($\pm$0.98) years. Fifty-one pupils (46.4%) brushed once a day, while 51 (46.4%) used a soft textured bristled toothbrush.None of the children used mouthwash or dental floss.The commonest toothbrush grip was the distal oblique, 56 (50.9%) and the commonest brushing technique was the horizontal scrub58 (52.7%). Only sixteen pupils (14.5%) brushed all tooth surfaces and tongue; the lingual surfaces were the most missed surfaces during cleaning. The mean duration of tooth brushing was 2.15 minutes. There were no statistical significant gender differences in techniques, grips, duration and surfaces cleaned.

Conclusion:The tooth brushing skills and oral hygiene practices of the pupils were less than satisfactory.

Keywords: Tooth- *brush grips; tooth brushing techniques; Oral hygiene practices;*

Résumé

Objectif : Pour évaluer les capacités de brossage des dents et les pratiques d'hygiène bucco-dentaire d'un groupe d'enfants en école primaire

Méthodes **:** Ceci était une étude transversale menée auprès d'un échantillon sélectionné d'enfants d'âge scolaire. Un questionnaire administré par un intervieweur a été utilisé pour recueillir des informations sur les caractéristiques sociodémographiques et les pratiques d'hygiène buccale. Pendant le brossage, les prises de brosse à dents, les techniques utilisées, les surfaces des dents brossées et le brossage de la langue ont été évalués. La durée du brossage des dents a également été notée. Ces données ont été analysées à l'aide d'IBM SPSS version 22 et le test de signification a été fixé à $\leq 0,05$.

Résultats : Cent dix enfants comprenant 51 (46,4%) de garçons et 59 (53,6%) filles ont été évaluées. Leur âge moyen était de 10,79 ($\pm$0,98) ans. Cinquante et un élèves (46,4%) se brossaient les dents une fois par jour, tandis que 51 (46,4%) utilisaient une brosse à dents à poils doux. Aucun des enfants n'utilisait de rince-bouche ou de fil dentaire. La prise de brosse à dents la plus courante était la distale oblique, 56 (50,9%) et la technique de brossage la plus courante était le lavage horizontal 58 (52,7 %). Seulement seize élèves (14,5%) brossaient toutes les surfaces dentaires et la langue ; les surfaces linguales étaient les surfaces les plus manquées lors du nettoyage. La durée moyenne du brossage des dents était de 2,15 minutes. Il n'y avait aucune différence statistiquement significative entre les sexes dans les techniques, les prises, la durée et les surfaces nettoyées.

Conclusion : Les compétences de brossage des dents et les pratiques d'hygiène buccale des élèves étaient moins que satisfaisantes.

Mots - clés : *Prises de brosse à dents; techniques de brossage des dents; Pratiques d'hygiène buccale;*

Introduction

Periodontal disease and dental caries are the commonest but preventable oral diseases. One of the ways these could be prevented is when good oral hygiene practice is instituted early in life [1-5]. Although plaque removal can be done either by chemical or mechanical means, the mechanical means particularly the manual tooth brushing is more

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frequently used because it is an affordable and efficient means of plaque control [6, 7].

Tooth brushing skill is not innate, it has to be learned because the effectiveness of plaque control is dependent majorly on manual dexterity [8]. However, other factors have been cited as essential for effective maintenance of oral hygiene such as: the design of the tooth brush bristles, duration of tooth brushing, the brushing techniques and the grip at the handle of the tooth brush [9–12].

The frequency of tooth cleaning, access to and /or availability of other tooth cleaning aids such as dental floss are vital for plaque control.[1] Tooth cleaning starts as soon as the first tooth erupts in infancy and parents are expected to be involved from infancy to the mixed dentition phase [13]. They are to assist their children to brush their teeth till age of six years and play supervisory roles in teeth brushing from seven years of age till their manual dexterity is established [1,4,14]. Though some reports [8,9] have shown inefficiency of tooth brushing in children less than 10 years old when unsupervised, others support that children can brush unsupervised before they are 10 years of age [6,15]. Low frequency and late onset of tooth brushing and lack of parental involvement in tooth cleaning have been associated with increased experience of dental caries in 6year old [16,17].

