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Auditing for better resource utilization and improved health care

The last issue of Volume 49 of our journal contains 6 articles that deal with auditing for better utilization of resources and for better health of patients. Audit is essential for progress by identifying areas of strength that need consolidation, and on the contrary, obviating weaknesses by identifying areas of need. There are various types of audit – clinical, financial, quality control and investigative. In this issue of the journal, Fasola and colleagues reported on their audit of blood utilization for elective general surgery at the University College Hospital, Ibadan. They noted that only 8% of the blood demanded and cross-matched was eventually utilized. The practice of minimal-blood-loss surgery is praiseworthy because blood transfusion is not without its risk. Everybody appreciates the importance of transfusing blood to save lives when there is massive blood loss as could occur with surgical operations but a utilization rate of 8% implies that some guidelines should be put in place for blood demand. The authors advocated the operation of a Maximum Surgical Blood Ordering Schedule (MSBOS) for efficient blood utilization. It would therefore be most appropriate if an algorithm can be developed to guide blood utilization for surgical operations in our hospitals which can be adopted for use nation-wide.

The other audit-related papers that our readers will find interesting include i) negligence of caregivers resulting in poor compliance with vaccination appointments of infants with forgetfulness blamed; ii) preference of older dental surgeons for multiple patient visits for endodontics care to allow for effective medications; iii) 80% success rate of apicectomy at 12- month follow notably in female patients, those less than 30 years of age and those with radicular cysts; iv) low frequency of self-breast examination for cancer screening especially women who had no obvious breast problems and those who felt well, which could be deceptive; and v) that knowledge was a key determinant for submission to have cervical cancer screening, and therefore, non-doctors and middle/lower cadre health workers should be targeted during cancer screening awareness campaigns.

There are interesting papers on work-place health issues, association of depression and hypertension among the elderly from the Ibadan Study of Ageing data, the pattern of bone metastasis in breast cancer patients, presbyopia as a common eye problem in individuals aged over 30 years, and increased incidence of dental caries among pre-teenage children associated with snacking. Idowu and colleagues' paper on multi-drug resistant *Klebsiella species* should interest readers, and lastly there is a preliminary report on the potential benefit of *NImreh B* for managing hepatitis B infection. Three case reports complete the selection of papers for this issue of the journal.

The Editorial Committee will like to thank all our authors for their immense contributions and for ensuring that we keep pace with global developments in medicine. It is through the auditing of our clinical and educational activities that we can bring about desired changes for better health despite the pervasive lack of resources and other social challenges.

A. Ogunniyi
Editor-in-Chief

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Bipolar hip hemiarthroplasty for femoral neck fracture in a patient with ipsilateral below knee amputation

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Abstract
A 66 year- old man, right below knee amputee with 2 months history of pain in the right hip joint and inability to bear weight on the right lower limb following a fall at home. A diagnosis of transcervical right femoral neck fracture was made following initial mis-diagnosis. He had a right bipolar hip hemiarthroplasty.
This paper provides insight into the peculiar nature of this condition and the operative challenges involved in managing individuals with this condition.
Satisfactory outcome is obtainable in our environment similar to what is observed in the developed world.

Keywords: *Knee amputee, right hip, transcervical hemiarthroplasty.*

Résumé
Un homme de 66 ans, amputé juste sous le genou avec 2 mois antécédents de douleur dans l'articulation de la hanche droite et incapacité à supporter du poids sur le membre inférieur droit suite à une chute à la maison. Un diagnostic de fracture transcervicale du col du fémur droit a été posé après un diagnostic initial erroné. Il a subi une hémiarthroplastie bipolaire de la hanche droite.
Cet article donne un aperçu de la nature particulière de cette condition et des défis opérationnels impliqués dans la gestion des personnes atteintes de cette condition.
Un résultat satisfaisant peut être obtenu dans notre environnement similaire à ce qui est observé dans le monde développé.

Keywords: *Knee amputee, right hip, transcervical hemiarthroplasty.*

Introduction

Hemiarthroplasty of the hip is one of the options of managing femoral neck fractures and proximal femoral injuries with intact acetabulum. The advantages of bipolar hip hemiarthroplasty include better stability and simpler implantation [1].

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Femoral neck fractures and pertrochanteric fracture are of equal incidence and makes up to 90% of proximal femur fracture. [2] The life time risk of hip fracture is 11.2% for men and 23.3% women [3].

Amputation is a surgical procedure carried out to remove whole or part of a limb which could be as a result of trauma from natural disaster or due to medical reasons with the aim of improving health outcomes and quality of life of patients [4].

There is no known prevalence of femoral neck fracture in ipsilateral amputated limbs however, the prevalence of amputation among all orthopaedic surgeries was noted to be 0.38% in Nigeria by Onuba *et al,* (5) Ogundele *et al,* in their study on major limb amputations showed that 30.4% of their patients with lower limb amputations were due to diabetic foot gangrene, 48.1% due to extreme trauma, 3.8% were due to peripheral vascular disease while 2.5% were due to neoplasm.[4] The rate of fracture in previously amputated patients is between 2.4 and 3 % and most of these fractures occur in the distal femur [6,7].

Increased osteoporosis, abnormal gait in amputee and poorly fitted prosthesis are some of the risk factors associated with femoral fracture [8].
As such a case report of an individual with femoral neck fracture with an ipsilateral below knee amputation is discussed.

Case summary

A 66 year old man with 2 months history of pain in the right hip joint and inability to bear weight on the right lower limb following a fall at home. He presented at a facility where he was managed for musculoskeletal pain with analgesics for about 2 months with no significant improvement in symptoms warranting referral for orthopaedic consult where a diagnosis of right femoral neck fracture was made and he was planned for right hip hemiarthroplasty.

He had a right below knee amputation done for Marjolins ulcer of the right foot having been managed for elephantiasis of the right foot and distal right leg 10 years ago and has been using a below knee prosthesis since then, allowing him to bear weight fully on the right lower limb. He is a known

diabetic with good glycemic control. Recent onset of pain warranted his use of bilateral axillary crutches.

Examination showed an elderly male ambulating with bilateral axillary crutches. The right lower limb showed a well moulded right below knee amputation stump which was externally rotated with wasted quadriceps muscles of the right thigh. There was limitation of all range of movement of the right hip joint due to pain in the right hip.

Radiological examination of the pelvis

Plate 1: Clinical photograph

Plate 2: Pre-operative X ray

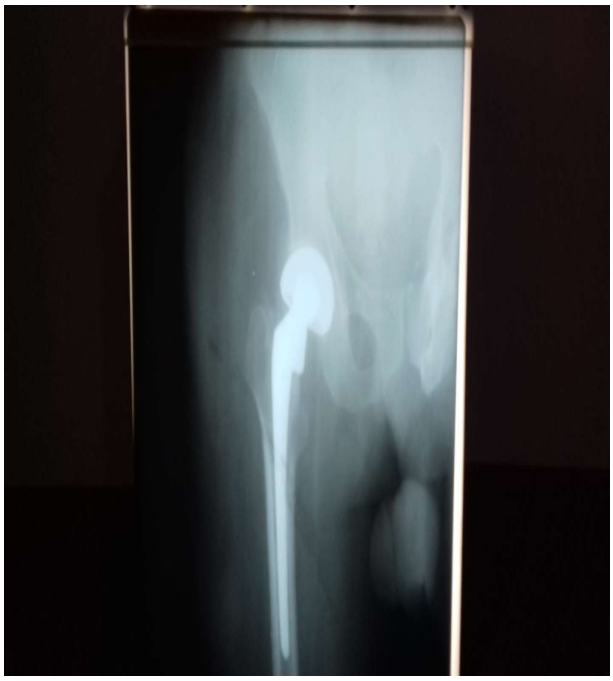

Plate 3: Post Operative X Ray (Ap View)

Plate 4: Post Operative X Ray (Oblique View)

He was worked up for right hip hemiarthroplasty surgery. Intra operatively, he had bipolar right hip hemiarthroplasty done through the lateral approach and subsequent reduction following fixation was a challenge in view of the prior below knee amputation and delayed presentation though this was reduced eventually. He had improvement in all ranges of

motion of the right hip joint post operatively and was mobilized out of bed on the 2nd day post surgery subsequently discharged 3rd day post surgery on partial weight bearing. Post operative period was uneventful.

Plate 5: clinical photograph in the post operative period with prosthesis in place

A later assessment at 10weeks post operative period after the fitting of the below knee prosthetic limb showed he was able to ambulate fully and was able to return to his pre injury state.

Discussion

The incidence of proximal femoral fractures in lower limb amputee is not known. However, Bowker *et al,* in studying fractures in the lower limb with prior amputation found nineteen fractures (34 per cent) about the hip of which nine were fractures of the femoral neck, nine intertrochanteric fractures and one subtrochanteric fractures [9].

Individuals with lower limb amputations have been observed to have reduced bone mineral density (BMD) in the amputated stump compared to the normal limb. BMD is observed to be lower in an individual with above knee amputation compared to a below knee amputation. [10,11]. In addition to decreased BMD, amputees showed altered gait mechanics, which may predispose them to low-energy falls [12].

Pyka *et al.* observed that prosthesis was a cause of fractures of the extremity in amputee [13]. . The reasons for this are thought to be due to osteoporosis and the lever arm carried by the prosthesis [14].

Operative challenges associated with arthroplasty in an amputated limb include; choice of surgical approach, manipulation and positioning of the affected limb [11], as well as severe osteoporosis and residual length of the femur [11,15]. As a result of the above, there is the need to use an approach that will give a better exposure for the orientation of the implant and positioning that will allow easy manipulation.

Different modalities of management have been used for managing proximal femoral fractures in amputees. These include non operative management, open reduction and internal fixation, hemiarthroplasty and total hip replacement.

The use of hemiarthroplasty in the management of femoral neck fractures have been associated with reduced risk of dislocation, shorter operation time, less blood loss and lower initial cost of surgery compared with total hip arthroplasty [16].

Total hip arthroplasty has also been used in managing similar fractures especially when there is pathologic involvement of the acetabulum.

Conclusion

In conclusion, amputees with ipsilateral femoral neck fractures may have factors such as reduced bone mineral density, altered gait mechanics which predispose them to low energy fall and intra operative challenges during hemi arthroplasty management such as residual stump length, surgical approach and positioning and manipulation. They could have outcome similar to that obtainable in non amputees especially in those with intact acetabulum.

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Ongoing survival without anticoagulation in a patient wearing Prosthetic mechanical valve in Nigeria: A case report

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Abstract
Background: Prosthetic mechanical valve implantation is becoming commonplace in our environment. As a standard of care, they are required to be placed on long-term anticoagulation to avert thrombosis. This brings about need for regular clotting profile with attendant costs and risk of bleeding. In our environment where for genetic and dietary reasons lower doses of anticoagulants suffice, chronic anticoagulation is fraught with risks. A few patients have survived for varying periods without anticoagulation while wearing prosthetic mechanical valves; but no such case has been reported from Nigeria. They provide a cohort that needs careful follow-up so they could be characterized and the experience brought to bear on management of patients with mechanical prosthetic valves. One such case encountered in our practice is hereby reported
*Case report***:** An 89-year-old man who underwent prosthetic aortic valve implantation in 2010 in India returned to Nigeria and discontinued all his drugs when the initial stock ran out. He went on for 8 years without any drug except for oral hypoglycaemic drugs that he was given on development of diabetes. He presented at this point well; and with no anticoagulation still had INR within the recommended range. But for mild background diabetic nephropathy he was well and has remained so. This makes it a total of 9 years post surgery without anticoagulants, the longest period without anticoagulants reported in a Nigerian wearing mechanical prosthetic valve.
*Conclusion***:** It is possible to survive prosthetic mechanical valves without anticoagulants provided INR remained within recommended range. The characteristics of individuals fitting this bill need to be determined so that it could be recommended for them to be on little or no anticoagulation after mechanical prosthetic valve placement.

Keywords: *Mechanical prosthetic valves; Anticoagulation; Without; Survival*

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Résumé
Contexte **:** L'implantation de valve mécanique prothétique devient courante dans notre environnement. En tant que norme de soins, ils doivent être placés sous anticoagulation à long terme pour éviter la thrombose. Cela entraîne la nécessité d'un profil de coagulation régulier avec les coûts associés et le risque de saignement. Dans notre environnement où, pour des raisons génétiques et diététiques, des doses plus faibles d'anticoagulants suffisent, l'anticoagulation chronique comporte de nombreux risques. Quelques patients ont survécu pendant des périodes variables sans anticoagulation tout en portant des valves mécaniques prothétiques ; mais aucun cas de ce genre n'a été signalé au Nigéria. Ils constituent une cohorte qui nécessite un suivi attentif afin de pouvoir être caractérisés et l'expérience mise à profit dans la prise en charge des patients porteurs de valves mécaniques prothétiques. Un tel cas rencontré dans notre pratique est ainsi signalé.
Rapport de cas **:** Un homme de 89 ans qui a subi une implantation de valve aortique prothétique en 2010 en Inde est retourné au Nigeria et a arrêté tous ses médicaments lorsque le stock initial était épuisé. Il a continué pendant 8 ans sans aucun médicament à l'exception des hypoglycémiants oraux qui lui ont été administrés lors du développement du diabète. Il a bien présenté à ce stade ; et sans anticoagulation avait toujours l'INR dans l'intervalle recommandée. Mais pour la néphropathie diabétique de fond léger, il allait bien et est resté ainsi. Cela fait un total de 9 ans après la chirurgie sans anticoagulants, la plus longue période sans anticoagulants rapportée chez un Nigérian portant une prothèse valvulaire mécanique.
Conclusion **:** Il est possible de survivre aux valves mécaniques prothétiques sans anticoagulants à condition que l'INR reste dans l'intervalle recommandée. Les caractéristiques des individus dont les données se raccordent à cet objet d'étude doivent être déterminées afin qu'il puisse être recommandé pour eux d'être sur peu ou pas d'anticoagulation après la mise en place de la valve prothétique mécanique.

Mots clés : *Valves prothétiques mécaniques; Anticoagulation; Sans pour autant; Survie*

Introduction

Over the years, cardiac valve replacement surgeries have increased in our environment; with availability of the required surgical expertise. Majority are expectedly from valves damaged by rheumatic heart disease [1], and a few from congenital and degenerative valve diseases. This has brought upon us a growing pool of patients requiring post-surgical care with anti-coagulants. In the west, an algorithm for anti-thrombotic therapy is in existence for prosthetic heart valves [2]. We in sub-Saharan Africa have keyed in automatically, not minding that as Africans we are less sensitive to warfarin than people of European ancestry [3]; and that our health services are way from ideal.

There have been reports of patients on mechanical prosthetic valves surviving free of complications without anticoagulation [4]. No such report has come from Nigeria to the best of the author's knowledge. This is therefore reporting one such case encountered recently to initiate a conversation among clinicians working in this our resource-constrained environment; on the need to explore options that can accommodate our peculiarities.

Case Report

NN is an 89 year elderly male who had seen the author several years ago when a diagnosis of aortic aneurysm with valve incompetence was made. He was informed that he would need aortoplasty and possible valve replacement. He absconded at that point. In December 2017, he returned reporting aortic valve surgery done in India with mechanical valve prosthesis placement in 2010. Since returning, he had been well and on no drug including oral anticoagulants; except for Metformin 500 mg BD for his diabetes mellitus. He sought out the author to resume clinical care in 2018. He however could not give information on the make of the metallic prosthesis used for him.

His cardiovascular status was unremarkable except for ejection systolic murmur all over the precordium. There was no symptom referable to the cardiovascular system. A chest X-ray done showed aortic unfolding and cardiomegaly (Fig. 1). Echocardiography and blood test for clotting profile were requested. Echocardiography confirmed the presence of a normally functioning prosthetic aortic valve, though reverberation artefact impaired image quality. The left side chambers were enlarged and the left ventricle had thick walls. Ejection fraction was in the mid range at 45%. His clotting profile result came back as follows: Control prothrombin time – 14 seconds, Patient prothrombin time – 34 seconds, *Prothrombin ratio – 1: 2.4,* International normalized ratio (INR) – 3.71. His diabetic control was poor with fasting blood glucose of 12.1 mmol/l.

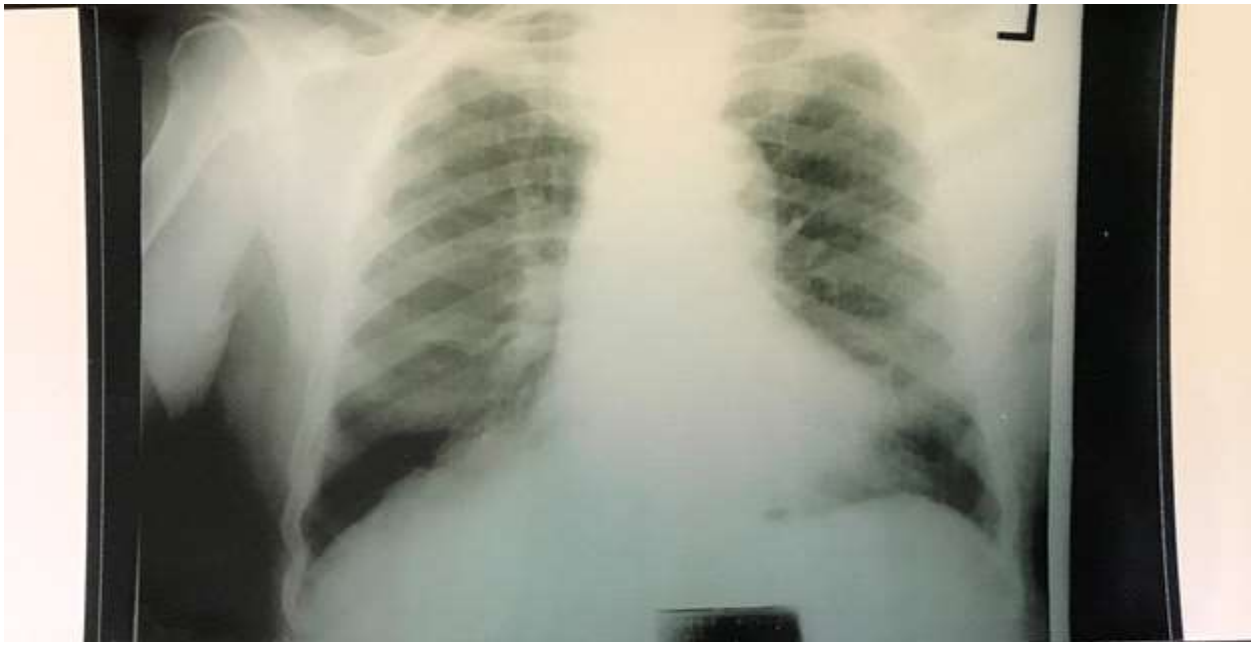

Fig. 1: Postero-Anterior X-ray view of the chest showing cardiomegaly and unfolded aorta

He was asked to still go without anticoagulants given the INR level, but to follow up monthly for

regular INR check. His oral hypoglycaemic agent dose was revised and blood glucose at the next visit after 2 weeks had normalized to 5.0 mmol/l. Thereafter he absconded from follow-up again, but his children report that he is still well; giving distance as reason for not continuing follow-up. He showed up one year after in June 2019 still well. INR done on this occasion was 2.2 . Liver function test done returned normal and so was the lipid profile. However, there was mild background kidney disease with serum urea and creatinine at 14.6 mmol/l and 165 micromol/ml respectively.

Discussion

Since the onset of cardiac valve replacement with mechanical prosthesis, guidelines have mandatorily recommended the use of anticoagulants to prevent complications [5]. The rationale for chronic anticoagulation is based on thrombogenicity inherent in the prosthesis; and the high rate of complications without use of anticoagulants [2]. This recommendation is however, based on non-randomised case series without controls [4].

This patient is in his 9th decade of life with a prosthetic aortic valve placed 9 years ago; without anticoagulants and no reported event. Most of the cases with long event-free survival are aortic [4]. Mechanical valves in the aortic position have been noted to be durable without anticoagulant use [6]. It is time therefore to stop attributing their survival just to good-luck as posited in a study [7]. By their recommendations, the warfarin is aimed at getting the INR to between 2.5 and 3.5 in the first 3 months and 2.0 to 3.0 thereafter [7]. This patient without anticoagulants had an INR of 3.7. This low thrombo-embolic risk in Africans has been reported earlier [8], and may be due to inherited or acquired inhibition of factors in the extrinsic or common pathways of the coagulation cascade. Also in clinical situations where Africans should receive anticoagulants to be at recommended INR, they were in an earlier report were already there without drugs [9]; re-inforcing the knowledge that warfarin need in Africans is different from others like Europeans [3].

Poor literacy, extreme poverty, poor infrastructure, long distance from hospitals and peculiar genotype and diet of Africans should call for introspection on our parts; and an environmental/ genetic approach adopted. Individual needs for warfarin is dependent on clinical factors varying from diet, co-medications, age, inter-current disease, genetics as well as liver and kidney functions [10]. Lower doses of warfarin have in some cases, been found to still keep patients at similar thrombo-embolic risk [11]; and for aortic sites, INR could drop as low as 1.8 [12].

Given the genetic predisposition to be at target INR with lower doses of anticoagulants in the African as well as environmental and health system challenges impeding required monitoring, it is time we came up with guidelines that suit our peculiarities. This would require that as part of pre-operative work-up for mechanical prosthetic valve surgery, Africans should be availed of preliminary coagulation studies; to guide any post-operative anticoagulation. The time is now in my view.

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Prevalence of work related musculoskeletal pain, knowledge and practice of ergonomics among staff of a tertiary health facility in Ibadan, Nigeria

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Abstract

Introduction: Musculoskeletal pain is one of the most prevalent occupational health disorders among hospital workers. This study was conducted to determine the prevalence of musculoskeletal pains, knowledge and practice of ergonomics among clinical and non-clinical staff in a tertiary health facility.

Methods: A five sectioned self-administered questionnaire was administered to the participants for data collection in a cross-sectional survey design, using convenience sampling method. Descriptive statistics and chi - square were used in analyzing the data.

Results: A total of 359 participants were involved in this study, consisting of 193 clinical staff (62 males; 32%) and (131 females; 68%); mean age of 36±11.0 years, and 166 non-clinical workers of 79 males (47.3%) and 87 females (52.7%); mean age 38±14.0 years. Non-clinical staff had a higher annual prevalence of musculoskeletal pains (79.4%) slightly above that reported by the clinical staff (78.4%). Pains were mostly distributed to the low back region for both groups. Years of work experience was not significantly associated with musculoskeletal pain (p=0.194). However, several other physical and psychological predisposing factors assessed were significantly associated (p<0.05) with musculoskeletal pains in both groups.

Conclusion: The non-clinical staff had higher prevalence of musculoskeletal pains. The knowledge of ergonomics and compliance to work safety regulations was also high among the clinical staff. Therefore, improving the working conditions of the workers will help in reducing the prevalence of musculoskeletal pains among them. Periodic education for the staff on work safety regulations, benefits and monitoring to ensure adherence should be carried out.

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Keywords: *Musculoskeletal pain, occupational health disorders, clinical and non-clinical staff, ergonomics.*

Résumé

Introduction : La douleur musculosquelettique est l'un des troubles de santé professionnel les plus répandus parmi les travailleurs hospitaliers. Cette étude a été menée pour déterminer la prévalence des douleurs musculosquelettiques, les connaissances et la pratique de l'ergonomie chez le personnel clinique et non clinique d'un établissement de santé tertiaire.

Méthodes : Un questionnaire auto-administré en cinq sections a été administré aux participants pour la collecte de données dans le cadre d'une enquête transversale, en utilisant la méthode d'échantillonnage pratique. Les statistiques descriptives et le chi-carré ont été utilisés dans l'analyse des données.

Résultats : Un total de 359 participants a été impliqué dans cette étude, qui consiste de 193 membres du personnel clinique (62 hommes; 32%) et (131 femmes; 68%); âge moyen de 36 ± 11,0 ans et 166 travailleurs non cliniques de 79 hommes (47,3%) et 87 femmes (52,7%); âge moyen 38 ± 14,0 ans. Le personnel non-clinique avait une prévalence annuelle plus élevée de douleurs musculosquelettiques (79,4%) légèrement supérieure à celle rapportée par le personnel clinique (78,4%). Les douleurs étaient principalement réparties dans la région du bas du dos pour les deux groupes. Les années d'expérience de travail n'étaient pas significativement associées à la douleur musculosquelettique (p = 0,194). Cependant, plusieurs autres facteurs de prédisposition physiques et psychologiques évalués étaient significativement associés (p <0,05) aux douleurs musculosquelettiques dans les deux groupes.

Conclusion: Le personnel non-clinique avait une prévalence plus élevée des douleurs musculosquelettiques. La connaissance de l'ergonomie et du respect des règles de sécurité au travail était également élevée parmi le personnel clinique. Par conséquent, l'amélioration des conditions de travail des travailleurs contribuera à réduire la prévalence des douleurs musculo-

squelettiques parmi eux. Une formation périodique du personnel sur les règles de sécurité au travail, les avantages et la surveillance pour assurer l'adhérence doit être effectuée.

Mots clés: *Douleur musculosquelettique, troubles de santé professionnel, personnel clinique et non clinique, ergonomie.*

Introduction

Musculoskeletal Pain (MSP) is one of the most prevailing occupational health challenges, and hospital members of staff are no less at risk of MSP. It is a global problem affecting all spheres of human endeavours, with an enormous consequential economic drain in many developing and developed countries [1]. International Association for the Study of Pain [2], described the economic burden of musculoskeletal pain as second only to that of cardiovascular disease. In the United States of America, the overall cost of MSP was estimated to be about 214.9 billion US Dollars and the direct costs of managing MSP that was work-related amounted to 88.7 billion US Dollars, of which 38% was spent on hospital admission and 21% on nursing home care [1]. The prevalence of MSP is very high with enormous economic implications.

Approximately 2% of gross domestic product (GDP) is spent on the direct costs of Musculoskeletal Disorders (MSDs) each year in the European Union. The annual work days lost due to MSDs in the U.K is estimated to be 9.5 million work days. Musculoskeletal pain causes an impact on the quality of life and interferes in the daily activities of two-thirds of individuals, especially for physical activities, sports, daily life activities and ability to go to work and to perform their job functions [2].

International Association of the study of pain, defined pain as an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage. Musculoskeletal pain, therefore, is defined as the pain that affects the muscles, ligaments, tendons and nerves, along with the bones. Work-related Musculoskeletal Pain (WRMSP) is a condition in work-related tasks that affect the nerves, tendons, muscles and supporting structures associated with exposures to job risk factors. WRMSP is a musculoskeletal disorder as a result of work-associated activity [3]. Musculoskeletal pain (MSP) is one of the most common symptoms of musculoskeletal disorders (MSDs) [4]. MSDs are a variety of conditions that affect the muscles, bones, ligaments, tendons and peripheral nerves and blood vessels [5,6]. MSDs often cause symptoms of pain, ache and discomfort to the affected body areas especially the back, neck and upper limbs are affected by work-related musculoskeletal pain depending on the physical movements, ergonomics and work designs. The United States Bureau of Labour and Statistics reported 34% of occupational illness that required absenteeism from work in 2012 in the U.S was due to WRMSP. Similarly, about one-third of all sick leaves among healthcare workers are related to WRMSDs [7]. Also, most occupations worldwide are associated with a high risk of developing injury [8], with MSDs as the most prevalent and frequently reported work-related disease according to the center for disease control.

MSP has been described as one of the main occupational problems among health care workers with prevalence rate between 40 – 50% [9,10]. Prevalence of work-related musculoskeletal pain among physiotherapists in some epidemiological studies reported 91% in Australia [11], 85% in Turkey [12], 68% in United Kingdom [13], and 91.3% in Nigeria [14] having the highest occurrence. For the nurses, the prevalence rate reported in Nigeria is 84% [3], in another study conducted in rural Japan, reported a 12-month prevalence of 91.9% [15], 72.5% in the United States [16]. Low back pain has been reported as the most frequent disorder among physiotherapist and nurses [12,13,17,18]. For the physicians, a study consisting of 169 Iranian physicians, revealed that 41.7% reported symptoms at least in one part of their bodies [19].

The 12-month prevalence of low back pain among staff in a rural hospital and office workers in an urban centre in Nigeria was reported to be 46% and 38% respectively [20, 21]. A study carried out recently [22] in Turkey among hospital workers revealed that most respondents (65.8%) had experienced low back pain, with 61.3% reporting an occurrence within the last 12 months [22]. The highest prevalence of low back pain was found among nurses (77.1%) and the lowest (53.5%) was among hospital aides. The presence of musculoskeletal symptoms among hospital cleaner and sanitary workers in Brazil was quite high as reported by 87% of them [23]. A study conducted among office workers in Thailand reported that the annual prevalence of self-reported musculoskeletal symptoms attributed to work was 63% [24].

High rates of occupational injury has been reported with healthcare institutions [8] with the most common symptoms reported to be low back pain, shoulder and widely distributed persistent pain. Among medical and dental professions, the back, neck, shoulder and knee problems are the most

common complaints [5–28], but it is also common in the elbow, wrist and hand. Various studies among health care professionals have recorded high prevalence rates of WRMSDs in at least one body region. The range of prevalence rates reported for the most commonly affected areas range between; 19% and 77% for the lower back [14, 29–32], 31% to 48.9% for the neck [14,30,33] and between 10% and 36.9% for the shoulders [14, 29–31].

Ergonomics is an applied science concerned with designing and arranging things people use, so that the people and things interact most efficiently and safely. Ergonomics is an important aspect in order to improve workers performance at work, develop an autonomous rhythm at work which will synchronize physical, physiological and psychological aspects that are responsible for human behaviour and efficiency at work and stands as a key factor deciding workers effectiveness [34]. Proper posture or positioning, equipment modification as well as rest periods of at least six minutes per hour [35], are some of the strategies for reducing the occurrence of work-related musculoskeletal pain. Others included that an educational package to alleviate abnormal stress or painful conditions related to selected occupations will be beneficial in either rehabilitating chronic conditions or preventing damage to the musculoskeletal system under working conditions [36].

Multiple causative factors for MSP have been established to include both work-related and non-work related factors [37,38]. The contributory factors to musculoskeletal pain may include prolonged sitting, poor posture, body vibrations, distant driving, heavy lifting, manual handling, poor diet and other psychosocial factors [37,39,40]. The common non work-related risk factors are poor ergonomics with driving, women menstruation, previous low back pain, psychological distress etc. These factors give a great concern to health and the quality of life. Other physical factors that increase the risk of MSP include monotonous work and respective movements [41,42], bending and twisting [43].

MSP arising from MSDs is globally prevalent and is one of the commonest causes of persistent pain and disability affecting a great number of people. Disorder of any part of the body affects the whole of the system leading to reduced quality of life, low or poor work output, absence from the workplace, change of carrier or even death. The incessant complaints of musculoskeletal pain of some clinical and non-clinical staff of the tertiary health facility stimulated the interest embodied in this study to investigate the prevalence of work-related musculoskeletal pain, knowledge and practice of ergonomics among them. Thus, the aim of this study was to estimate the frequency of work-related musculoskeletal pain and assessed the knowledge and practice of ergonomics among the staff of a tertiary health facility located in Ibadan, Nigeria.

Materials and method

Study Design

The study utilized a cross-sectional survey design.

Location of Study

This study was carried out in a tertiary health facility in Ibadan, Nigeria.

Target Population

The population of the study comprised both male and female clinical and non-clinical staff in a tertiary health facility in Ibadan that has practised for at least 12 months and above and currently working in the hospital within the period of this study.

Sampling technique

The study employed a convenience sampling technique to select the participants for the study. Convenience sampling method was considered appropriate for the study because it is based on the availability and willingness of the participants to participate in the study.

Sample Size

The sample size was calculated using the sample size formula for estimation of a single proportion [44];

$$N = \frac{Z^2 P(1-P)}{d^2}$$

Where Z= 1.96 at 95% confidence interval

d = tolerance error/ absolute precision required on either side of the proportion which is 5% or 0.05.

P = estimated population proportion.

A proportion was not known for the target population. This was because some of the workers in the above-mentioned locations of study may be unavailable, for reasons such as being transferred to other places or being on vacation (leave). Therefore a value of 50% (0.5) was assigned to obtain the maximum value of the population proportion. Thus;

$$n = \frac{(1.96)^2 \times 0.5(1-0.5)}{(0.05)^2} = 384$$

However, this research worked with 400 subjects who were willing to participate in the study. Hence the sample size was greater than the calculated size and therefore allowed for attrition.

Materials

a) In this cross-sectional survey study, the instruments that were used for data collection were adopted from the Standardized Nordic Questionnaire [45] and a modified General Nordic Questionnaire for Psychological and Social factors at work (QPS Nordic) [46]. The Standardized Nordic was used to assess the occurrence of musculoskeletal pain while the modified QPS Nordic was used to assess the physical and psychosocial risk factors.

The reliability and validity of the questionnaires were conducted. The subjects filled and refilled the questionnaires and their responses to the questionnaires were compared with their clinical history. Reliability tests with the test-retest method of preliminary version of the general questionnaire (one study on 29 safety engineers, one on 17 medical secretaries and one on 22 road maintenance workers) showed that the number of non-identical answer varied from 0 to 23% [45]. Similarly, validity tests against the clinical history among 19 medical secretaries and 20 road maintenance workers, showed that the number of non-identical answers varied between 0 and 20% [45].

The validation of the QPS Nordic was carried out in two sets of data collected from four Nordic countries. The first data was used to study the structure of the questionnaire and to construct the scales while the second data was used to test the construct and predictive validity of the scales. It was found that the internal consistency of the scales varied between 0.60 and 0.88 measured by Cronbach's alpha and the test-retest reliabilities was from 0.55 to 0.82 when the interval between the two administration was from five to eight weeks [46].

The questionnaire was made up of open and close ended questions, it contained 5 sections:

Section A: Contained the demographic data of the participant, consisting of questions 1 – 4.

Section B: contained job history of the participant, consisting of questions 5 – 9

Section C: Contained questions on the occurrence of musculoskeletal symptoms, consisting of questions 10 – 11.

Section D: Contained the questions on ergonomic and working condition consisting of questions 12 – 35.

Section E: Contained questions on the preventive measures and curative treatment facilities, consisting of questions 36 – 40.

Method of data collection/procedure

The copies of the self-administered questionnaires were distributed to the target population who were within the inclusion criteria in the tertiary health facility. The nature, objectives and relevance of the study were also explained to them. The collection of the questionnaire from the respondents after the distribution was within two weeks.

Data analysis

Statistical Package for Social Sciences (SPSS) version 23.0 for Windows Evaluation Version was used for data analysis [47]. The mean and standard deviation (mean ± SD) was used to describe continuous variables. Qualitative variables were presented as absolute and relative frequencies; While Chi-square and binomial logistic regressions were used to determine the association between non-parametric variables. Probability values of $p<0.05$ were considered statistically significant.

Ethical consideration

Ethical permission from the ethical committee of the UI / UCH, Ibadan, Oyo State, was obtained before carrying out the study. Informed consent was obtained from participants before involving them in the study. The rules and regulations guiding research in the hospital were properly followed.

Results

Socio- demographic profile of the Participants

A total of 400 copies of the questionnaire were distributed among the participants and 380 were returned; a response rate of 95.0%. Data from 359 participants were computed and analyzed, 21 were discarded because of the incomplete response to questions. Out of the 359 participants, 193 were clinical workers (62 males; 32%) and (131 females; 68%); mean age of 36±11.0 years, age range of 24 – 59 years); while non-clinical health workers were 166 (79 males (47.3%) and 87 females (52.4%); mean age 38±14.0 years, age range of 20 – 57 years). The demographic data of the participants are presented in the Table 1.

The demographic features of the participants showed that 68.0% and 52.4% were female among the clinical and non-clinical staff respectively. Majority of the participants were married, 64.1% (clinical staff) and 56.5% (non-clinical staff) and 75.2% of the clinical staff reported a tertiary educational status while only 51.9% of the non-clinical staff reported having attained tertiary educational status. Years of working experience is shown to be mostly within the range of 1 – 3 years among both clinical (39.9%) and non-clinical (33.6%) staff.

Prevalence of workers that experienced discomfort or pains (musculoskeletal pains) that are related to work in the past 12 months among clinical and non-clinical staff

The prevalence of workers that experienced discomfort or pains (musculoskeletal pains) that were related to work in the past 12 months among clinical and non-clinical staff was reported in this present study. The result revealed that the prevalence rates of WRMSP among clinical and non-clinical staff are 120(62.2%) and 140(62.7%) respectively. Only 21.1% of the total hospital staff (clinical and non-clinical) involved in this study was reported to be in good health compared to 78.9% that were reported to have experienced work-related musculoskeletal pain.