The duration of tooth brushing had been investigated and reports showed that an average period of two to three minutes is sufficient to remove plaque [9], but few authors reported some benefits in shorter [8] and longer duration [17,18], better plaque removal and enamel remineralisation, respectively. The types of brushing technique, skills and oral hygiene practices of children can be easily assessed and corrected where necessary in the school environment when the dental practitioner is part of the school health team. Therefore, oral health should be an integral part of the school health programme [19].

Several studies [1,5–12,14,15,20–23] had been carried out on manual tooth brushing skills, duration, grip/techniques among children in various parts of the world. In Nigeria, previous studies on oral hygiene of children appeared to be limited to the practices [2,3,24–26]; where the frequency of daily tooth brushing, and use of fluoride containing toothpaste were reported. Use of adjunctive measures of oral hygiene and types of cleaning aids were also reported. However, there is dearth of information on tooth brushing skills and techniques among Nigerians. Therefore, the aim of this study was to assess the manual tooth brushing skills, particularly the grips, techniques, surfaces cleaned, duration of tooth brushing and oral hygiene practices among Nigerian school children.

Methods

This cross- sectional study was done among a group of primary school children aged between 9 and 12years. A multistage sampling was used to select the subjects. The first stage involved picking a local government area within the metropolitan city, and then a school was picked from the list of public schools by ballot.

Inclusion criteria:

1. Children that had no mental or physical disabilities
2. Children that had no medical conditions
3. Those children that were willing to participate in the study

All the 9 to 12- year olds were eligible, but a convenient sample was employed for the sample size. Prior to collection of data from the children, all the research assistants were trained on the methodology of data collection. An interviewer-administered questionnaire was used to collect information on age as at the last birthday, sex, parents' occupation and level of education. Other information obtained include: identification of the individual who taught the subject how to brush their teeth, frequency of tooth cleaning, texture of the toothbrush bristles and how often they changed their toothbrushes, use of fluoride containing toothpaste and other oral hygiene aids such as dental floss and mouthwash were also obtained.

The second part was an observational study where a group of five school children between 9 and 12 years were made to brush in a conducive environment within the school premises facing different directions. They were given medium textured toothbrushes of the same design and brand and the same brand (tube) of fluoride containing toothpaste. The pupils were blind to the parameters being evaluated. The parameters observed included the hand they used in holding or gripping while using the toothbrush, the type of toothbrush grip according to Beals *et al* [27] (palm grips-distal oblique and power, finger grips-oblique, precision and spoon), See Appendix I. Stop watches were used by the observers to record the duration of toothbrushing. The oral cavity was divided into sextants, The checklist was made to accommodate the sextants comprising three of the sextants in the maxilla and three in the lower jaw: (Posterior right, anterior and posterior left). Tongue brushing and toothbrushing of the tooth surfaces (buccal, lingual and occlusal) were noted.

The information was entered into IBM SPSS statistical software version 22 for analysis. Descriptive statistics was obtained for demographic variables and oral health practices variables Chi square and Fischer's exact tests were used to compare the relationship between two categorical variables as appropriate while ANOVA test was used to compare means. The level of significance was set at ≤ 0.05

Results

One hundred and ten children comprising 51 (46.4%) males and 59 (53.6%) females were assessed. Their mean age was 10.79 (±0.98). Majority 59(53.6%) of their mothers were petty traders while 54 (49.1%) of their fathers were artisans. Majority of the fathers, 41 (37.3%) and mothers, had 51 (46.4%) had secondary education (Table 1).

Table 1: The socio-demographic characteristics of the school children

Socio-demographic characteristics	n(%)
Age	
9	12 (10.9)
10	`30 (27.3)
11	37 (33.6)
12	31 (28.2)
Sex	
Male	51 (46.4)
Female	59 (53.6)
Level of father's education	
Primary	19 (17.3)
Secondary	41 (37.3)
tertiary	23 (20.9)
*Don't know	26 (23.6)
Level of mother's education	
Primary	26 (23.6)
Secondary	51 (46.4)
Tertiary	17 (15.5)
*Don't know	16 (14.5)

**Don't know children didn't know their parents*

Tooth brushing habits

Table 2 shows that ninety (81.8%) of the pupils were taught how to brush by their mothers, 51 (46.4%) brushed once a day and 51 (46.4%) used a soft textured bristled toothbrush.