Table 1: Socio-demographic profile of participants N=359

Variables	Clinical Staff (n = 193)		Non-Clinical Staff (n = 166)	
	Fre.	%	Fre.	%
Gender				
Male	62	32	62	47.3
Femiale	131	68	69	52.7
Marital Status				
Married	124	64.1	94	56.5
Single	67	34.6	68	41.2
Widowed	2	13	1.0	0.8
Separated	0.0	0.0	0.0	0.0
Educational status				
Primary education	0.0	0.0	7.0	3.8
Secondary education	1	0.7	53	32.1
Tertiary education	145	75.2	86	51.9
Post graduate	47	34.2	20	12.2
Years of working experience				
1-3 years	77	39.9	58	35.1
4-6 years	48	24.8	53	32.1
7-9 years	24	11.8	17	9.9
10-13 years	25	13.1	15	13.7
14 years and above	19	9.8		

N = number of participants

The body regional distribution of musculoskeletal pains between clinical and non-clinical health workers

The regions of the body where the participants felt the musculoskeletal pain among the participants are as shown in Table 2. Participants were allowed to respond to more than one body region where they felt the pains. The result revealed that 49.7%, 39.2% and 32.7% of the clinical staff suffer from low back pain, neck pain and upper back pain respectively, while among the non-clinical staff, neck pain (45%) was reported to be most prevalent, followed closely by lower back pain (43.5%) and shoulder (31.3%). Also, among both the clinical and non-clinical staff, lower back pain (46.8%) was reported to have the highest prevalence followed by neck pain (42.0%) and the upper back (31.2%).

Prevalence of musculoskeletal pain among different hospital professions

The prevalence of musculoskeletal pain among different occupations/departments in the tertiary health facility is as shown in Table 3. The reported prevalence of the musculoskeletal pain among the overall numbers of clinical staff were mostly Dentists and Optometrists (100% respectively), followed by the Physiotherapists (84.6%), Dental therapists (83.3%), Medical Laboratory Scientists (82.1%) and Radiographers (80.0%). The overall annual prevalence of musculoskeletal pain among the non-clinical staff was most reported by the morgue officers (100.0%), followed by medical records officers (94.1%) and hospital cleaners (88.9%). In addition, all the dentists and optometrists involved in the study experienced musculoskeletal pain in the past 12 months. Other clinical professionals, except for the dieticians (20.0%), reported a high annual prevalence

Table 2: The body regional distribution of musculoskeletal pains between clinical and non-clinical health workers

Variables	N (%) Clinical staff	Non-Clinical staff	Total
Have you at any time during the last 12 monhs had trouble (such as ache, pain, discomfort, numbness) as a result of your work in:			
Neck	76 (39.2)	75 (45.0)	151 (42)
Shoulder	54 (28.1)	52 (31.3)	106 (29.5)
Upper back	63 (32.7)	49 (29.8)	112 (31.2)
Elbow	15 (7.8)	24 (14.5)	39 (10.9)
Wrist/Hand`	48 924.8)	40 924.4)	88 (24.5)
Lower back	96 (49.7)	72 (43.5)	168 (46.8)
Hip/thigh	39 (20.3)	25 (15.3)	64 (17.8)
Knee	43 (22.2)	51 (30.5)	94 (26.1)
Ankle/feet	47 (24.2)	38 (22.9)	68 (23.7)

N = number of participants

Table 3: Prevlence of musculoskeletal pain among different hospital professions

Clinical staff (N = 193) Specialty	N(%)	Non-Clinical staff (N=166) Specialty	N (%)
Have you experienced any discomfort or pains that you feel are related to your work in the past 12 month?			
Physiotherapy	163 (84.6)	Administrative	147 (88.5)
Physicians	147 (76.2)	Officers	156 (94.1)
Med. Lab.	159 (82.1)		
Scientists	150 (77.8)	Medical Record	140 (84.6)
	39 (20.0)	Officers	148 988.9)
Nurses	154 (80.00		
Dieticians	152 (78.6)	Hospital Health	107 (64.3)
Radiographers	193 (100)	Attendants	100 (60.0)
Pharmacists	160 (83.3)		0 (0.00
Dentists	193 (100)	Cleaners	166 (100)
Dental Therapists		Account Officers	111 (66.7)
Optometrists		Security Officers	107 (64.7)
		Laundry Officers	
		Morgue Officers	
		Drivers	
		Works	

N = number of participants

of musculoskeletal pain. The details of the prevalence of musculoskeletal pain are shown in Table 3.

In the same vein, high annual prevalence of WRMSP was observed among the different occupations of the non-health care workers, which include morgues officers 166 (100.0%), medical record officer, 156 (94.1%), Hospital Cleaners 148 (88.9%), administrative officers 147 (88.5%) and hospital health attendants (84.6%). The details of the prevalence of musculoskeletal pain are also shown in Table 3. All of the morgue attendants experienced musculoskeletal pain in at least one part of their body.

Health seeking behaviour of clinical and non-clinical staff of the tertiary health facility in Ibadan, Oyo State

The results of the health seeking behaviour of the clinical and non-clinical staff of the tertiary health facility are as shown in Table 4. The results revealed that less than half of the clinical staff (40.8%) reported 'rest' as the treatment they often sought when they developed work-related musculoskeletal pain, while 34.6% of the non-clinical staff indicated 'pharmacological treatment' as the means of modulation of their work-related musculoskeletal pain. Interestingly, only the non-clinical staff (5.8%) reported 'traditional treatment' as the treatment they often sought when they developed work-related musculoskeletal pain. The details of the health seeking behaviour of the participants are as shown in Table 4.

work experience between 1 – 3 years had the highest occurrence of the work-related musculoskeletal pain of 35.3% and 33.0% respectively. Further inferential statistics of Chi-square revealed a non-significant association ($p = 0.194$) between the prevalence of musculoskeletal pain and years of experience in the two occupational groups.

Predisposing factors of WRMSP among clinical and non-clinical workers

The results of the predisposing factors of WRMSP among clinical and non-clinical workers of the tertiary health facility are as shown in Table 6. All the physical predisposing factors in relation to work-related musculoskeletal pain are statistically significant ($p < 0.05$). Meanwhile, all the psychological predisposing factors were found

Table 4: Health seeking behaviour of clinical and non-clinical staff of the tertiary health faciltiy in Ibadan, Oyo State.

Variables	Clinical staff (N = 193)		Non-clinical staff (N=166)	
	Freq.	%	Freq.	%
Rest	70	40.8	40	24.0
Pharmacological treatment	48	25.0	57	34.6
Physiotherapy	24	12.5	19	11.5
Traditional treatment	0	0.0	6	5.8
*Others	13	6.7	10	2.9
No treatment	19	10.0	34	20.2
Drugs and Physiotherapy	10	5.0	2	1.0

*Others: Any othr method used outside the methods mentioned in the table

Table 5: Association between work experience (years in service) and prevalence of musculoskeletal pain.

	N (%)								
Clinical staff 9N = 193)				Non-clinical health workers (N=166)					
Prevalence	1 - 3yrs	4 - 6yrs	7 - 9yrs	≥10years	1-3yrs	4-6yrs	7-9 yrs	≥10yrs	X^2	P-value
Have you experienced any discomfort or pain that you feel are related to your work?										
Yes	42(35.3)	32(26.9)	14(11.8)	31(26.1)	34(33.0)	33(32.0)	10(9.7)	26(25.2)	6.065	0.194
No	19(31.1)	6(15.8)	4(22.2)	4(21.7)	10(22.7)	9(34.6)	3(11.5)	4(15.4)		

Association between work experience (years in service) and prevalence of musculoskeletal pain

A cross-tabulation between work experience (years in service) and prevalence of musculoskeletal pain between clinical and non-clinical staff of the tertiary health facility is as shown in Table 5. From the results, clinical and non-clinical health workers with

to be significantly associated with the occurrence of musculoskeletal pain except for two variables – 'working in a disorganized section' ($p = 0.086$) and 'working with frustrated workers/complex supervisor' ($p = 0.062$).

Table 6: Predisposinf factor of WRMSP among clinical and non-clinical health workers N = 359

Work-related predisposing factors	N (%) Clinical No Problem	Clinical Problem	Non-clinical No Problem	Non-clinical Problem	X^2	P-value
Carrying heavy load arounds daily	77(39.9)	116(60.1)	75(45.0)	91(55)	5.667	0.017*
Working in an awkward & cramed position	56(28.8)	137(71.2)	76(45.8)	90(54.2)	5.866	0.015*
Prolonged working in the same position	49(25.5)	144(74.5)	63(38.2)	103(61.8)	12.313	<0.001*
Bending or twisting your back in an akward way	137(71.2)	81(42.0)	70(42.0)	96(58.0)	6.082	0.014*
Moving andwalking up and down stairs	85(43.8)	109(56.2)	87(52.7)	62(47.3)	5.788	0.016*
Lifting and transferring heavy objects	67(34.6)	126(65.4)	67(40.5)	99(59.5)	14.354	<0.001*
Handling inappropriate tools and inhaling bd odour	58(30.1)	134(69.3)	3(38.2)	103(61.8)	9.823	0.002*
During the rest period I spend so much time on it.	68(35.3)	125(64.7)	76(45.8)	90(54.2)	8.646	0.003*
Continuing work while injured or hurt	58(30.1)	135(69.9)	65(38.9)	101(61.1)	3.978	0.046*
Psychological factors						
Performing the same task over and over	95(49.0)	98(51.0)	80(48.1)	85(51.1)	3,326	0.046*
Having to meet unreasonable target daily	86(44.4)	107(55.0)	75(45.0)	91(55.0)	8.839	0.003*
Working in a disorganised section	62(32.0)	131(68.0)	76(46.0)	89(53.4)	2.839	0.003*
Working with frustrated workers/complex supervisor	73(37.9)	95(62.1)	86(51.9)	80(48.1)	3.485	0.062
Handling more then one operation	78(40.5)	120(59.5)	76(45.8)	90(54.2)	9.016	0.003*
Working on difficult tasks	81(41.8)	112(58.2)	80(48.1)	86(51.9)	5.704	0.017*
Working overtime, irregular shifts length of work day*	58(30.1)	133(69.3)	63(38.2)	103(61.8)	5.517	0.019*

a = Handling inappropriate tools and inhaling bad odour/chemicals during working hours
b= During the rest period. I spend so much time resting in uncomfortable chair and table
c= Working overtime, irregular shifts length of workday, no resting period/break.
**= significant at P<0.05*

Table 7: Knowledge and practice of ergnonomics between clinical and non-clinical staff

	Clinical health workers (N = 193) Frequency	Percentage	Non-clinical staff (N = 166) Frequency	Percentage
Are there any operating rules within your workplace guiding the safety of individual ar work (ergonomics)?				
Yes	158	81.7	133	68.0
No	35	18.3	43	32.0
If yes, do you comply with the regulations?				
Always	105	54.2	56	34.0
Sometimes	26	13.7	33	19.6
When necessary	24	12.2	23	13.7
Not sure	4	2.3	3	2/0

Knowledge and practice of ergonomics between clinical and non-clinical Staff

The results of the knowledge and practice of ergonomics between clinical and non-clinical staff in the tertiary health facility are as shown in Table 7. The results showed that 68% of non-clinical staff had knowledge of ergonomics while only 81.7% of clinical staff had knowledge of ergonomics. Among the few that has knowledge of ergonomics, only 34% and 54.2% of non-clinical and clinical staff respectively always observes the ergonomic rules.

Discussion

Prevalence of musculoskeletal pain among clinical and non-clinical staff in the tertiary health facility.

Musculoskeletal pain is a frequent health care problem among the working population [48, 49]. The findings of this study revealed that more than three-quarters of the total respondents (clinical and non-clinical) have had musculoskeletal pain within 12 months. Also, the annual prevalence of musculoskeletal pain among non-clinical hospital workers was found to be a unit percent higher when compared with the clinical staff,

thus depicting that the annual prevalence of WRMSP is approximately equal and high across all the hospital staff. This is in tandem with a study by a group of researchers [50] that reported 83% prevalence in their study on the prevalence of musculoskeletal injuries among healthcare workers. However, a group of researchers [51] also reported a lower prevalence of 64.5%. The high prevalence of musculoskeletal pain among the clinical and non-clinical staff may be as a result of the poor working environment among the different occupations involved in this study. Also, unavailability of automated equipment and modern facilities required to ameliorating excessive manual labour and possibly high workload – personnel ratio in the hospital may have resulted in the high WRMSP prevalence reported.

Body regional distribution of work-related musculoskeletal pain among clinical and non-clinical staff in the tertiary health facility.

In this present study, Lower Back Pain (LBP) was found to be the most prevalent work-related musculoskeletal pain. This is in tandem with the findings of the literature, in which the yearly prevalence of LBP among hospital staff varies from 43% to 76% [52-55]. A Researcher expounded that this divergence in LBP prevalence rates reported in the literature can be due to the methodological heterogeneity used for the assessment of common LBP and the variability of the gender and the age of concerned groups [51]. Neck and the upper back pain were reported to be the second and third most prevalent musculoskeletal pains among the hospital staff involved in this study. The clinical staff reported 49.7% of lower back pain slightly higher than 43.5% reported by the non-clinical staff. This implies that both clinical and non-clinical health workers experience low back pain most. Neck and shoulder pain are also reported more among the clinical (39.2 and 28.1%) and non-clinical (45.0 and 31.3%). Similarly, 48% of the nursing staff of an urban general hospital in Italy reported back pain related to work in the previous year [56].

As reported in a recent research, the body region where musculoskeletal pains were being experienced most by nursing professionals were low back (73%), neck (67%) and shoulder (62%) [57]. Low back (57%), shoulder (52%), and neck (48%) were also identified as the most affected regions among hospital workers [58]. Also, various studies have identified the lumbar spine, neck, and shoulder as the most prevalent regions for musculoskeletal pain among health care workers [59,60]. Within the clinical health workers, the frequently reported high occurrence of musculoskeletal disorders can be due to activities performed in direct patient care, usually involving upper limb force, trunk flexion, and extension movements, which leads to debilitating impact on the musculoskeletal system, particularly for the spine and shoulder regions [61–63].

Furthermore, it has been recognized the role of patient transfer and lifting activities on the presence of musculoskeletal disorders among healthcareworkers [64]. The main risk factors for the development of musculoskeletal disorders among this workers are: pushing occupied beds, lateral patient transfers, repositioning patients in bed, making occupied beds, as well as lifting and carrying heavy equipment overlong distances [65]. Also, repetitive and monotonous task, lifting and carrying heavy loads mostly with an improper lifting and carrying technique, prolonged sitting, standing or bending, absence or inadequate break time could have resulted to the high rate of low back, neck and shoulder pain among the hospital staff especially the non-clinical staff.

The occurrence of musculoskeletal pain among the different occupations in the tertiary health facility.

Musculoskeletal pain has been implicated as one of the main occupational problems among health care workers with prevalence rate between 40 – 50% [9,10]. The findings of this study showed that all the clinical occupations reported a high annual prevalence of musculoskeletal pain except for the dieticians. The finding of this study is in line with some epidemiological studies on the prevalence of WRMSP among healthcare workers. In Nigeria, the prevalence rate reported for physiotherapist is 91.3% [14], 91% in Australia [11] and 68% in the UK [13]. For the physicians, it was reported in a study that 41.7% of 169 Iranian physicians noted symptoms at least in one part of their bodies [19].

Recent studies reported 84% prevalence among nurses in Nigeria [3] and also a 12-month prevalence of 91.9% among nurses in rural Japan[15]. Studies conducted linked low back risk factors in nurses to non-patient care activities as moving equipment, furniture, heavy lifting as well as to caregiving task such as patient washing, transferring, feeding and making beds. With a lifetime prevalence rate of 35-79%, nurses like other healthcare workers are at high risk particularly for these ailments. This further supports the argument that due to numerous duties allocated to healthcare workers such as Dentists, Physiotherapist and

Nurses which include both patient and non- patient duties, coupled with an insufficient number of professionals per ward to meet up with these numerous duties, the few employed health professionals are over laboured and this may tend to result to low back pain.

Furthermore, the findings of this study showed that among the non-clinical staff of the tertiary health facility, the medical record officers reported the most prevalence with the administrative officers and cleaners having approximately the same prevalent rate. In a similar study, 54.1% amongst the secretaries and 53.5% amongst hospital aides were reported [22]. Furthermore, in a study carried out in Brazil, musculoskeletal symptoms was reported among 87% of hospital cleaning and sanitary workers [23]. This could be as a result of the manual nature of the work performed by these workers including heavy lifting, bending and twisting among the cleaners [22]. Among secretaries and records officers, prolonged sitting or standing and poor ergonomic environment may be responsible for the symptoms they reported.

Health-seeking behaviour among clinical and non-clinical staff of the tertiary health facility

The results of this study revealed that about 41% of clinical workers as against 24% of non-clinical workers adopted 'physical resting' as a means of coping with their musculoskeletal symptoms. This implies that more of the clinical staff utilized their break time and made meaningful use of their leisure at the indication of any musculoskeletal pain. Contrastingly, Medical care was sought more for musculoskeletal symptoms among the non-clinical staff (34.6%) than in the clinical staff (25%). Similarly, it was reported that 33.3% of the hospital staff involved in their study sought medical care for 'moderate' low back pain [22]. The low rate of medical care sought by the clinical staff reported in this present study could probably be due to more of the clinical staff taking out time to rest when they experienced musculoskeletal pain and thus gives the body a chance to recuperate and avoid re-injury and consequently chronic pain. Furthermore, as expected, Physiotherapy treatment was sought by 12.5% of clinical staff as compared to 11.5% of non-clinical staff. This may explain the reason why 5.8% of non-clinical staff reported 'seeking traditional treatment' for their work-related musculoskeletal pain, while none of the clinical staff opted for 'traditional treatment'. The non-clinical staff option for traditional treatment may be due to the fact that some of the workers sometimes prefer or believe in local traditional medicine efficacy in managing their conditions.

Association between Work Experience and the Prevalence of Musculoskeletal Pain among Clinical and Non-Clinical Staff of the Tertiary Health Facility

The result of this present study showed that work-related musculoskeletal pain occurred most among both clinical and non-clinical staff having a work experience between 1-3years. This is expected because workers with lesser years of experience have less expertise and often carry out their work activities in an improper procedure and sometimes using an inadequate technique, involving an enourmous and excessive effort, time and energy not necessary for the job and thus predisposing them to musculoskeletal disorders. In addition, new employees tend to be overzealous, especially in their first few years of employment and are more active and physically involved in their work than their old colleagues which may have contributed to the high prevalence rate reported among them. However, the association between work experience and prevalence of WRMSP in this present study was not statistically significant ($p= 0.194$).

Contrarily, a significant association ($p = 0.001$) between work experience and prevalence of musculoskeletal disorders among Tunisian hospital staff [51] was reported. This variance in association may have been due to the size of samples used in the study (533) compared to 395 of this present study. Thus, further study with larger sample size is required among hospital staff in the tertiary health facility to arrive a generalized conclusion.

Predisposing factors of wrmsp among clinical and non-clinical health workers

Musculoskeletal disorders (MSDs) are often experienced by healthcare workers at a rate exceeding that of workers in construction, mining, and manufacturing. These injuries are due in large part to repeated manual lifting of patients, some of whom are heavy in extremely awkward postures, while transferring, and repositioning patients and working.

Among hospital staff, WRMSP has been reported to be statistically associated between work experience, manual handling work postures, work control, work organization and patient care needs [52,53,66]. However, a no significant association between repetitive movements, uncomfortable

posture, heavy load handling, working on night shifts, stress and occurrence of MSD was also reported [51].