About fifty percent brushed before going to bed and 90.9% used fluoride-containing toothpaste. None of the children used dental floss and mouthwash. Only 4 (3.6%) had heard of dental floss.

Table 2: The tooth brushing habits of tehe subjects

	n (%)
Use of fluoride toothpaste	
Yes	
100 (90.9)	
No	5
(4.5)	
Don't know	5
(4.5)	
Frequency of tooth brushing/day	
Once	51 (46.4)
Twice	48 (10.0)
Thrice	11 (10.0)
Tooth cleaning last thing at night before bed	
Yes	56 (50.9)
No	54 (49.1)
Who taught the child to use the tooth brush	
Mother	90 (81.8)
Father	6 (5.5)
Mother and father	5 (4.5)
Self	3 (2.7)
Aunty	2 (1.8)
Child not sure of who taught him/her	2 (1.8)
Teacher	1 |(0.9)
Grand mother	1 (0.9)
The texture of toothbrush bristles used	
Soft	51 (46.4)
Medium	17 (15.5)
Hard	28 (25.5)
Don't know	14 (12.7)
Frequency of tooth brush change	
0.5 months	10 (9.1)
0.75 months	2 (1.8)
Monthly	24 (21.8)
Every too months	16 (14.5)
Every three months	21 (19.1)
Every 4 months	3 (2.7)
Every 5 months	3 (2.7)
Every 6 months	7 (6.4)
Every 12 months	7 (6.4)
Every 24 months	2 (1.8)
Did not know	15 (13.6)

The minimum and maximum time for toothbrush change was two weeks and two years, respectively. The mean frequency of change of toothbrushes was 3.4 (±4.2) months. Using ANOVA, there were no statistical significant differences between the age groups on frequency of changing toothbrushes [p=0.95; F 0.111].

Duration of Tooth brushing

The mean duration for tooth brushing of the subjects was 128.77seconds or 2.15 minutes, the least duration of tooth brushing was 56 seconds while maximum duration was 305 seconds (Fig 1).There were no statistically significant difference between the age groups and duration of tooth brushing [p=0.89; F 0.209].

Tooth brushing skills

One hundred and nine (99.1%) children were right-handed and there was no statistically significant difference between males and females. The distal