Despite these findings, statistical analysis of present data showed a significant association between all the physical job risk factors of musculoskeletal disorders which includes; 'heavy load handling/transfers', 'working in awkward and cramped position', 'Prolonged working in the same position', bending or twisting the back in awkward way', 'moving and walking up and down stairs', 'handling inappropriate tools and inhaling bad odor / chemicals during working hours', 'during rest period I spend so much time resting in an uncomfortable chair and table', and 'continuing work while injured or hurt'. In the same vein, WRMSP was found to be associated with all the psychological parameters involved in this present study, except for 'working in a disorganized section' ($p = 0.086$) and 'working with frustrated workers/complex supervisor' ($p = 0.062$).

Knowledge and practice of ergonomics among the clinical and non-clinical staff

Results of this study revealed that the clinical staff have higher knowledge of ergonomic principles about their workplace than the non-clinical staff. However, among those that are aware, only a few comply with the principle always. The lowest compliance to ergonomic regulations was observed among the non-clinical staff where few reported to have always complied with the ergonomic regulations. Ergonomic principles are very important in any working environment to ensure the safety of the staff. Ergonomic principles differ according to individual's profession and the activities involved in the profession. To improve the knowledge of ergonomics in a health facility, it is often suggested that periodic seminars and trainings on ergonomics should be carried out in different departments to increase the knowledge and awareness of proper work safety. Ergonomically, the risk of developing musculoskeletal disorder can be curtailed through improving the work practices, using safe lifting technique, improving the work environment and job and equipment design.

Conclusion

The non-clinical workers suffer musculoskeletal pains more than clinical workers and the musculoskeletal pains are mostly distributed to the low back in both clinical and non-clinical health workers. The annual prevalence of musculoskeletal pain among the clinical and non-clinical staff was highest among the Dentists, Optometrists and medical records officers respectively. Occurrences of musculoskeletal pains were reported high among most of the clinical and non-clinical professions except among the dieticians and laundry officers. Rest and Physiotherapy were sought mostly by clinical staff, while pharmaceutical treatments and traditional treatment were sought mostly by the non-clinical staff.

Musculoskeletal pains were caused by several work-related risk factors and occurrences of musculoskeletal pain were not directly influenced by years of work experience. The knowledge and practice of the principle of ergonomics among non-clinical staff is low. There is, therefore, the need to promote safety and health education in the tertiary health facility to serve its primary purposes effectively.

Limitations

Our findings were deduced from a questionnaire-based, self-reported survey and therefore, reflect the attitude and perception of participants regarding ache, pain and discomfort. The prevalence of MSDs among a particular group of workers in different countries, even those exposed to the same level of hazards may be very different due to their different attitudes and perception.

Secondly, recall bias may have been present, however, as this may occur especially when respondents are asked to report on events occurring over such a long time span as 12 months and respondents' experiences of musculoskeletal pain may have influenced their assessment of the perceived risk factors in the questionnaire. There may have been overestimation of risk factors in respondents with musculoskeletal pain as they may have recalled or perceived their exposure to risk factors more acutely than those without any musculoskeletal pain.

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Audit of blood utilization for elective general surgery operations in a tertiary hospital in south western Nigeria

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Abstract

Introduction: Blood transfusion is a lifesaving procedure and may be required for surgical procedures. However, blood ordering practices and utilization has been reported to be inefficient and wasteful with gross over-ordering and high cross-match to transfusion ratios. This study audited blood utilization for elective general surgery operations in a tertiary hospital in south western Nigeria.

Methodology: It was a cross-sectional descriptive study assessing pre-operative clinical status, number of blood units requested and number transfused for elective general surgery cases for which blood was requested. The data was analyzed using SPSS version 20.0 (IBM); data summarized with pie chart and frequency tables, and means compared with student's t test. Three indices; cross-match to transfusion ratio (CTR), transfusion probability (%T) and transfusion index (TI), were calculated for each procedure.

Results: Of the 82 elective general surgery cases during the study period, 106 units of blood were cross-matched and only 9 units were transfused. This translated to a non-utilization rate of 92%. The calculated indices were: mastectomy (CTR 13.7, %T 8.6 and TI 0.09); thyroidectomy (CTR 17.5, %T 3.6 and TI 0.07) and laparotomy (CTR 6.0, %T 15.4 and TI 0.31).

Conclusion: We concluded that there was significant over-ordering of blood and non-utilization in the present blood ordering system. A Maximum Surgical Blood Ordering Schedule (MSBOS) should be implemented to improve the efficiency of the blood utilization practice. A "group and save" policy is recommended for mastectomy, thyroidectomy and laparotomy from the indices calculated.

Keywords: *Blood transfusion, Blood ordering schedule, blood utilization, cross-match to transfusion ratio, MSBOS.*

Résumé

*Introduction***:** La transfusion sanguine est une procédure vitale et peut être nécessaire pour des interventions chirurgicales. Cependant, les pratiques de commande et d'utilisation du sang ont été signalées comme étant inefficaces et plein de gaspillages avec des sur-commandes importantes et des rapports de correspondance croisés aux transfusions élevés. Cette étude a vérifié l'utilisation du sang pour des opérations de chirurgie générale élective dans un hôpital tertiaire du sud-ouest du Nigéria.

Méthodologie **:** Il s'agissait d'une étude descriptive transversale évaluant l'état clinique préopératoire, le nombre d'unités de sang demandées et le nombre de transfusions pour les cas de chirurgie générale élective pour lesquels du sang était demandé. Les données ont été analysées à l'aide de SPSS version 20.0 (IBM); les données résumées avec un diagramme à secteurs et des tableaux de fréquences, et des moyennes comparées au test t d'élève. Trois indices; le rapport de correspondance croisé à la transfusion (CTR), la probabilité de transfusion (% T) et l'indice de transfusion (TI) ont été calculés pour chaque procédure.

Résultats **:** Sur les 82 cas de chirurgie générale élective au cours de la période d'étude, 106 unités de sang ont été croisées de correspondance et seulement 9 unités ont été transfusées. Cela s'est traduit par un taux de non-utilisation de 92%. Les indices calculés étaient: mastectomie (CTR 13,7 ; % T 8,6 et TI 0,09); thyroïdectomie (CTR 17,5 ; % T 3,6 et TI 0,07) et laparotomie (CTR 6,0 ; % T 15,4 et TI 0,31).

Conclusion: Nous avons conclu qu'il y avait une sur-commande importante de sang et une non-utilisation dans le système actuel de commande de sang. Un programme de commande de sang chirurgical maximal (MSBOS) doit être mis en œuvre pour améliorer l'efficacité de la pratique d'utilisation du sang. Une politique 'groupe et sauve' est recommandée pour la mastectomie, la thyroïdectomie et la laparotomie à partir des indices calculés.

Mots clés : *Transfusion sanguine, programme de commande de sang, utilisation du sang, rapport de correspondance croisée à la transfusion, MSBOS.*

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Introduction

The first documented clinical attempt at human blood transfusion was in 1492, when blood from three ten year old boys was transfused into Pope Innocent VIII. However, all four of them died [1]. In the 17th century, there were successful experiments in transfusion between animals. More research into blood transfusion began with Harvey's experiments on the circulatory system. However, many early attempts at human blood transfusion had fatal results. The first fully documented human blood transfusion was by Jean-Baptiste Denys on June 15, 1667. He transfused the blood of a sheep into a 15-year old boy, who survived the transfusion. In 1818, James Blundell, a British obstetrician, performed the first successful blood transfusion of human blood for the treatment of postpartum haemorrhage [2]. After this attempt, many more blood transfusions were done across the world and surgeries were also performed using direct blood transfusion. Many patients had died and it was not until 1901, when the Austrian Karl Landsteiner discovered human blood groups that blood transfusions became safer [3].

Blood transfusion involves the collection of blood from the donor, screening for infections, determining the blood group of the donor and recipient and cross matching the blood of both to confirm compatibility. Two options are practiced in the preoperative planning for likely blood transfusion; first option is to group and cross-match. In this situation the blood group of the patient is determined and thereafter, donor's red cells are incubated with the patient's serum and donor blood is reserved for the procedure. The other option is to group and save; in which the blood group of the patient is determined and screened for abnormal antibodies. A sample of the patient's serum is saved should the need arise to cross-match blood for the patient. It does not remove any blood unit from the pool. It takes less time to do group and save, however should blood be required, it will need to be cross matched.

Blood ordering in many situations is based on perceived anticipated need for transfusion, however, blood transfusion is associated with risks and the processing of blood for transfusion is costly and time consuming. Hence, the number of units of blood ordered should be determined by the expected blood loss and preoperative status of the patient [4]. However, it has been observed that more units of blood are cross-matched than are required. Several researchers found that there was gross over-ordering of blood especially for the routine elective cases much in excess of needs suggesting that "cross-matching of blood was more a culture than necessity" [5 – 8]. This leads to loss of laboratory scientist/ technician time, loss of shelf life and wastage of blood units [9 – 10].

Three indices were developed to determine the efficiency of blood ordering and scheduling practice. The first index introduced was the **Cross-match to Transfusion ratio** (CTR). This is the ratio of the number of cross-matched units transfused to the number of cross-matched units requested. Ideally it should be 1 to 1, meaning every unit of blood cross-matched is transfused. However, a Cross-match to Transfusion Ratio of 2.5 and below is generally accepted as indicative of efficient blood usage i.e. 2.5 units of blood cross-matched for every unit transfused [5]. In 1980, Mead introduced the use of Transfusion Probability (%T); [11] %T is defined as the probability that a particular procedure will require transfusion. A value of 30% and above is accepted as suggestive of appropriate blood use for a procedure. The third index, the Transfusion Index (TI), shows the average number of units for every patient for whom blood was cross-matched. A value of 0.5 or more shows efficient blood usage.

The practice of blood over ordering tends to be prevalent in health centers without a Maximum Surgical Blood Ordering Schedule (MSBOS). The MSBOS is a formal policy which guides the maximum amount of blood that should be cross-matched preoperatively for each elective procedure. It is not an absolute and rigid policy, rather it is a guide. It is developed by institutions to guide the expected blood usage for elective surgical procedures to guide and inform appropriate ordering of blood and blood products. Institutions that have developed and implemented an MSBOS have recorded significant improvement in the efficiency of blood utilization [12]. The MSBOS is derived by multiplying the TI by 1.5 [11].

Institutions audit their current blood ordering and transfusion practice to derive the indices which will guide the development of an MSBOS. The question is "are we currently cross-matching more units of blood than are required for elective surgical procedures?" It is also recommended that such audits be done periodically in an effort to improve the efficiency of blood ordering and transfusion [13].

Materials and methods

This was a cross-sectional descriptive study of blood utilization in consecutive elective general surgical cases at the University College Hospital, Ibadan, an 850-bed tertiary hospital in Oyo state, Nigeria over

a six-month period. An average of 200 elective general surgery operations was performed yearly in the hospital. All consecutive elective general surgery cases in the study period for which blood was requested pre-operatively were audited. Patients who had been transfused pre-operatively within 2 weeks of the surgery and those with American Society of Anaesthesiologists (ASA) score greater than III were excluded. Data collected included demographic information, the type of procedure, pre-operative packed cell volume (PCV), American Society of Anaesthesiologists (ASA) status, number of units requested by the general surgery team and the number requested for by the anaesthesiologist, number of units cross-matched, duration of surgery, estimated blood loss and the number of blood units replaced intraoperatively and/or in the immediate post-operative period (which was defined in this study as within 48 hours post operation), whether blood was brought into the operating room and if it was returned if unused and the post-operative PCV.

IBM SPSS Statistics for Windows, Version 20.0 (IBM Corp., Armonk, N.Y., USA) was used for statistical analysis. The blood transfusion indices discussed earlier were calculated for each procedure, using the following formulas:

a) Cross-match to Transfusion Ratio (CTR) = Number of blood units cross-matched / Number of blood units transfused

b) Transfusion Probability (%T) = No. of patients transfused x 100/No. of patients for whom blood was cross-matched

c) Transfusion Index (TI) = No. of units transfused/ No. of patients for whom blood was cross-matched

d) Maximum Surgical Blood Ordering Schedule (MSBOS) = TI x 1.5

Results

A total of 82 elective general surgery cases for which blood was requested were included. There were 13 males and 69 females with a male to female ratio of 1 to 5. The mean age was 49.4 years (SD 14.1 years). A total of 106 units of blood were cross-matched for the cases, out of which 9 units were transfused, 5 of which were done intraoperatively; giving a non-utilization rate of 92% (97 units unused). Simple mastectomy was the most common procedure performed (n=37), followed by thyroidectomy (n =28) (Fig. 1). In all, the surgeons requested for a total of 97 units of blood while the anaesthesiologists requested for 121 units of blood. The anaesthesiologists requested for an average of 0.29 more units than the surgeons (t=4.98 df=81 p<0.0001).

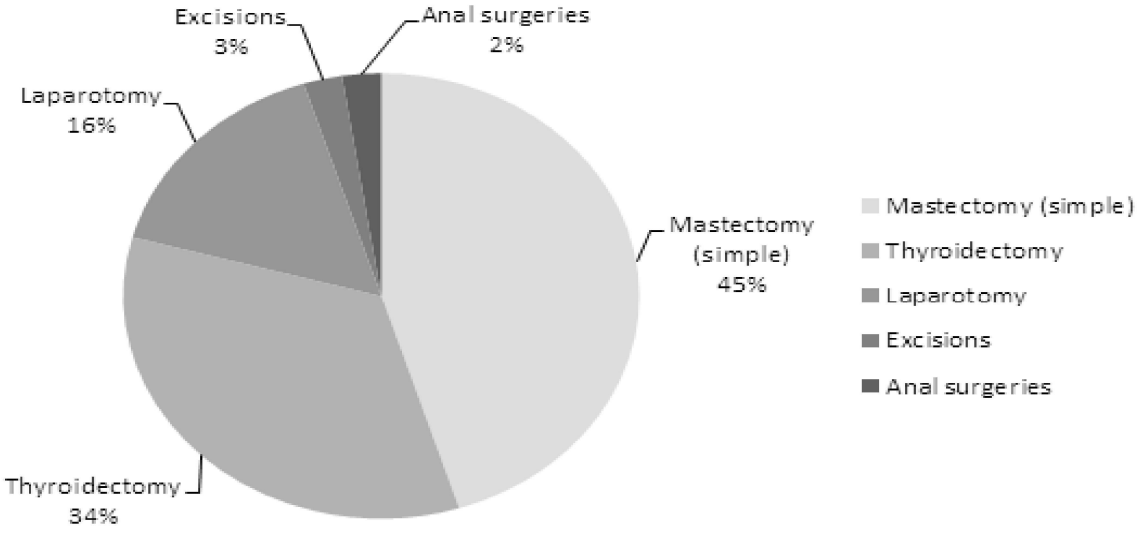

Fig. 1: Proportion of procedures in study (Total = 82)

Mastectomy (n=37)

The mean age and weight of the patients who had mastectomy were 54.6 years (SD 12.5 years) and 64.9 kg (SD 13.5 kg) respectively. American Society of Anesthesiologists' (ASA) scores I, II and III were

assigned to 3 (8%), 29 (78%) and 5 (14%) of the cases respectively.

The surgeons requested a total of 38 units of blood while the anaesthesiologists requested 51 units of blood for the procedure (Table1). The anaesthesiologists requested an average of 0.35 more units than the surgeons (t=3.97 df=36 p<0.0001).

Blood transfusion indices for mastectomy (Table 3):

A total of 41 units of blood were cross-matched, while three units were transfused (two intraoperatively and one postoperatively). Blood was cross-matched for 35 of the cases, and was transfused in 3 of the cases. The Cross-match Transfusion Ratio (CTR) for MRM was 13.7; the transfusion probability %T was 8.6%; the Transfusion Index (TI) was 0.09 and the MSBOS (1.5xTI) was 0.12.

Table 1. Number of blood units requested by surgeons and anaesthesiologists for mastectomy (n=37) in UCH, Ibadan

Number of units of blood requested	Surgeons		Anaesthesiologists	
	Frequency	Total	Frequency	Total
0	1	0	0	0
1	34	34	24	24
2	2	4	12	24
3	0	0	1	3
Total		38		51

In 15 (40%) of the cases, blood bags were brought into the operating room. However, the blood units were returned in 12 of the cases; the probability of return being 80%. In one of the cases, blood was wasted (not returned to the blood bank and not used). Table 2 shows the mean pre-operative and post-operative packed cell volumes, duration of surgery and estimated blood loss. The mean drop in packed cell volume (from the preoperative PCV to the post-operative PCV) was 3.02% and this was statistically significant (t=5.04, df=36, 95% Confidence Interval= 1.8% - 4.2 %).

Thyroidectomy (n= 28)

There were 24 (86%) females amongst the 28 cases of thyroidectomy; male to female ratio being 1:6. The mean age was 44.1years (SD 13.3years) while the mean weight of the patients was 69.5 kg (SD 18.2 kg). The ASA scores assigned were I, II and III in 3 (11%), 21 (75%) and 4 (14%) of the cases respectively.

Table 2. Mean pre-operative and post-operative packed cell volumes (PCV), duration of surgery and estimated blood loss for mastectomy in UCH, Ibadan

Parameter	Mean	Standard deviation
Pre-operative PCV (%)	35.08	3.39
Post-operative PCV (%)	32.05	4.36
Drop in PCV (preop – postop)	3.02% (p <0.0001)	
Duration of surgery (minutes)	133.9	33.6
Estimated blood loss (ml)	319.7	219.4

Table 3. Blood transfusion indices for elective general surgery procedures in UCH, Ibadan. (CTR=Cross-match-Transfusion Ratio, %T=Transfusion Probability, TI=Transfusion Index, MSBOS=maximum surgical blood ordering schedule, xd=cross-matched, tx=transfused)

Procedure	Units xd	Units tx	Patients xd	Patients tx	CTR	%T	TI	MSBOS
Mastectomy	41	3	35	3	13.7	8.6	0.09	0.12
Thyroidectomy	35	2	28	1	17.5	3.6	0.07	0.11
Laparotomy	24	4	13	2	6.0	15.4	0.31	0.46

Table 4. Number of blood units requested by surgeons and anaesthesiologists for thyroidectomy (n=37) in UCH, Ibadan.

Number of units of blood requested	Surgeons		Anaesthesiologists	
	Frequency	Total	Frequency	Total
1	25	25	17	17
2	2	4	10	20
4	1	4	1	4
Total		**33**		**41**

The surgeons requested a total of 33 units of blood while the anaesthesiologists requested 41 units of blood for the procedure (Table 4). On the average, the anaesthesiologists requested 0.29 more units of blood than the surgeons, and this was statistically significant (t=3.29 df=27 p=0.003).