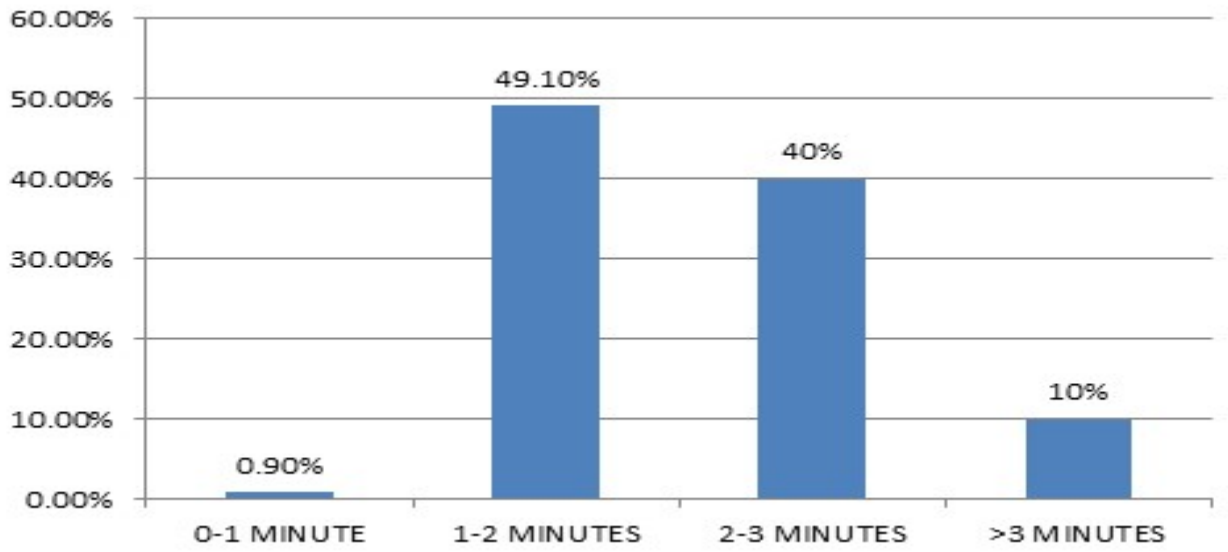

Fig. 1: Duration of tooth brushing among the subjects

Table: 3 The surfaces cleaned during tooth brushing among the children

	Sextants or quadrants	n (%)
lingual surface	*Maxilla*	
	Right posterior	33 (29.1)
	Anterior segment	33 (31.0)
	Left posterior	41 (37.3)
	Mandible	
	Right posterior	40 (36.4)
	Anterior segment	42 (38.2)
	Left posterior	48 (43.6)
Buccal/labial surfaces	*Maxilla*	
	Right posterior	107 (97.3)
	Anterior segments	104 (94.5)
	Left posterior	107 (97.3)
	Mandible	
	Right posterior	107 (97.3)
	Anterior segments	108 (98.2)
	Left posterior	106 (96.4)
Occlusal surfaces	*Maxillary*	
	Right quadrant	78 (70.9)
	Left posterior	77 (70.0)
	Mandible	
	Right quadrant	93 (84.5)
	Left quadrant	90 (81.8)

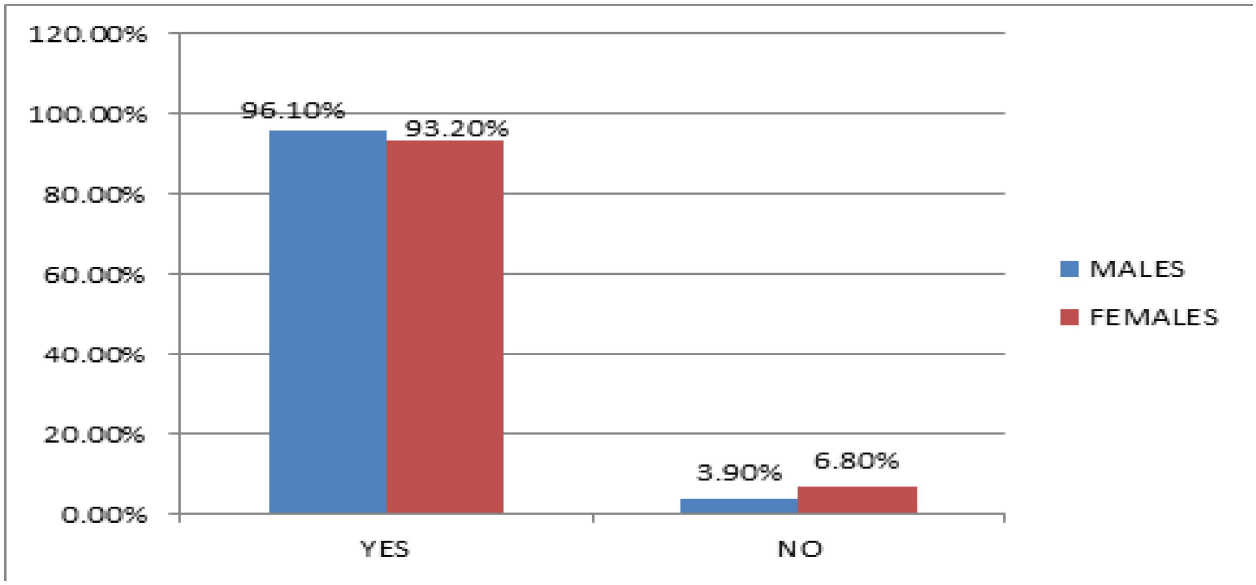

Fig.2: The distribution of tongue cleaning among the subjects

Table 4: Gender differences in tooth brushing skill and techniques among the subjects