In 13 (46%) of the cases, blood bags were brought into the operating room, of which blood bags were returned to the blood bank in 11 instances, and in one of the cases blood was wasted (neither returned nor used). The probability of return was 85%.

Table 5 shows the mean pre-operative and post-operative packed cell volumes, duration of surgery and estimated blood loss for thyroidectomy procedures. The mean drop in packed cell volume (from the preoperative PCV to the post-operative PCV) was 0.93% and was not statistically significant (t=1.18 df=25 95% CI= -0.69% - 2.55 %).

Blood transfusion indices for thyroidectomy (Table 3):

A total of 35 units of blood were cross-matched, while two units were transfused intraoperatively. Blood was cross-matched for the 28 cases, and was transfused in one of them. The Cross-match Transfusion Ratio (CTR) for thyroidectomy was 17.5; the transfusion probability %T was 3.6%; the Transfusion Index (TI) was 0.07 and the MSBOS was 0.11.

Table 5. Mean pre-operative and post-operative packed cell volumes, duration of surgery and estimated blood loss for thyroidectomy in UCH, Ibadan.

Parameter	Mean	Standard deviation
Pre-operative PCV (%)	36.66	2.56
Post-operative PCV (%)	35.89	4.09
Drop in PCV (preop – postop)	0.93%	(t=1.18, df=25, p =0.250)
Duration of surgery (minutes)	117.8	44.8
Estimated blood loss (ml)	217.7	198.4

Laparotomy (n=13)

Of the 13 laparotomy cases, 7 were males while 6 were females. The mean age was 50.38 years (SD 16.4 years) while the mean weight of the patients 69.75 kg (SD 6.02 kg). Of the cases, 1, 10 and 2 had ASA scores of I, II and III respectively.

The surgeons and anaesthesiologists requested the same total number of units of blood

Table 6. Number of blood units requested by surgeons and anaesthesiologists for laparotomy (n=13) in UCH, Ibadan

Number of units of blood requested	Surgeons		Anaesthesiologists	
	Frequency	Total	Frequency	Total
1	4	4	5	5
2	9	18	7	14
3	0	0	1	3
Total		22		22

(Table 5). There was no difference between the average number of units of blood ordered by the anaesthesiologists and surgeons, (t=0.00 df=12 p=1.000).

For 11 of the 13 cases, blood bags were brought into the operating room and in eight instances the blood bags were returned. The probability of return was 62%.

There was a mean increase in packed cell volume following the procedure which was 0.25% and was not statistically significant (t=0.16, df=11,p= 0.879) (Table 6).

Blood transfusion indices for laparotomy (Table 3): A total of 24 units of blood were cross-matched for laparotomy, and four of the units were transfused (one intraoperatively and three postoperatively). Blood was cross-matched for all 13 laparotomy cases, and was transfused in two of the cases. The Cross-match-Transfusion Ratio (CTR) for thyroidectomy was 6.0; the Transfusion Probability (%T) was 15.4%; the Transfusion index (TI) was 0.31 and the MSBOS was 0.46.

transfusion indices indicates that much more blood was cross-matched than needed with cross-match to transfusion ratios of 13.7, 17.5 and 6.0 for mastectomy, thyroidectomy and laparotomy respectively (the ideal should be 2.5 or less) and the probabilities of transfusion %T were less than 30% and thus did not warrant a group and cross-match policy. It would be recommended that the three procedures have a group and save policy. This is supported by findings in Tanzania [10], Nepal [15], and Ghana [7] which concluded that mastectomy was unlikely to need blood transfusion.

It was also interesting to note that on the average, the anaesthesiologists requested a significantly higher number of blood units than the surgeons, suggesting that without a MSBOS there is likely to be disparate blood ordering practices between the two teams. This difference may lead to disagreements between anaesthesiologists and surgeons, and may delay the start of surgery [16]. It is also worthy of note that the blood bags were retrieved from the blood bank and taken into the theatre for a significant proportion of the surgical

Table 7: Mean pre-operative and post-operative packed cell volumes, duration of surgery and estimated blood loss for laparotomy in UCH, Ibadan

Parameter	Mean	Standard deviation
Pre-operative PCV (%)	36.05	4.61
Post-operative PCV (%)	35.58	7.49
Drop in PCV (preop – postop)	-0.25% (t=0.16, df=11,p= 0.879)	
Duration of surgery (minutes)	76.7	28.1

Other procedures (n=4

These included two excisions (one of an axillary cystic hygroma and another of an anterior abdominal wall mass) and the remaining two were anorectal surgeries. The numbers were not adequate to run the above analyses to determine the blood transfusion indices for the procedures.

Discussion

The University College Hospital, Ibadan does not have a Maximum Surgical Blood Ordering Schedule (MSBOS), the results show an inefficient blood utilization practice with a gross non-utilization rate of 92% which is comparable with similar studies in Ilorin (69.7%), Nepal (86.4%) and India (76.8%) [9 -10, 14]. A reduction in the non-utilization rate from 76.8% to 25.26% was recorded in the center in India after implementation of a MSBOS [9]. Furthermore, for the procedures in this study, the calculated blood operations. There was also a high probability of returning the unused blood bags; signifying that it might have been unnecessary to take the blood bags into the theatre. This is important because blood storage outside the blood bank is usually sub-optimal, and particularly in the studied facility, the blood is kept in warmers. It is recommended that the practice of bringing in blood bags to the theatre before surgery commences should be discouraged. Another option will be to have appropriate facilities such as blood refrigerators in the theatre to keep the blood while awaiting their use.

It is however important to consider these recommendations in context. Many centers in developing countries face problems of blood availability due to voluntary donor apathy, and sometimes there may be poor communication between the staff in theatre and the blood bank leading to delays in making blood available in a

group and save schedule [17]. So it is imperative for centers to develop formal policies and guidelines based on their peculiarities which will be informed by carrying out periodic audits of their blood ordering and utilization practices.

Limitations of the study

The limitations of this study include the relatively small sample size. The study also did not account for the effect of experience of surgeon on blood loss for surgical procedures or that of anaesthesiologist on the decision to transfuse. It is hoped that similar audits will be done for other surgical operations in general surgery and other surgical specialties. It is believed that this pilot will serve as a template for further audits into blood utilization at health facilities in the sub-region, and in the development of formal blood ordering policies and MSBOS for effective blood utilization in the sub-region.

Conclusion

There is gross over-ordering of blood and inefficient blood transfusion indices for elective general surgery procedures at the center. It will be useful to convey a stakeholders meeting involving surgeons, anaesthesiologists, haematologists, blood bank laboratory scientist and management staff to review the entire process and make appropriate recommendations. A group and save policy should be considered for procedures with low transfusion probabilities. It is recommended that periodic audits be carried out and used in formulating blood ordering policies in institutions to improve the efficiency of blood utilization.

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Hyperosmolar hyperglycemic state in a newly diagnosed elderly patient with diabetes mellitus: a case report

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Abstract
Background: Diabetes mellitus has been reported to have a higher incidence in developed countries; however, the incidence is rising in developing countries due to the aging of the population and lifestyle changes. The prevalence of undiagnosed diabetes mellitus is significant and this is a case of a newly diagnosed diabetes mellitus.
Case presentation: The patient was a 65-year-old woman who presented with seven days history of a painful swelling on the right buttock, three days history of fever with chills and a day history of altered level of consciousness. There was associated polyuria, polydipsia, weight loss and an episode of non-projectile vomiting. No known family history of diabetes mellitus. She was managed for hyperosmolar hyperglycemic state, right gluteal cellulitis, and chest infection. She was stable before discharge, educated on lifestyle modifications and the need to adhere to her drugs.
Conclusion: This case has shown the importance of screening for diabetes mellitus because the woman might not have developed complications of diabetes if she had been diagnosed earlier and properly managed. It is therefore important that all persons above 40years be screened for diabetes mellitus regardless of family history.

Keywords: *Hyperosmolar hyperglycemic state, newly diagnosed, elderly, diabetes mellitus, case report*

Résumé
Contexte : Le diabète sucré aurait une incidence plus élevée dans les pays développés; néanmoins, l'incidence augmente dans les pays en voie de développement en raison du vieillissement de la population et des changements de mode de vie. La prévalence du diabète sucré non diagnostiqué est significative et il s'agit d'un cas de diabète sucré nouvellement diagnostiqué.
Présentation du cas : La patiente était une femme âgée de 65 ans qui présentait des antécédents de sept jours d'un gonflement douloureux de la fesse droite, des antécédents de fièvre avec frissons pendant trois jours et antécédent d'un jour d'altération du niveau de conscience. Une polyurie, une polydipsie, une perte de poids et un épisode de vomissements sans projectile ont été associés. Aucun antécédent familial connu de diabète sucré. Elle a été prise en charge pour un état hyperglycémique hyperosmolaire, une cellulite fessière droite et une infection pulmonaire. Elle était stable avant sa décharge, informée des modifications de son mode de vie et de la nécessité de respecter ses médicaments.
Conclusion : Ce cas a montré l'importance du dépistage du diabète sucré parce que la femme n'aurait peut-être pas développé de complications du diabète si elle avait été diagnostiquée plus tôt et correctement prise en charge. Il est donc important que toutes les personnes de plus de 40 ans soient dépistées pour le diabète sucré indépendamment de leurs antécédents familiaux.

Mots-clés : *Etat hyperglycémique hyperosmolaire, nouvellement diagnostiqué, personnes âgées, diabète sucré, rapport de cas*

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Introduction

The term diabetes mellitus(DM) is a metabolic disorder of many aetiologies characterized by prolonged hyperglycaemia with abnormalities of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both [1,2]. The two most common types of DM are designated type 1 and type 2. Type 1 diabetes mellitus is the result of complete or near-total insulin deficiency. Type 2 diabetes mellitus is a heterogeneous group of disorders characterized by variable degrees of insulin resistance, impaired insulin secretion, and increased glucose production [1,2]. Presently, above 25% of adults population in the United States of America have diabetes mellitus and elderly people with diabetes mellitus have higher burden of co-morbidities and complications [3].

However, the incidence is rising in developing countries due to the aging of the population and lifestyle changes [4,5]. The prevalence in North West Nigeria was 4.3%. Obesity and age were found to be the major risk factors of diabetes mellitus [6].

Case presentation

A 65-year-old woman presented on 15/03/2010 with seven days history of a painful swelling on the right buttock where she had intramuscular injection at the referral centre a week before presentation, three days history of fever with chills and a day history of altered level of consciousness. There was associated polyuria, polydipsia, weight loss and an episode of non-projectile vomiting which contained recently ingested food. There was no previous history of diabetes mellitus and no known family history of diabetes mellitus. No previous history suggestive of cognitive dysfunction, depression, chronic pain, and urinary incontinence.

Examination showed an elderly woman, febrile (38.0^{o}C), mildly pale and severely dehydrated. Her weight was 62kg and her height was 1.6 meters. Body Mass Index was 24.2kg/m^{2}(normal). The respiratory rate was 40 cycles/minute. There were bi-basal coarse crepitations. The pulse rate was 120beats/min, regular, weak volume with thickened arterial walls. Blood pressure was 90/60mmHg. Glasgow Coma Scale (GCS) was (best eye opening=3, best verbal response=4, best motor response=4) 11/15, Reflexes were globally depressed. Plantar responses were flexor bilaterally. The right gluteal swelling measured 3cm by 3cm, tender, firm and hyperaemic. Random Blood Glucose (RBG) done with a glucometer was >600mg/dl. Urinalysis showed nitrite, blood, bilirubin, urobilinogen, protein, and ketone to be negative, Glucose was positive ++, pH was 6, S.G was 1020. Serum osmolarity could not be calculated because the actual glucose value was not determined but was estimated to be above 320mos/l based on the electrolyte and urea results available. A provisional diagnosis of hyperosmolar hyperglycemic state, delirium, gluteal cellulitis and chest infection in a newly diagnosed patient with diabetes mellitus was made.

The patient was commenced on intravenous (I.V) normal saline at the Emergency unit. One litre was given for the first 30minutes, then one litre for the next one hour, one litre for the next two hours, one liter for the next four hours and one litre six-hourly until the patient was stable. Intravenous ceftriaxone 1g 12-hourly and metronidazole 500mg 8-hourly were also commenced. The normal saline was exchanged with 5% Dextrose/Saline when RBG was <250mg/dl measured with a reliable glucometer. She had IV soluble Insulin 10 international unit(i.u) stat, then deep I.M insulin 6 i.u 2-hourly, subcutaneous Heparin 5,000I.U 12-hourly**,** and intranasal oxygen 6L/min as necessary. Vital signs, fluid input and output were monitored closely and the patient was subsequently admitted into the medical ward. PT/PTTK, INR, D-Dimer were not done due to financial constraints. Electrolyte, Urea and Creatinine results showed Sodium -160mmol/l, potassium -3.3mmol/l, Chloride - 127mmol/l, bicarbonate -18mmol/l, Urea 152mg/dl, P.C.V: 25%. Chest X-ray showed uniform opacities (with air bronchogram) in the lower zones with normal cardiac silhouette. On the second day of admission, RBG was 238mg/dl, intra-muscular insulin was stopped and Glucose potassium insulin (G.K.I) at 5:5:10 (5mmol potassium and 10i.u of insulin in 5%Dextrose/Water) was commenced. Sputum M/C/S showed Gram-Negative Bacilli, pus cells, culture yielded moderate growth of Klebsiella species sensitive to amoxicillin/clavulanic acid, ceftriaxone and ciprofloxacin. Sputum AFB done three times was negative. Retroviral screening was non-reactive. The patient regained full consciousness GCS (15/15) on the fifth day, RPG (Random Plasma Glucose) was 332mg/dl and oral diet was commenced**,** G.K.I(Glucose Potassium Insulin) was discontinued and patient was started on subcutaneous soluble insulin given as follows: 30minutes pre-breakfast-8i.u, 30minutes pre-lunch- 8i.u, 30minutes Pre-dinner-8i.u, N.P.H-6i.u at bed-time. PCV was 25%. Fersolate tablet 400mg thrice daily and folic acid 5mg daily were added to her drugs. However, on the 8th day of admission patient developed severe anaemia (PCV 17%) and was transfused with two units of cross-matched whole blood. On the 12th day of admission, the Fasting Plasma Glucose was 198mg/dl, 2hrs post-breakfast 193mg/dl, 2hrs post-lunch 93mg/dl. The blood culture was sterile after four days of incubation. Post-transfusion PCV was 24% and the gluteal swelling had resolved. Her drugs were changed to oral gliclazide 60mg daily, metformin 500mg twice daily, aspirin 75mg daily and she was discharged two days later to the clinic after she had improved. She was seen a week after discharge and found to be stable.

Discussion

The case presented was a newly diagnosed patient with diabetes mellitus on presentation at the

emergency department. Hyperglycemic emergencies may be the first presentation in a previously undiagnosed diabetes mellitus patient like this case [5,7]. She had a history of polyuria, polydipsia and weight loss, although polyuria and polydipsia are not common symptoms in the elderly because the renal threshold for glucose increases with old age and there are impaired thirst mechanisms. Neurological symptoms, renal problems, vascular abnormalities, recurrent urinary infections, fatigue, hypotension, urinary incontinence, cognitive impairment and symptoms of depression are common in the elderly. Non-specific symptoms like confusion and failure to thrive are also common [1,8]. The criteria for diagnosis are symptoms of DM plus RBG of $\geq$11.1 mmol/L (200 mg/dl) or FPG of $\geq$7.0 mmol/L (126 mg/dl) or 2HPP glucose of $\geq$11.1 mmol/L (200 mg/dL) during an oral glucose tolerance test.

The result of RBG that was done for her at presentation was >600mg/dl and urinalysis showed glycosuria but no proteinuria. Glycated haemoglobin remains the gold standard test to assess long-term glycemic control in the management of diabetes mellitus [3]. Glycated haemoglobin increases progressively with age hence its value should be used along with Fasting Blood Glucose in screening for diabetes mellitus in the elderly. Besides the glucose level, the blood pressure and fasting lipid level should also be checked [8]. Her blood pressure was normal but the lipid level was not done. Elderly patients with diabetes mellitus are more prone to hyperosmolar hyperglycemic state (HHS) and hypoglycaemia [2]. There is minimal ketosis in HHS because of residual insulin secretion sufficient to control ketogenesis. Infection is one of the precipitating factors in HHS [2,7,8]. This patient had gluteal cellulitis and chest infection when she was assessed at presentation. The typical characteristic of HHS is intense dehydration, severe hyperglycemia, and often some degree of neurologic damage with mild or no ketosis as presented in this case [8]

Management of diabetes mellitus in the elderly needs thorough clinical evaluation, and psychosocial assessment [3]. In the management of the patient, blood samples should be taken for baseline measurements of serum sodium, potassium, urea when indicated as it was done in this patient. To resuscitate the patient with HHS, one liter of normal saline (half strength normal saline in the presence of hypernatraemia) should be given fast intravenously using a large bore cannula, then one litre in the first hour, then 500 ml/h thereafter as needed and as determined by the clinical severity of dehydration, for example, the presence or otherwise of orthostatic hypotension, mucosal dryness, loss of skin elasticity, oliguria, and titrated to achieve a urine output of 1~3 ml/kg/h [9]. The patient was adequately hydrated intravenously until she became conscious and she could drink water. Patients should be examined for the presence of basal crepitations, elevated Jugular Venous Pressure, and increasing respiratory rate. The rate of infusion should be adjusted accordingly to prevent fluid overload. Fluid input and output should also be monitored. These were properly done in this case. As soon as the patients hydration status is adequate and the general well-being improved, graded oral fluids and oral glucose-lowering agents may be introduced. Central venous pressure monitoring is very important in the elderly and those with heart failure [10]. This was not used in this case.

Close monitoring of patients by blood glucose and glycated haemoglobin in this age-group is very important because of the high frequency of asymptomatic hypoglycaemia [9]. .In Nigeria, the brunt of the costs of health care provision is borne largely by the patients and family members [7]. At a point in the management of this case, a waiver had to be raised for some investigations to be carried out. Sulphonylureas are supposed to be used with caution in the elderly because of higher risks of hypoglycaemia. The drugs should be started initially with half of the usual adult dose and increase gradually. Gliclazide and glimepiride are preferred to glibenclamide because they have lower risks of hypoglycaemia. Gliclazide was used for this patient. However, Dipeptidylpeptidases 4 (DPP 4) inhibitors and glucagon like peptide 1 (GLP 1) receptor agonists could also be used in the elderly because of low risk hypoglycaemia [1]. In the management of diabetes mellitus in the elderly, blood glucose targets depends on health status and life expectancy. Elderly patients who can take care of themselves should be managed like younger persons with diabetes mellitus, because of their long life expectancy. For the frail ones who are not physically independent, glucose control should be less strict to avoid hypoglycemia [1,8]. The role of family physician in diagnosis of DM being the first contact doctor is very important. Patients who have a family history of DM or above 40years should be counseled for diabetic screening.

Conclusions

A 65year old woman with newly diagnosed hyperglycemia was presented. She was managed for

hyperosmolar hyperglycemic state (rule out delirium), right gluteal cellulitis, and chest infection. She was stable before discharge, educated on DM, lifestyle modifications and the need to adhere to her drugs. This case has shown the importance of screening for diabetes mellitus in our society. The woman might not have developed diabetes complications if she had been diagnosed earlier and properly managed and this was emphasized to the relatives. Therefore, patients with a family history of DM or above 40 years should be counselled and screened for diabetes.

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Work stressors and psychological distress among police officers in Oyo State, South West Nigeria

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Abstract
Background: Police officers have a psychologically demanding job and may experience workplace hazards which adversely affect their psychosocial well-being, mental health status and work performance.
Objective: This study was designed to assess work stressors in police work and the mental health status of police officers in Oyo State, South west Nigeria.
*Methods***:** A cross-sectional design utilized cluster sampling technique to select 435 police officers in the two area commands in Oyo State, South west Nigeria. A structured self-administered questionnaire was used for collection of socio-demographic characteristics, organizational and operational work stressors. The General Health Questionnaire 12 assessed psychological distress. The maximum obtainable score was 12 and scores of ≥3 were indicative of psychological distress.
*Results***:** Majority (72%) of police officers were male and mean age was 31.8 ± 8.3 years. 88% were in the junior police rank and 24% had worked more than ten (10) years in the police force. Psychological distress was observed in 34% of police officers. Significant predictors of psychological distress by multivariate logistic regression analysis included: female gender (O.R:1.91, 95% CI 1.16-3.15), and organizational stressors such as: multiple tasks (O.R:2.74, 95% CI 1.53-4.89), special duties (O.R:2.36, 95% CI 1.28- 4.37), confused feedback (O.R:3.05, 95% CI 1.44- 6.42), and bureaucratic hassles (O.R:2.71, 95%CI 1.33-5.51).
Conclusion: Improved work conditions and psychological screening at recruitment should be instituted in the Nigerian Police Force to reduce psychological distress among police officers.

Keywords: *Police officers, work stressors, Psychological distress*.

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Résumé
Contexte: Les agents de police ont un travail exigeant sur le plan psychologique et peuvent être exposés à des dangers au travail qui nuisent à leur bien-être psychosocial, à leur état de santé mentale et à leur rendement au travail.
Objectif: Cette étude a été conçue pour évaluer les facteurs de stress au travail dans le travail de la police et l'état de santé mentale des agents de police dans l'État d'Oyo, au sud-ouest du Nigéria.
Méthodes: Une conception transversale a utilisé une technique d'échantillonnage en grappes pour sélectionner 435 agents de police dans les deux zone de commandements de l'État d'Oyo, au sud-ouest du Nigéria. Un questionnaire auto-administré structuré a été utilisé pour la collecte des caractéristiques sociodémographiques, des facteurs de stress organisationnels et opérationnels au travail. Le Questionnaire de Santé Générale 12 a évalué la détresse psychologique. Le score maximal pouvant être obtenu était de 12 et les scores e"3 étaient indicatifs d'une détresse psychologique.
Résultats: La majorité (72%) des agents de police étaient des hommes et l'âge moyen était de 31,8 ± 8,3 ans. 88% étaient au grade de policier subalterne et 24% avaient travaillé plus de dix (10) ans dans le corps policier. Une détresse psychologique a été observée chez 34% des policiers. Les prédicteurs significatifs de la détresse psychologique par analyse de régression logistique multivariée comprenaient: le sexe féminin (OR: 1,91 ; IC à 95% 1,16-3,15) et les facteurs de stress organisationnels tels que: tâches multiples (OR: 2,74 ; IC à 95% 1,53-4,89), tâches spéciales (OR: 2,36 ; IC à 95% 1,28 - 4,37), rétroaction confuse (OR: 3,05 ; IC à 95% 1,44 - 6,42) et tracas bureaucratiques (OR: 2,71 ; IC à 95% 1,33-5,51).
Conclusion: Des conditions de travail améliorées et un dépistage psychologique lors du recrutement devraient être institués au sein de la police nigériane afin de réduire la détresse psychologique des policiers.

Mots clés: *Agents de police, facteurs de stress au travail, détresse psychologique*.

Introduction

The work environment of Nigerian Police officers is filled with various psychosocial factors. Institutional and structural hindrances to which they are exposed, such as underpayment, frequent transfer/deployment, poor equipment and operational vehicles, poor accommodation, near absence of promotion and inadequate or erratic communication facilities, have negative impacts on their productivity and attitude to work, which have been reported in another study conducted among police officers in Ibadan, Oyo state Nigeria [1]. Police officers' work conditions can vary from many hours of inactivity to sudden periods of overwhelming responsibility and pressure for quick crucial decision making [2]. High workloads, tight deadlines [3], exposures to physical risk such as being a victim of violence, witness to the murder of a companion or having to kill when necessary are recognized job stressors in police work [2]. Other studies have shown that working overtime and lack of support from supervisors are significant work stressors in policing [4].

Job stress can be defined as harmful physical and emotional responses that occur when requirements of the job do not match the capabilities, resources or needs of the worker [5]. Work stressors in policing can be divided into organizational stressors and operational stressors. Organizational stressors include multiple tasks and managerial issues such as poor leadership and lack of support from supervisors [6]. It has been reported that Nigeria is grossly under policed and that to attain the United Nations ratio requirement of one police officer to four hundred (1:400) citizens of a country, the Nigerian Police Force (NPF) would need to recruit one hundred and fifty five thousand (155,000) police officers for a Nigerian population of approximately one hundred and eighty two million (182,000,000) [7, 8]. This reality translates to job stress which would have negative impacts on police officers in terms of psychosocial well-being, mental health status and work performance [2, 3, 6]

Operational stressors include physical threats such as participation in high speed chases and physical assaults [9], having to kill when necessary and witnessing the death of a colleague [6]. A study carried out in the United Kingdom (U.K) on police officers showed that mental ill health was detected in 41% of the study population using the General Health Questionnaire twelve (GHQ 12) and that organizational and operational stressors were reported, with higher GHQ scores in cases than non-cases [6].

In Nigeria, Police officers are constantly faced with the challenges of maintaining law and order in the face of risks to their health and wellbeing. The current security concern in Nigeria has shown the vulnerability of police officers to terrorist attacks and has increased the level of psychological stress in the Police force. Current publications on National security, the Nigeria police and the challenges of security in Africa, also reiterate this security concern [10-13] Furthermore, the police themselves have reported that they were disadvantaged and handicapped due to a plethora of factors that overwhelmed them, such as lack of resources, poor government support, poor conditions of service, lack of appropriate and adequate training and a poorly-equipped workforce [10]. The effects of these factors on the mental health status of police officers have received little attention. Poor community police relationship may also stem from psychosocial stressors of police work making police officers unfriendly or even aggressive towards the populace [11]. This study was carried out to identify the work stressors in police work and to assess the psychological distress among police officers.

Methods

The study was conducted among police officers in Oyo state, Southwest Nigeria. The study design was descriptive and cross-sectional.

The study population comprised junior and senior police officers of the male and female gender, from the two (2) area commands in Oyo State. The sample size was calculated utilizing the Leslie Kish formula and a prevalence of 41% of psychological distress among United Kingdom (U.K) police [6]. A cross-sectional design utilized cluster sampling technique to select 435 police officers from these two area commands in Oyo State. The two area commands had 37 police divisions and six police divisions were selected by balloting. All junior and senior police officers in the 6 divisions were requested to participate in the study.

Data was collected using a pretested, self-administered, structured questionnaire which was constructed and developed from a review of literature on police work stressors [2,4,6,14,16] incorporating the JSS (Job stress survey) [14] and the JSF (Job satisfaction/frustration questionnaire) [15]. Data were collected on demographic and socio-economic characteristics, occupational variables such as rank, promotions, demotions, job description, hours of

work and work conditions, work satisfaction and organizational and operational stressors.

Organizational stressors in this study included organizational issues such as the managerial structure and climate of the job [6] e.g. multiple tasks (more than one task within a limited time frame, as actual law enforcement is only 10% of the duties of a police officer [16]), confused feedback (irregularities in chain of command leading to poor communication made worse by inadequate communication facilities) and bureaucratic hassles (political conflicts within the department and clashes with authority). Operational stressors were derived from operational aspects of the job such as the risk of violence and exposure to traumatic events [17].

The General Health Questionnaire twelve (GHQ12) was used to assess the psychological health status of the police officers and identify those with psychological distress. The questionnaire comprised twelve questions. Each question was rated on a four-point scale, (better than usual, same as usual, less than usual or much less than usual). A Bi-modal (0-0-1-1) scoring method was used to compute the scores for each respondent. The 'standard' threshold of > 3 was used to differentiate 'cases' (presence of minor psychological distress by GHQ12), from 'non-cases' (absence of minor psychological distress by GHQ12) [18].

A written permission to carry out the study was obtained from the Oyo State Commissioner of Police as well as the Oyo State Director of Medical Services of the Nigeria Police Force, situated at the State force headquarters. The purpose of the study was explained to the police officers and informed verbal and written consent were obtained. Administration of questionnaires was achieved during the weekly lecture day as well as every day of the week in the selected divisions. The divisional police officers also provided support in the distribution of questionnaires to all the police officers within the divisions visited. Trained research assistants gave explanations to police officers on questions that were not clearly understood. Divisions where some police officers were not present due to their busy schedule were re-visited at least once. Most police officers were very cooperative and eager to participate. Respondents' privacy and confidentiality was guaranteed by anonymity of responses.

Ethical clearance was obtained from the University of Ibadan/University College Hospital Institutional Review Board.

Statisical analysis

Data analysis was done using SPSS version 15. Police officers were categorized into senior and junior based on a classification of twelve (12) ranks, from the information obtained from the Police headquarters. Senior officers range from the rank of Inspector to Commissioner of Police, while junior officers also called un-commissioned officers or rank and file, are the ranks of Constable, Corporal and Sergeant.

Frequencies, percentages, means and proportions were generated with appropriate tables. T test was used to test associations between quantitative variables, while χ^2 (Chi – square) test and Fisher's test where appropriate was used to test associations between qualitative variables with results significant at $p<0.05$.Multivariate logistic regression was used to determine significant predictors of psychological distress (GHQ12 scores ≥ 3).

Results

Socio-demographic and occupational characteristics

The mean age of police officers in this study was 31.8±8.30years. More than half of the police officers 260 (60%) were less than 30years of age, the majority, 315 (72%) were males, 342 (79%) were Christians and 327 (75%) were of Yoruba ethnicity. About two thirds of police officers 278 (64%) were married, while 260 (60%) had secondary education or less, and 175 (40%) had post-secondary education. The mean number of years in police service was 10.65 years (S.D=8.62), range; 1-35 years (Table 1).

Organizational stressors

Reported organizational stressors are presented by rank (Table 2). More senior police officers (56%) than junior police officers (33%) experienced multiple tasks, p=0.00, and 64% of the junior officers and 82% of senior police officers had worked overtime, p=0.01. More senior police officers (41%) than junior officers (25%) had experienced poor support from their supervisors, p=0.01.Poor performance from fellow police were reported by more senior officers than junior. Table 3 shows that more male police officers (41%) had experienced multiple tasks than females (21%); p=0.00. Transfer in the last one year, working overtime, rotating shifts, poor support, job responsibility not being clear, poor job performance and confused feedback were not significantly associated with the gender of the police officers.

Table 1: Socio-Demographic and occupational characteristics of respondents

Characteristic	N = 435 n (%)
Age <30	260 (60)
31-40	115 (26)
41-50	42 (10)
50 years and above	10 (4)
Sex	
Male	315 (72)
Female	120 (28)
Marital Status	
Single	151 (35)
Married	278 (64)
Divorced	3 (1)
Widowed	3 (1)
Educational level	
Primary	8 (2)
Secondary	252 (58)
Post-secondary:	
Technical College	18 (4)
Polytechnic	83 (19)
College of Education	44 (10)
University	30 (7)
Religion	
Christianity	342 (79)
Islam	90 (21)
*Others	3 (1)
Ethnicity	
Yoruba	327 (75)
Hausa	23 (5)
Igbo	30 (7)
**Other tribe	55 (13)
Rank	
Junior police	381 (88)
Senior police	54 (12)
Years in present rank	
≤5years	237 (55)
6-10years	160 (37)
>10years	5 (1)
No response	33 (8)
Total years in police service	
≤5years	111 (26)
6-10years	150 (35)
>10years	104 (24)
No response	70 (16)
Rotating shift duty	
Yes	341 (78)
No	94 (22)

* *African Traditional*
** *Ebira, Tiv, Edo*

Operational Stressors

Table 4 shows that a higher percentage of the senior police officers 33 (61%), had experienced the death of a colleague, p=0.03. Other operational stressors such as participating in an act of corruption, being attacked, confrontation and use of force were not significantly associated with the rank of the police officers. Table 5 shows the sex distribution of operational stressors. Experiencing the death of a colleague and having to kill when necessary were more prevalent among male police officers (52% vs. 36% and 18% vs. 10% respectively; $p< 0.05$).

Psychological distress

One hundred and forty nine (34%) of all the police officers had psychological distress. A greater percentage of the female police officers 50 (42%), than male police officers 99 (31%), had GHQ scores ≥ 3, indicating greater psychological distress among females, $p\leq 0.05$. Age, marital status, education and rank were not associated with psychological distress (Table 6).

Table 7 shows that there was a significant association between police officers' psychological distress and satisfaction with work conditions such as: work load, public regard for their work; opportunity for personal growth and development; support from senior colleagues, opportunity to give suggestions apart from obeying orders and job satisfaction ($p\leq 0.05$)

Table 8 shows organizational stressors in the police officers' work that were associated with psychological distress. These include multiple tasks, confused feedback, and bureaucratic hassles. Bivariate analysis of operational stressors and psychological distress in the police officers showed that witnessing the death of a colleague and confrontation and the use of force were statistically significant ($p<0.05$).

A multivariate logistic regression analysis (Table 9) showed that significant predictors of psychological distress included female sex (O.R: 1.91, 95% CI 1.16-3.15), multiple tasks (O.R: 2.74, 95% CI 1.53-4.89), confused feedback (O.R:3.05, 95% CI 1.44-6.42), and bureaucratic hassles (O.R:2.71, 95% CI 1.33-5.51).

Discussion

Demographic characteristics in this study showed that a large percentage of the police officers (72.4%) were of the male gender as it is in other police forces across the world. The finding in this study that female police officers were more psychologically distressed is similar to that of police officers in the United Kingdom [6]. A Norwegian study showed that female police officers perceived all factors on the stress measure used in the survey as more severe

Table 2. Organizational stressors and rank of police officers.

Organizational stressors	Junior police N=435	Senior police	Total no. police	X^2	P-value
Transfer in the last 1 year					
Yes	161 (42)	28 (52)	189 (43)	1.77	0.18
No	220 (58)	26 (48)	246 (57)		
Multiple tasks in the last 1 year					
Yes	125 (33)	30 (56)	155(36)	10.67	0.001
No	256 (67)	24 (44)	280 (64)		
Working overtime in the last 1 year					
Yes	243 (64)	44 (82)	287(66)	6.60	0.01
No	138(36)	10 (19)	148(34)		
Poor support from Supervisors in the last 1 year					
Yes	95 (25)	22 (41)	117(26)	6.01	0.01
No	286 (75)	32 (60)	318(73)		
Job responsibility not clear in the last 1 year					
Yes	54 (14)	10 (19)	64(15)	0.71	0.39
No	327 (86)	44 (82)	371(85)		
Confused feedback					
Yes	53 (14)	8 (15)	61 (14)	0.03	0.85
No	328 (86)	46 (85)	374(86)		
Experienced poor leadership from administrators					
Yes	97 (26)	14 (26)	111 (26)	0.005	0.94
No	284 (75)	40 (74)	324 (75)		
Poor job performance by fellow police					
Yes	71 (19)	18 (33)	89 (21)	6.27	0.01
No	310 (81)	36 (67)	346 (80)		
Bureaucratic hassles					
Yes	46 (12)	14 {26)	60 (14)	7.63	0.006
No	335 (88)	40 (74)	375 (86)		
Failure of promotional course					
Yes	86 (23)	10 (19)	96 (22)	0.45	0.50
No	295 (77)	44 (82)	339 (78)		

than their male colleagues, and that females are more worried about various work situations than their male counterparts, although they appear to be exposed to severe incidents less frequently than male police [4]. The "macho culture" (control, dominance and authority) among male police officers makes them reluctant to seek help in dealing with stress, and makes it difficult for them to admit psychological weakness [2]. Another study on occupational stress among Nigerian Police officers (Lagos state police command) revealed that police officers in Nigeria seldom seek for professional assistance from relevant health professionals [19].

Another study among police officers also in Lagos, Nigeria that examined the lived experiences of police officers experiencing occupational stress as evidenced in frequent illnesses, showed that extended working hours, inadequate salary, conflict from supervisor's demands, unclear and unending work roles, and family-work conflict, had very high occurrence rates, hence making them feel sick or depressed at work [22].

Dissatisfaction with police work was significantly associated with psychological distress; p=0.001. The British study (United Kingdom) showed that job perception was significantly more negative for the police officers who had psychological distress, as evidenced by high GHQ scores, with a clear association between the desire to leave policing altogether in 55% of the police officers with high scores [2].

Other issues associated with psychological distress were dissatisfaction with the opportunity for personal development, work load, support from senior colleagues, and the opportunity to give suggestions apart from obeying orders. These findings are similar

Table 3. Organizational stressors and gender of police officers.