	Males n (%)	Female n (%)	Total n (%)
Hand used			
Right	51 (100.0)	58 (98.3)	109 (99.1)
Left	0	1 (1.7)	1(0.9)
Grips		P=0.53	
Distal oblique	26 (51.0)	30 (50.8)	56 (50.9)
Power	14 (27.5)	20(33.9|)	34 (30.9)
Oblique	8 (15.7) 5 (8.5)	13 (11.8)	
Precision	3 (5.9)	2 (3.4)	5 (4.5)
Spoon	0	2 (3.4)	2 (1.8)
		p=0.45	
Techniques used			
Horizontal scrub	27 (52.9)	31 (52.5)	58 (52.7)
Horizontal scrub and vertical strokes	19 (37.3)	16 (27.1)	35 (31.8)
Vertical strokes	4 (7.8)	3 (5.1)	7 (6.4)
Vertical and circular motion	1 ‖(2.0)	3 (5.1)	4 (3.6)
Horizontal and circular motions	0	4 (6.8)	4 (3.6)
Horizontal and circular motions	0	2 (3.4)	2 (1.8)
		p=0.21	
Those who brushed all the buccal and lingual surface			
Yes	7 (13.7) 9 (15.3)	16 (14.5)	
No.	44 (86.3)	50 (84.7)	94 (85.5)
		p=0.52	
Those who brushed all the occlusal surfaces			
Yes	34 (66.7)	39 (66.1)	73 (66.4)
No	17 (33.3)	20 (33.9)	37 (33.6)
		p=0.55	

oblique (50.9%) and power grips (30.9%) were the commonest grips used by the participants while brushing; it was observed that 47 (42.7%) children switched from one grip to another especially the palm grips 27 (24.5%). The least used grip was the spoon technique.

Horizontal scrub technique; 58 (52.7%) was the commonest brushing technique followed by a combination of horizontal and vertical strokes 35 (31.8%) (Table 3).

Tooth surfaces cleaned

Over 90% of the children brushed the buccal/ labial surface of the upper and lower teeth. Over 80% of the children brushed the occlusal surfaces of the lower teeth, while above 70% brushed the occlusal surfaces of the upper teeth. Sixteen pupils (14.5%) brushed all the tooth surfaces (Table 3). One hundred and four (94.5%) brushed their tongues (Figure 2).

Gender differences

There were no statistically significant differences between the males and females in techniques, skills, grips and the surfaces brushed. (Table 4)

Discussion

Tooth brushing is the most frequently carried out oral hygiene practice [7]. In the present study, 81.8% of the children were taught how to brush by their mothers. This supports the previous reports on how children acquired tooth brushing skills [1,23]. Studies have shown that parents especially mothers have influence on oral health behaviours of their children [1,23] and their roles may be optimised by oral health education imparted during perinatal periods and parents' teachers fora [3,28,29]. The primary care provider for the child is the parent but teachers may also have roles to play. In this study, only a child claimed a teacher taught him how to brush. One of the thematic areas of the national policy on school health is based on tripartite roles of a child's school, parents and community at large [19].

It was also observed that less than two thirds of the subjects used soft and medium textured toothbrushes at home. The textures of toothbrushes recommended are the soft to medium textured to avoid injuries to the gingival tissue [30]. Fifty-nine (53.6%) brushed their teeth at least twice a day. This finding is comparable to that of Indians [1]; however, it was lower than the 72.4% and 89.6% reported from previous studies among selected populations of adolescents in Nigeria [24,26]. This finding may be because the children in the present study are younger in age. The mean duration of tooth brushing was comparable to the 2.19 minute reported by Arora *et al* [8] on 3 to 12 year old Indian children, though they observed that those that brushed less than 2 minutes had equally efficient plaque removal. On the other hand, Creeth *et al* [17] and Newby *et al* [18] demonstrated that when there was an increase in toothbrush duration with fluoride dentifrices there was an increased anti-caries activity because of an increase in fluoride delivery. However, two to three minutes duration twice a day is satisfactory and generally recommended [22].

A fifth of them changed their toothbrushes every three months, however 13.6% could not tell how often they changed their toothbrushes. These findings were also reported among Indian children by Ahad and Gheena [1]. Normally, toothbrushes are supposed to be changed every three to four months after which their bristles are frayed and efficiency is consequently reduced. Only 3.6% knew what dental floss was and none of them use dental floss. When there are tight contacts between adjacent teeth, the dental floss could aid in interdental cleaning thereby preventing the common dental diseases. It is understandable that the children never applied dental floss for cleaning, but the fact that they are not aware of this tooth cleaning aid revealed a gap in the quality of oral health education the pupils had received.