Organizational stressors	Male police N=315	Female police N=120	Total no. Police N=435	X^2	P-value
Transfer in the last 1 year					
Yes	134 (42)	55 (46)	189 (43)	1.77	0.18
No	181 (58)	65 (54)	246 (57)		
Multiple tasks inthe last 1 year					
Yes	130 (41)	25 (21)	155(36)	15.82	0.00
No	185 (59)	95 (79)	280 (64)		
Working overtime in the last 1 year					
Yes	212 (67)	75 (62)	287(66)	0.89	0.20
No	103(33)	45 (38)	48(34)		
Poor support from Supervisors in the last 1 year					
Yes	87 (28)	30 (25)	117(27)	0.30	0.33
No	228 (72)	90 (75)	318(73)		
Job responsibility not clear in the last 1 year					
Yes	52 (16)	12 (10)	64(15)	2.93	0.056
No	263 (84)	108 (90)	371(85)		
Confused feedback					
Yes	48 (15)	13 (11)	61 (14)	1.39	0.15
No	267 (85)	107 (89)	374(86)		
Experienced poor leadership from administrators					
Yes	87 (28)	24 (20)	111 (25)		
No	228 (72)	96 (80)	324 (75)	2.65	0.06
Poor job performance by fellow police					
Yes	68 (22)	21 (17)	89 (20)	0.89	0.21
No	247 (78)	99 (83)	346 (80)		
Bureaucratic hassles					
Yes	49 (16)	11 {9)	60 (14)	2.98	0.055
No	266 (84)	109 (91)	375 (86)		
Failure of promotional course					
Yes	68 (22)	28 (23)	96 (22)	0.15	0.39
No	247 (78)	92 (77)	339 (78)		

Table 4: Operational stressors and rank of police officers

Operrational stressors	Witnessing the death of a partner N=435 n (%)		Confrontation and use of force N=435 (%)`		Being attacked N=435 (%)		Having to kill when necessary N=435 (%)		Participating in an as corruption N=435 (%)	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Jumnior Police	174(46)	207(54)	131(34)	250(6)	155(41)	226(60)	56(15)	325(85)	17(5)	364(96)
Senior police	33(61)	21(39)	19(35)	35(65)	27(50)	27(50)	13(24)	41(76)	3(6)	51(94)
Total	207(48)	228(52)	150(35)	285(66)	182(42)	253(58)	69(16)	366(84)	20(5)	415(95)
X^2	4.52		0.01		1.68		3.11		0.12	
P value	0.03		0.90		0.19		0.07		0.72	

to that in a study conducted in the United States of America using the Police Stress Survey which showed that lack of support, inadequate support by supervisors, inadequate support by the department were the main organizational stressors perceived by officers. In that study, age played a role in the amount

Table 5: Operational stressors and gender of police officers

Operational stressors	Witnessing the death of a partner N=435 n (%)		Confrontation and use of force N=435 (%)`		Being attacked N=435 (%)		Having to kill when necessary N=435 (%)		Participating in an as corruption N=435 (%)	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Male police (N = 315)	164952)	151(48)	111(35)	204(65)	133(42)	182(58)	57(18)	258(82)	12(4)	303(96)
Female police (N = 120)	43(36)	77(64)	39(12)	81(68)	49(41)	71(59)	12(10)	108(90)	8(7)	112(93)
Total	2-7(48)	228(52)	150(35)	285(65)	182(42)	253(58)	69(16)	366(84)	20(5)	415(95)
X^2	9.17		0.28		0.07		4.26		1.61	
P value	0.002		0.33		0.44		0.024		0.15	

Table 6: Socio-demographic characteristics of respondents and GHQ 12 Scores**.**

Characteristic	GHQ scores (n= %)		X^2	P value
Sex	0 -2	≥3		
Male (N=315)	216 (68.6)	99 (31.4)	Fishers	0.05
Female (N=120)	70 (58.3)	50 (41.7)	Exact	
Age group				
≤ 30	170 (65.4)	90 (34.6)		
31 – 40	72 (62.6)	43 (37.4)	2.06	0.55
41 – 50	31 (73.8)	11 (26.2)		
> 50	13 (72.2)	5 (27.8)		
Marital status				
Never Married	97 (64.2)	54 (35.8)	Fishers	0.67
Married	189 (66.5)	95 (33.5)	Exact	
Highest level of education				
Secondary & below	169 (65.0)	91 (35.0)	Fishers	0.75
Post Secondary	117 (66.9)	58 (33.1)	Exact	
Religion				
Christianity	233 (68.1)	109(31.9)	8.49	0.01
Islam	53 (58.9)	37 (41.1)		
African traditional	0 (0.0%)	3 (100)		
Ethnicity				
Yoruba	212 (64.8)	115(35.2)	3.82	0.28
Hausa	13 (56.5)	10 (43.5)		
Igbo	19 (63.3)	11 (36.1)		
Other tribe	42 (76.4)	13 (23.6)		

of stress perceived by officers. Their findings suggested that the younger the officers, the greater their perceptions of stress. This would suggest that the longer an officer had been in the force, the less likely they were to experience stress from a perception of organizational pressure and of a lack of departmental support [8]. On the contrary, this study shows that more senior officers reported lack of support from supervisors compared to the junior police officers.

The fact that work stressors are predictive of depressive symptoms was demonstrated by a study conducted among employees in a wide variety of occupations in a French company which showed that high levels of psychological demands, low levels of decision latitude and low levels of social support at work were significant predictors of subsequent depressive symptoms in both the men and women [21].

A study conducted among other working populations in the United Kingdom which examined relationships between working hours, perceived work stressors and psychological health in a group of managers, found that individual perception of some work stressors were significantly associated with measures of psychological health, and that perceived workload appeared more important in determining psychological health than actual workload [6].

Table 7: Satisfaction with work conditions and (GHQ 12 scores

Satisfaction with work conditions	GHQ 12 Scores 0-2	≥3	Total no. of police officers N=435	X^2	P -value
Regard received for work from the public					
Unsatisfied	74 (52)	68 (48)	142 (100)		
atisfied on average	138 (74)	48 (26)	186 (100)	18.16	0.00
Very satisfied	74 (69)	33 (31)	107 (100)		
Opportunity for personal development					
Unsatisfied	85 (57)	63 (43)	148 (100)		
Satisfied on average	123 (73)	45 (27)	168 (100)	8.70	0.01
Very satisfied	78 (66)	41 (34)	119 (100)		
Good pay for work					
Unsatisfied	114 (63)	68 (37)	182 (100)		
Satisfied on average	126 (70)	54 (30)	180 (100)	2.46	0.29
Very satisfied	46 (63)	27 (37)	73 (100)		
Work load					
Unsatisfied	119 (58)	85 (42)	204 (100)		
Satisfied on average	126 (76)	39 (24)	165 (100)	13.62	0.001
Very satisfied	41 (62)	25 (38)	66 (100)		
Support from senior colleagues.					
Unsatisfied	73 (53)	65 (47)	138 (100)		
Satisfied on average	137 (75)	45 (25)	182 (100)	17.45	0.00
Very satisfied	76 (66)	39 (34)	115 (100)		
Opportunity to give suggestions apart from obeying orders.					
Unsatisfied	87 (57)	65 (43)	152 (100)		
Satisfied on average	116 (75)	38 (25)	154 (100)	11.27	0.004
Very satisfied	83 (64)	46 (36)	129 (100)		
Job satisfaction					
Unsatisfied	34 (48)	37 (52)	71 (100)		
Satisfied on average	86 (68)	40 (32)	126 (100)	12.09	0.002
Very satisfied	166 (70)	72 (30)	238 (100)		

Psychosocial hazards in police officer's job, which requires them to work tirelessly while being exposed to physical danger, could result in mental pressure.

A study on occupational stress and psycho-physiologic disorder was conducted in Nigeria, among five (5) different working groups (*bank workers, police officers, health personnel, academic persons and civil servants) [22]*. The purpose of the study was to explore the causes of occupational stress and its effect on organizational performance among the working groups. There was a significant similarity between the working groups as regards *psychological and physiologic symptoms, shown by responses from the Life Event Experience survey (LES), the general health questionnaire (GHQ) and the job satisfaction questionnaire (JSQ). The study concluded that* there is a relationship between occupational stress and health, and occupational stress and job satisfaction, and that occupational stress and ill health play a significant role in the dissatisfaction that workers experience at work [22].

Similarly, this study on work stressors and psychological distress among police officers in Oyo State, South west Nigeria *showed that* dissatisfaction with work conditions and job satisfaction *amongst other work stressors was significantly associated with psychological distress among police officers* ($p \geq 0.05$).

This study showed that organizational stressors such as multiple tasks, confused feedback, and bureaucratic hassles, were associated with psychological distress compared to operational stressors. The general belief is that police work involves only law enforcement, but this is actually

Table 8 : Organizational stressors and GHQ 12 Scores

Organization stressors	GHQ scores 0-2	≥3	Total no. of police	X^2	P-value N=435
Transfer in the last 1 year					
Yes	118 (62)	71 (38)	189(100)	Fishers	0.10
No	168 (68)	78 (32)	246(100)	Exact	
Multiple tasks in the last 1 year					
Yes	110 (71)	45 (29)	155(100)	Fishers	0.05
No	176 (63)	104 (37)	280(100)	Exact	
Poor support from Supervisors in the last 1 year					
Yes	76 (65)	41 (35)	117(100)	Fishers	0.45
No	210 (66)	108 (34)	318(100)	Exact	
Job responsibility not clear in the last 1 year					
Yes	39 (61)	25 (39)	64(100)	Fishers	0.23
No	247(67)	124 (33)	371(100)	Exact	
Confused feedback					
Yes	30 (49)	31 (51)	61(100)	Fishers	0.003
No	256 (68)	118 (32)	374(100)	Exact	
Poor leadership					
Yes	71 (64)	40 (36)	111(100)	Fishers	0.36
No	215 (66)	109 (34)	324(100)	Exact	
Poor job performance by fellow Police					
Yes	52 (58)	37 (42)	89 (100)	Fishers	0.06
No	234 (68)	112 (32)	346(100)	exact	
Bureaucratic hassles					
Yes	31 (52)	29 (48)	60 (100)	Fishers	0.01
No	255 (68)	120 (32)	375(100)	Exact	
Failure of promotional course					
Yes	57 (59)	39 (41)	96 (100)	Fishers	0.08
No	229 (68)	110 (32)	339(100)	Exact	

Table 9: Multivariate logistic regression showing significant predictors of psychological distress (GHQ 12 scores ≤ 3).

Variables	(Exp B) OR Odds ratio	95% CI Lower	Upper	P value
Alcohol (frequently)	5.15	1.58	16.75	0.006
Break hours (none)	6.09	1.78	20.81	0.004
Bureaucratic hassles	2.71	1.33	5.51	0.006
Confused feedback	3.05	1.44	6.42	0.003
Female sex	1.91	1.16	3.15	0.010
Multiple tasks	2.74	1.53	4.89	0.001
Sedatives (every time)	2.15	1.22	3.79	0.008
Special duty (Yes)	2.36	1.28	4.37	0.006

just ten percent of police work [16]. An important organizational stressor which was associated with psychological distress among police officers in this study was the low regard that the public had for their work. The policing job is essentially and primarily based on human contact and interaction with the public [23, 24]. It has been proposed that the Nigerian Police officers need to properly value themselves and improve their self-image. The Nigerian police are not only undervalued, but they are also reticent of the public good will. This could affect their self-presentation as police officers [23, 24]. It has also

been proven from a recent nationwide study that the performance of officers and their sense of professionalism depend on their morale and sense of self-worth, as both internal management and external recognition can have positive impacts on this; more importantly, the paramilitary culture inherited from the past inhibits public trust and partnership [25].

Recommendations

Based on the findings of this study, it is recommended that recruitment and selection exercises for the police should include psychological assessment at pre-employment examination with the utilization of the GHQ12. Regular screening during police service is also very needful. Applicants should be provided with detailed information about the job of a police officer and its expectations and rewards if found noble, which would in turn increase police officers' productivity. The provision of modern communication facilities should eliminate confused feedback. Psychological and social interventions, some of which have been found to be of help to police officers in developed countries such as stress reduction programmes, sports, counseling sessions, social support and psychotherapy [25], may be of benefit to the Nigerian Police.

There is an enormous necessity for the engagement of clinical and occupational psychologists into the Police health services, as a mode of psychological intervention. This would also help to reduce the high rates of psychological morbidity and the rising rate of police aggression among the Nigerian population that they protect.

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Association between depression and hypertension in the Ibadan Study of Ageing

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Abstract
Introduction: The elderly population is growing all over the world with attendant increase in occurrence of comorbid conditions. Using data from a longitudinal study of community-dwelling elderly persons in Nigeria, we explored the prevalence and corelates of hypertension and depression as well as the factors associated with the comorbidity of these two conditions.
Methods: The Ibadan Study of Ageing, a longitudinal community-based cohort study conducted between 2003 and 2009 on the profile and determinants of successful ageing. A multistage cluster random sampling was used to select a cohort of elderly participants from across eight contiguous Yoruba-speaking states in Nigeria- Ekiti, Kogi, Kwara, Lagos, Ogun, Ondo, Osun, and Oyo. Participants (non-institutionalized elderly, aged 65 years or over) were assessed at 4 time points: baseline(2003/2004) and annually from 2007 (wave 1), 2008 (wave 2 and 2009 (wave 3). Data was collected in face-to-face interviews; depression was assessed using the World Mental Health initiative version of the Composite International Diagnostic Interview (CIDI), social engagement was assessed using an adapted World Health Organization Disability Assessment Schedule WHODAS) and functional disability using activities of daily living (ADL) and instrumental activities of daily living (IADL). Hypertension was defined according to the Joint National Committee-7(JNC-7) recommendations as systolic blood pressure of 140 mmHg and above, diastolic blood pressure of 90mmHg. This current study is based on cross-sectional data from the wave 1(2007) assessment.
Results: Of the 1597 participants, 58% were females and 42% were 70 years and older. The mean age was 74.2 years (SD ±7.8). Nine hundred and ninety-eight (62.5%) participants had hypertension while 177 (10.6%) met the criteria for major depression while comorbid depression and hypertension was present in 122 (7.1%). The comorbidity of hypertension and depression was significantly associated with gender (higher in women) (p=0.001), insomnia (p=0.001), lack of family participation (p<0.001), lack of community participation (p=0.002), and experiencing a negative life event in the past year (p=0.003). In a multivariate analysis, lack of participation in family activities was associated with an increased risk of co-morbidity between hypertension and depression (OR 4.51, p=0.000, CI 2.14-9.50).
Conclusions: These findings suggest that the comorbidity of depression and hypertension could potentially be minimized by modifying social risk factors such as keeping the elderly involved in family and community life participation by promoting their involvement in recreational and volunteer activities as well as social gatherings.

Keywords: *Depression. Hypertension. Elderly. Nigeria*

Résumé
Introduction: La population âgée augmente dans le monde entier, avec une augmentation préposée de maladies concomitantes. En utilisant les données d'une étude longitudinale des personnes âgées vivant dans la communauté au Nigéria, nous avons exploré la prévalence et les corelats de l'hypertension et de la dépression ainsi que les facteurs associés à la comorbidité de ces deux conditions.
Méthodes **:** L'étude de Vieillissement d'Ibadan, une étude de cohorte longitudinale communautaire menée entre 2003 et 2009 sur le profil et les déterminants du vieillissement réussi. Un échantillonnage aléatoire en grappes à plusieurs degrés a été utilisé pour sélectionner une cohorte de participants âgés provenant de huit États contigus de langue yoruba au Nigéria - Ekiti, Kogi, Kwara, Lagos, Ogun, Ondo, Osun et Oyo. Les participants (personnes âgées non institutionnalisées, âgés de 65 ans ou plus) ont été évalués à 4 points de temps: ligne de base (2003/2004) et annuellement à partir de 2007 (vague 1), 2008 (vague 2) et 2009 (vague 3). Les données ont été recueillies en interviews face-à-face; la dépression a été évaluée à l'aide de la version de l'initiative mondiale pour la santé mentale du Composite International de Diagnostic Interview (CIDI),

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l'engagement social a été évalué à l'aide d'un calendrier adapté d'évaluation du handicap de l'Organisation mondiale de la santé (WHODAS) et l'incapacité fonctionnelle en utilisant les activités de la vie quotidienne (AVQ)) et les activités instrumentales de la vie quotidienne (AIVQ). L'hypertension a été définie selon les recommandations du Joint National Committee-7 (JNC-7) comme une pression artérielle systolique de 140 mmHg et plus, une pression artérielle diastolique de 90 mmHg. Cette étude actuelle est basée sur des données transversales issues de l'évaluation de la vague 1 (2007).

Résultats **:** Sur les 1597 participants, 58% étaient des femmes et 42% avaient 70 ans et plus. L'âge moyen était de 74,2 ans (ET ± 7,8). Neuf cent quatre-vingt-dix-huit (62,5%) participants souffraient d'hypertension tandis que 177 (10,6%) répondaient aux critères de dépression majeure tandis que la dépression et l'hypertension comorbides étaient présentes chez 122 (7,1%). La comorbidité de l'hypertension et de la dépression était significativement associée au sexe (plus élevé chez les femmes) (p = 0,001), à l'insomnie (p = 0,001), au manque de participation familiale (p <0,001), au manque de participation communautaire (p = 0,002), et avoir vécu un événement de vie négatif au cours de la dernière année (p = 0,003). Dans une analyse multivariée, le manque de participation aux activités familiales était associé à un risque accru de comorbidité entre l'hypertension et la dépression (OR 4,51, p = 0,000, IC 2,14-9,50).

Conclusions **:** Ces résultats suggèrent que la comorbidité de la dépression et de l'hypertension pourrait être réduite au minimum en modifiant les facteurs de risque sociaux tels que garder les personnes âgées afin d'être impliqué dans la participation de vie familiale et communautaire en favorisant leur participation à des activités récréatives et bénévoles ainsi qu'aux rassemblements sociaux.

Mots clés : *Dépression. Hypertension. Les personnes âgées. Nigeria*

Introduction

The population of the elderly is growing all over the world. Globally, the population of persons aged 60 years and above which was 901 million in 2015 is projected to grow by 56% to 1.4billion by 2030 and to reach 2.1billion by the year 2050. Between 2015 and 2050, the African continent will witness the third fastest growth rate of 64%, behind Latin America and the Caribbean (71%) and Asia (66%), with population; growth projected to be faster in urban populations [1]. In the year 2015, the number of older people (above 60 years) in Nigeria was put at about 7million [2].

Ageing is often associated with increased occurrence of chronic health conditions such as hypertension and diabetes mellitus. In Nigeria, hypertension is a particularly common non-communicable disease among the elderly populations, with reported prevalence of over 60% in those who are 65 years and above [3]. The life-time risk for hypertension is 93% and 91% through 80 years for men and women over 55 years respectively [4]. This large burden of hypertension in the elderly is often attributable to conditions such as arterial stiffness, neurohormonal and autonomic dysregulation, and the ageing kidney [5].

The WHO estimates that, globally, depression accounts for up to 4.3% of the total burden of disease [6], and is the second leading cause of years lived with disability. Depression is the most common mental disorder in the elderly [7-9]. As earlier reported from the Ibadan Study of Ageing, elderly Nigerians have a particularly high burden of depressive illness, with an estimated 12-month prevalence of major depressive disorder of 7%, and an incidence rate of 104.3 per 1000 person-years [10]. The risk of depression is higher among persons with a variety of chronic physical disorders such as arthritis, asthma, cancer, cardiovascular disease, diabetes, and hypertension. Kessler, et al reported a 12-month prevalence of 3.2% in individuals without co-morbidity and 23% in those with chronic physical health conditions [11].

Previous observational studies, have suggested that the occurrence of depression is high among persons with hypertension, even though this association is equivocal; as some other studies have not found similar association [12, 13]. Indeed, it has been reported that anxiety, and not depression, is the mental health condition with increased risk among persons with hypertension. For example, a recent survey from South Africa, using the Composite International Diagnostic Interview to measure DSM-IV mental disorders, examined the relationship between hypertension and depression. After controlling for traumatic life events, an association between anxiety, but not major depression, was found [14].