In the present study, the five toothbrush grips described by Beals *et al* [27]. were observed. The distal oblique was the commonest while the spoon was the least used grip. This corroborates what had been reported previously [6, 8, 9, 11, 12, 20] it could be that the distal oblique was a more comfortable and stable position for tooth brushing as against the spoon grip. Also, it has been reported that "using the palm grip was easier than using the pen grip to perform the reciprocate motion of the toothbrush" [13]. Moreover, the distal oblique grip has been reported to be the most effective grip for plaque removal [8,9,11]. It was also observed, as expected, that 42.7% of them switched grips when they crossover from one tooth surface or quadrant to another. This switch was particularly common in the palm grips that is, between distal oblique and power grips. The switch was spontaneous and related to convenience.

The horizontal scrub technique was the more commonly used brushing technique followed by the combination of horizontal scrub and vertical strokes. This agrees with what has been reported among children [8,12,20]. The technique is relatively simple to learn and apply, but prone to causing gingival

injuries if excessive force is used [30]. It is believed that the technique tends to remove plaque from the smooth inner and outer surfaces of teeth [20].

Only 14.5% brushed the tongue and all (lingual/palatal, buccal/labial, occlusal) the tooth surfaces. Majority of the pupils missed the lingual surfaces of the teeth especially the maxillary jaw. These findings suggest that children in our environment require oral health education by dental professionals on proper oral hygiene practices and perhaps supervised tooth brushing and follow up to ensure that the basic skills are learnt before irreversible damages occur. The tongue was brushed by majority of the subjects. This was a good development because the tongue is believed to harbour over 500 species of bacteria and in addition, it contributes to plaque formation through the frequently shed epithelial cells and oral debris. [7]

Conclusion

The tooth brushing skills and oral hygiene practices of the pupils were less than satisfactory. The distal oblique was the commonest grip and horizontal scrub was the commonest tooth brushing technique among the subjects. The areas most missed were the lingual surfaces and the mean duration of tooth brushing was about 2 minutes.

Recommendation

Further studies are to be carried out with large samples of pupils and also to assess the efficiency and areas of application of the various toothbrushing techniques

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In praise of teachers: Communication and Professionalism. An appreciation-induced offer from patient and a hunch-induced rejection by Doctor

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I graduated with the Bachelor of Medicine and Bachelor of Surgery degree from the College of Medicine, University of Ibadan in 1983. That meant I was taught Medicine in the milieu of Yoruba culture. In any culture, there are non-verbalised manners that individuals are expected to note and conform with. It was impressive watching our teachers delve into the Yoruba culture to extract vital information from patients to make diagnosis easy; though our language of instruction was English. Being of Igbo extraction, I kept wondering how I would fare at home on graduation should I encounter patients from my tribe. Would I find appropriate Igbo words to clerk my non-English speaking patients or make sense of expressions steeped in nuances of the Igbo Language?

My first clinic experience as a House Physician at General Hospital Owerri was challenging and I would feel later interesting. My first patient in trying to explain how she felt used the Igbo expression "Naradanada" The vowel "N" here is pronounced as the English "Ng" in the word sing. In Igbo alphabet it is written as N with a dash on top of the letter. I was lost and referred her to my Medical Officer. The next patient a boisterous male who had been artfully dodging female doctors by re-sitting himself told me with a "you should understand" mien how his "akwara" was weak. The "kw" double consonant in Igbo is pronounced as the "q" for queen in English. My basic Igbo vocabulary took my mind to tendons, nerves and blood vessels. My prescription of a drug combining analgesics and neurotropic vitamins did not impress him; and he showed his disappointment in his fallen crest. My ordeal was compounded when a young woman whose turn it was to see me next complained in Igbo of "Obaranaagbamnaukwu". In a literary sense, it meant "I am bleeding from my legs". I asked to be shown the bleeding point, but she was reluctant being in the open consulting room. The lady orderly in the clinic realizing my handicap asked that I examined the patient behind the screen. I thereafter learnt that the expression was for vaginal bleeding.

My excitement of show-casing the Ibadan stuff faded in frustration. While wondering if I should not take a break for a 2-week tutorial in medical expressions in Igbo and nuances of the language, another male patient walked towards my consulting table looking sad. I recognized him as the flutist in our primary school band. He loved music, and then in Standard 6 would gather pupils in the Infant classes to listen to him play music with his mouth organ. I called him by his primary school nick-name and he was jolted back to life. He asked who I was, and I answered. Sighing and shaking his head, he told me he was poisoned by envious colleagues who did not want him to live to release a music album that he was working hard to compose. In between finding answers to my questions, he would cough and made concerted efforts to suppress it. The duration of his cough from history took my mind to Pulmonary Tuberculosis. My spirit was lifted as I asked him to get behind the screen for physical examination. While he was getting ready, my mind was replaying a bed-side teaching at Ibadan Medical School on pulmonary tuberculosis. My finding of right apical crepitations broadened my smile; and as I asked him to dress up. He asked if I had found what type of poison he was given and what the antidote was.

Calm and confident now, I told him he had pulmonary tuberculosis and that I would admit him for free treatment. Being a natural musician, he spontaneously burst into a song with my name. I made sure I told him it was an infection not poisoning and it was curable if only he complied with treatment which anyway would be at no cost to him. I made sure I followed it up with sputum and Chest X-ray confirmation. My consultant commended my acumen during the morning round, and the patient took the opportunity to tell my consultant a few things about me as a child.

After the intensive phase of treatment in hospital, he improved clinically with weight gain and

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Disclaimer: This is a true event presented in such a manner that, but for the author and the hospital, no other individual could be identified.

he requested for discharge to enable him to get back to his usual routine. On the day of his discharge he requested me to see him. Happy on his bed, with his belongings packed, he made me an offer in gratitude. Basil he said, seeing me now as one of the children who used to listen to him play music in primary school, "I was working on my music album when I fell ill thinking I was poisoned. You lifted my spirit by telling me what it was, after many people advised me to go to native doctors for treatment. Now I am on my way back to health and I request to sing your praise in the last track". Deep down, I felt a sense of pride and fulfilment for helping an old school mate, but then the hunch. My mind went back to lectures on Medical Ethics in the Medical School at Ibadan. Doctors should not advertise. Not knowing what he planned to sing in the track, I politely rejected and asked him instead to sing praise to God. He was a bit disappointed, but I stood my ground.

It has however remained tucked away in the dark recesses of my mind, and serves as a constant reminder that we were taught in the best traditions of the Ibadan Medical School by teachers who were passionate to their calling. God bless them all living or dead.

Tribute
to
Amazon of Pharmacology
Professor Dinah Mary James, *OBE*
25 March 1919 – 09 February 2020

She came, she saw and not only did she conquer, she left an enduring legacy in Nigeria, the country she lived for twenty years from 1958 when she arrived. Almost without gainsaying, Professor Dinah Mary James, OBE, who was fondly called *Iya Pharmacology* spent her *entire* productive years for research and training in Pharmacology at the Nigeria's first Medical School, University of Ibadan where she rose to become the first Professor of Pharmacology in 1965.

Professor Dinah Mary James was appointed Senior Lecturer in our Department of Pharmacology in 1958 and was the first Academic to be appointed directly in the fledging Department which had been part of Department of Physiology until 1952. She retired from the University in 1978 and returned to the United Kingdom. In 1980, Professor Dinah James was conferred with the prestigious OBE by her Majesty, Queen Elizabeth II for services to medicine and research.

Professor Dinah Mary James, *OBE*
1919 – 2020

The commitment of, and fortunately the impact of *Iya* Pharmacology in the research and teaching of pharmacology to generations of students from all parts of the country could place her in the same league of *Pharmacology Greats* like: Oswald Schiedeberg (Germany), John Abel (USA), and Arthur Cushny (UK), at least, insofar as Nigeria is concerned! Indeed, Our University of Ibadan benefited from great Pharmacologists like Bill Bowman, Eleanor Zaimis, Alan Cuthbert and Heinz Schild who, at the instance of Dinah James, were regularly visiting for purpose of research and training of both undergraduate and postgraduate students of the University.

On Sunday, 09 February 2020, only weeks to her 101st birthday on the 25 March 2020, *Amazon*, Professor Dinah Mary James, OBE, took her last breath and finally slept for ever; *Iya Pharmacology*, good night!

Tribute by D T Okpako – Retired Professor, Former Head, Department of Pharmacology and Therapeutics, Faculty of Basic Medical Sciences; Dean, Faculty of Pharmacy, University of Ibadan, Nigeria and,
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