Some longitudinal studies suggest that depression might be an independent risk factor for incident hypertension. A recent meta-analysis by Meng, et al, suggests that, among persons with depression at baseline, the risk of incident

hypertension increased with the length of the period of follow-up. [15] However, some other studies have not demonstrated such relationship [16, 17]. These conflicting findings have been explained by inadequate follow-up time, small sample size, non-standard methodological approaches and definitions. Some studies suggest that it might be important to explore the type of hypertension when considering its association with depression, For, example, in a cross-sectional population-based study reported by Barret-Connor and Palinkas, the association between depression and hypertension was found with diastolic blood pressure (DBP)[18]. Also, Lobo-Escolar, et al reported an association between depression and stage 2 hypertension in older adults in a study of people aged 55 years and above [19].

Irrespective of the direction of causality, the co-occurrence of depression and hypertension has consequences for the outcome of both conditions. For example, symptoms of depression are associated with poor medication adherence which ultimately affects control of blood pressure and cardiovascular outcomes.

Sub-Sahara Africa and specifically Nigeria is experiencing a rapid rise in the the population of the elderly, with the attendant salience of health co-morbidities such as hypertension and other chronic conditions including mental disorders. Hypertension and depression are highly prevalent in elderly populations. Providing effective healthcare that fully meets the needs of this population will require attention to addressing such comorbidities. In this study, we set out to explore the prevalence and corelates of hypertension and depression as well as the factors associated with the comorbidity of these two conditions in community dwelling elderly Nigerians.

Materials and methods

The Ibadan Study of Ageing, a longitudinal community-based cohort study, conducted between 2003 and 2009 to determine the profile and determinants of successful ageing [20]. The methodology has been reported elsewhere [10], and only a brief description related to this current study is provided here.

A multi-stage cluster sampling of local government areas, enumeration areas, geographical units, and households was adopted in selecting participants from across eight Yoruba-speaking states of Ekiti, Kogi, Kwara, Lagos, Ogun, Ondo, Osun, and Oyo, all in the south-western and north-central parts of Nigeria. These eight contiguous states had a population of 25 million, which was approximately 22% of the national population, at the time of study. The subjects were persons aged 65 years and over, living in non-institutionalized households, fluent in Yoruba (the language of the study) and who provided informed consent. One eligible person per household was invited to participate, in households with more than one eligible person, the Kish table was used to select one respondent [21]. Follow up data was obtained from this cohort at 4 time points- baseline, waves 1, 2 and 3. The baseline assessment was carried out between August 2003 and November 2004. Thereafter commencing from 2007, annual follow-up assessments were conducted: wave 1 in 2007, wave 2 in 2008 and wave 3 in 2009. The present report is based on the cross-sectional wave 1 data collected in 2007.

At baseline, the resulting sample size of 2152 represented a response rate of 79%. Non-response was predominantly due to change of address or not being found at home after repeated visits, rather than refusal. Three subjects who had incomplete assessment were excluded from further analysis, leaving a total of 2149. The first wave of follow-up on which this current study is based was conducted in 2007. Of the 2149 persons successfully interviewed at baseline, 328 had died. The remaining cohort of 1821 was enlarged by the addition of 506 new participants selected from the original listing of households. The new total of 2321 constituted the study sample in 2007. Of these, 1865 (80.4%) were successfully interviewed, for this report we excluded 268 participants with incomplete data. Experienced trained interviewers conducted face-to-face interviews and were monitored by supervisors with survey experience. The study was approved by the University of Ibadan/University College Hospital Joint Ethics Review Board.

Measures

Hypertension

Blood pressure was measured using Omron MS-2 Basic model, and the measurements were done according to standard procedures. Participants were seated for at least 5 minutes before their BP was taken. This was done twice at five minutes interval and the average measurement was taken. For this study, hypertension was defined according to the Joint National Committee-7(JNC-7) recommendations as systolic blood pressure of 140 mmHg and above, diastolic blood pressure of 90mmHg and above, or self-reported past or current use of anti-hypertensives.

Depression

Depression was assessed using the World Health Organization (WHO) Composite International

Diagnostic Interview (CIDI)[22]. The diagnosis of depression was based on Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) [23]. This has been previously described [24, 25].

Other variables

Social engagement (participation in household activities and participation in community activities) was assessed using an adapted World Health Organization Disability Assessment Schedule, version 2(WHO-DAS II) [26]. Participants were asked whether they joined the family in talking together, eating together, visiting family members or working together during the last 30 days. On community participation, they were asked whether they participated in different activities such as religious activities, festivities, talking with community members, and working together. The responses were categorized as "Not at all" versus "Yes" (A little bit, Quite a bit, and A lot).

Information was obtained about use of alcohol and tobacco, and the responses were classified as "ever use" and "never use".

Disability, access to medical facility, and the presence of chronic medical conditions were also assessed. Height was measured using a portable stadiometer with a sliding head-plate, with the subjects on flat surface, shoes removed, and stretching to the maximum height with the back of the heels and occiput touching the stadiometer. Weight measurement was done at home using portable electronic scale, measured to the nearest 0.1kg. Body mass index (BMI) was calculated as weight (kg) divided by square of height (m^2). The World Health Organization (WHO) classification of BMI was used.

To determine economic status, participants' household and personal items inventory was taken and related to the median number of the possessions of the total sample. Based on this, the economic status was categorized as high or low.

Residence was classified as follows: rural (less than 12,000 households), semi-urban (12,000 households) and urban (greater than 12,000 households).

Statistical analysis

STATA 13 was used to analyze the data. To account for the stratified multistage sampling method used in data collection, the data was weighted to adjust for clustering. Continuous variables were expressed as means (standard deviation) and categorical variables were expressed as proportions and percentages. Univariate analysis was performed to explore demographic and clinical variables associated with hypertension and with co-morbidity of hypertension and depression. Multivariate analyses were done to identify factors that independently increased the likelihood of co-morbidity of hypertension and depression.

Weights were derived and applied because of the clustering associated with the stratified multistage sampling [27]. The jack-knife replication method was used for the complex sample design and the weighting to estimate standard errors for proportions in STATA Version 13 [28].

Results

There were one thousand, five hundred and ninety-seven (1597) participants. Of these, 927 (58%) were females and 670 (42%) were 70 years and older. The mean age was 74.2 years (SD ±7.8). Nine hundred and ninety-eight 998 (62.5%) participants had hypertension while one hundred and seventy-seven 177 (10.6%) met the criteria for major depressive episode (Table 1). Comorbid depression and hypertension was present in 122 (7.1%) of the respondents.

The prevalence of hypertension was higher among female respondents (66.4%) compared to male respondents (55.9%) ($p< 0.001$) (Table 2). Hypertension was also higher among those who were not currently married (most of whom were widowed) compared to those who were married ($p<0.001$). Even though the rate of hypertension was higher in respondents older than 70 years (61.7%) compared those younger than 70 (58.4%), the difference was not statistically significant ($p=0.35$). Similarly, the prevalence of hypertension was higher among urban compared to rural dwellers, and among those who were currently depressed (67%) compared to those who were not (60%), but these were also not statistically significant.

The prevalence of depression was higher among female respondents compared to males (13.7% vs 7.7%, $p=0.002$). Depression was also more prevalent among those not currently married than those who were married(14.7% vs 8.6%, $p=0.014$) and among those who were in low economic group compared to those in high economic group but this was not statistically significant (11.5% vs 9.5%, $p=0.287$). Table 3.

Table 4. shows the results of univariate analyses exploring factors associated with co-morbidity of hypertension with depression. Among patients who had hypertension, the number of patients

Table 1. Socio-clinical demographics of the study population

Variables(N=1597)		Frequency	%
Sex	Female	927	49.0
	Male	670	51.0
Age group (years)	< 70	436	29.0
	≥70	1161	71.0
Marital status	Currently married	920	66.8
	Not currently married	677	33.2
Educational status	Not educated	658	53.7
	Educated	525	46.3
Residence	Urban	1163	73.2
	Rural	434	26.8
Economics Status	Low	965	55.4
	High	642	44.6
Hypertension status	Hypertensive	998	60.7
	Not hypertensive	599	39.3
Depression status	Depressed	177	10.6
	Not depressed	1420	89.4
Hypertension	<70 years	262	28.0
	≥70 years	736	72.0
	< 18.5	260	16.0
Body Mass Index BMI (kglm^2)	18.5 – 24.0	899	60.0
	≥25	359	24.0

Table 2: Association between hypertension and socio-demographic characteristics of all study participants

		Total	Hypertensiven (%)*	Not hypertensiven (%)*	p-value
Sex	Female	927	620 (66.4)	307 (33.6)	0.000
	Male	670	378 (55.3)	292 (44.7)	
Age group	<70yr	436	262(58.4)	174(41.6)	0.346
	e"70yr	1161	736(61.7)	425(38.3)	
Marital status	Married	920	524 (56.3)	396 (43.7)	0.000
	Not married	677	474 (69.6)	203 (30.4)	
Educational status	Not educated	658	428 (62.1)	230 (37.9)	0.724
	Educated	525	329 (61.0)	196 (39)	
Location	Urban	1163	747 (62.6)	416 (37.4)	0.050
	Rural	434	251 (55.6)	183 (44.4)	
Economic status	Low	965	618 (61.3)	347 (38.7)	0.574
	High	632	380 (60.0)	252 (40.0)	
Depression status	Depressed	177	122(67.0)	55(33.0)	0.155
	Not depressed	1420	876(60.0)	544(40.0)	
Body Mass Index (BMI)Kg/m^2	<18.5	260	140(48.28)	120(51.72)	0.000
	18.5-24.0	899	553 (59.87)	340 (40.13)	
	>=25	359	256 (70.63)	103 (29.37)	

*Weights were derived and applied because of the clustering associated with the stratified multistage sampling

who had co-morbidity of hypertension and depression was 122 (90 females and 22 males), giving a prevalence of 12.2%. The comorbidity of hypertension and depression was significantly associated with gender (with women having a higher rate compared to men) (p=0.001), having insomnia (p=0.001), lack of family participation (p<0.001), lack of community participation (p=0.002), and

Table 3: Association between depression and socio-demographic characteristics of all study participants.

		Total	Depressedn (%)*	Not depressedn(%)*	p-value
Sex	Female	927	124(13.7)	803(86.3)	0.002
	Male	670	53(7.7)	617(92.3)	
Age group	<70yrs	436	45(9.8)	391(90.2)	0.624
	≥70yrs	1161	132(11.0)	1029(89.0)	
Marital status	Married	920	82(8.6)	38(91.4)	0.014
	Not married	677	95(14.7)	8582(82.3)	
Educational status	Not educated	658	86(12.8)	572(87.2)	0.171
	Educated	525	55(9.5)	470(87.2)	
Location	Urban	1163	135(11.2)	1028(88.8)	0.194
	Rural	434	42(8.9)	392(91.1)	
Economic status	Low	965	119(11.5)	846(88.5)	0.287
	High	632	58(9.5)	574(90.5)	
Hypertension	No	599	55(9.0)	544(91.0)	0.155
	Yes	998	122(11.7)	876(88.3)	
Body mass index	<18.5	260	31(12.0)	229(88.0)	
(BMI)kg/m²	18.5 – 24.0	899	94(10.5)	805(89.5)	0.292
	≥25	359	39(10.9)	320(89.1)	

** Weights were derived and applied because of the clustering associated with the stratified multistage sampling*

experiencing a negative life event in the past year (p=0.003)

In multivariate analysis in which all factors that had shown significant association in univariate analysis were included as covariates, only lack of participation in family activities was associated with an increased risk of co-morbidity between hypertension and depression (OR 4.51, p=0.000, CI 2.14-9.50). (Table 5)

Discussion

This is the largest population-based survey of elderly persons in Nigeria reporting not only on the prevalence of hypertension in this group but also its co-morbidity with depression. The prevalence of hypertension in elderly persons in our study was 62.5%. This is comparable to previous estimates for elderly populations in other settings. For instance, in the Three-City Study of 9,294 elderly persons in France, the prevalence of hypertension was 73.7% [29].

The factors responsible for increased prevalence of hypertension in elderly persons include arterial stiffness, dysregulation of the neurohormonal and autonomic mechanisms, the aging kidney which causes a decline in the glomerular function and renal homeostatic mechanisms, and inadequate blood pressure control.

Compared to males, the proportion of females with hypertension was significantly higher (58% vs 42%). Similar findings have been reported in earlier studies [30]. This higher prevalence in females is commonly attributed to oestrogen withdrawal, weight gain, and excess pituitary hormone production. As expected, elderly persons with BMI ≥25Kg/m² had higher prevalence of hypertension than those with lower BMI. This study showed that, compared to currently married persons, non-married elderly persons had higher rates of hypertension. Married persons are more likely to receive care and had more support and are probably less likely to be under emotional pressure as those who were not married.

The current prevalence of depression in this study was about 10.6% which is higher than the 7% reported at baseline [10], but consistent with our finding that the incidence of depression increased with each year of follow-up. The rate of depression in the elderly in this setting seems to be consistently higher than that found in the general adult population. An earlier general population study of 6752 persons of 18 years which used similar depression ascertainment procedures to this study reported a lifetime estimate of major depressive episode (MDE) of 3.1% and 12month estimate of 1.1% [31].

Similarly, another study done in the same study area also in the general population reported a prevalence of 5.2% [32]. Peltzer, *et al,* in South Africa, reported a symptom-based depression rate of 4.0%, however, the study population included participants from age 50 years[33]. Our study population consisted of older individuals from age 60

Table 4: Factors associated with depression among elderly persons with hypertension

		Total	Depressed n (%)*	Not depressed n (%)*	p-value
Sex	Female	620	90 (15.0)	530 (85.0)	0.001
	Male	378	32 (7.9)	346 (92.1)	
Age group (year)	<70	262	32(11.5)	230(88.5)	0.928
	≥70	736	90(11.78)	646(88.22)	
Marital status	Not married	474	69 (15.3)	405 (84.7)	0.037
	Married	524	53 (9.5)	471 (90.5)	
Educational status	Not educated	758	104 (13.0)	654 (87.0)	0.054
	Educated	598	62 (9.0)	536 (91.0)	
Location	Urban	747	99 (12.8)	648 (87.3)	0.281
	Rural	251	23 (8.4)	228 (91.6)	
Economic status	Low	618	79 (12.8)	654(87.0)	0.054
	High	380	62 (9.0)	684 (91.9)	
Presence of chronic medical condition other than hypertension	No	217	18 (7.1)	199 (92.9)	0.121
	Yes	781	104 (13.1)	677 (86.9)	
Insomnia symptom	No	562	42(7.47)	520(92.53)	0.001**
	Yes	428	80(18.70)	348(81.30)	
Currently impaired activity of daily living	No	781	86 (11.0)	695 (89.0)	0.261
	Yes	217	36 (14.8)	181 (85.2)	
Experiencing disability	No	777	86 (11.0)	691 (89.0)	0.284
	Yes	221	36 (14.6)	185 (85.4)	
Ever drank alcohol	No	510	60 (11.4)	450 (88.6)	0.749
	Yes	464	60 (12.1)	404 (87.9)	
Ever used tobacco	No	617	85 (12.7)	532 (87.3)	0.280
	Yes	369	36 (10.0)	333 (90.0)	
Family participation in the past 30 days	Yes	895	95 (10.0)	800 (90.0)	0.000**
	No	88	26 (33.2)	62 (66.8)	
Community participation in the past 30 days	Yes	863	92 (10.2)	771 (89.8)	0.002**
	No	121	29 (24.6)	92 (75.4)	
Experienced terrible events in past year	No	422	30 (7.6)	392 (92.4)	0.003**
	Yes	562	91 (14.9)	471 (85.1)	
Chronic condition: Stroke	No	684	85 (12.0)	599 (88)	0.883
	Yes	80	12 (11.4)	68 (88.6)	
Chronic condition: Diabetes	No	947	116 (12.0)	831 (88.0)	0.274
	Yes	44	6 (7.0)	38 (93.0)	
Chronic condition: Hypertensive stage	No	430	52 (11)	378 (89)	0.566
	Yes	568	70 (12.3)	498 (87.7)	
Body Mass Index (BMI)Kg/m^2	<18.5	140	24 (15.4)	116 (84.6)	0.292
	18.5-24.0	553	(57(10.0)	496(90.0)	
	>=25	256	31(13.1)	225(86.9)	

** Weights were derived and applied because of the clustering associated with the stratified multistage sampling, ** Statiscally significant*

years who are increased risk of the occurrence of more co-morbid conditions and are also less likely to utilize health care for their depression. This latter factor is well recognized in this age group. Slightly more urban dwellers had depression compared to rural dwellers.

This is consistent with previous reports, [34] though it has been pointed out that the likelihood of having depression does not necessarily depend on residence but rather on population characteristics such as presence of co-morbidity, poor self-report of health issues, disability and change in health status [35]. Besides, due to deteriorating urban infrastructures, inadequate social services and general economic decline, urban dwellers are more likely to experience stressful situations that may predispose to depression.

Table 5. Factors associated with depression in elderly persons with hypertension

		Adjusted OR		
		OR	(95%C. I)	p-value
Sex	Male	1		
	Female	1.74	0.75-4.03	0.189
Marital status	Currently married	1	-	-
	Not-currently married	1.04	0.42-2.56	0.926
Education	Educated	1	-	-
	Not educated	1.96	0.98-3.94	0.057
Family participation in past 30 days	Yes	1	-	-
	No	4.51	2.14-9.50	0.000
Community participation in the past 30 days	No	0.98	0.51-1.89	0.948
	Yes	1	-	-
Experienced terrible event in the past year	No	1		
	Yes	2.17	1.13-4.18	0.388

The risk factors associated with co-morbidity of hypertension and depression identified in our study included female sex, not being currently married, lack of formal education, lack of family participation, and insomnia. This is comparable to the findings from a similar population study of the elderly in China where the risk factors for depression in elderly persons ≥60 years were illiteracy, not being married, significant stressful life, and poor sleep [36]. However, in this study, when other factors associated with comorbidity were controlled for, only lack of family participation emerged as an independent predictor of the co-occurrence of depression and hypertension.

Previous studies have reported increased likelihood of depression in people who were not married compared to those who were married. This can possibly be attributed to the challenges of care, lack of support and socio-economic problems. Lack of education and low economic status were other associations we found related to the co-morbidity of hypertension and depression. People who lack formal education were also more likely to be socially disadvantaged and without support from children who may themselves have little or no education and economic empowerment.

Lack of family participation and community participation are both strongly associated with co-morbidity of hypertension and depression. These factors in the context of our study involve social interaction such having meals together, conversations, visiting family members and attending social and religious meetings. These interactions improve social bonding and communality, they help the elderly overcome the challenges of loneliness and anxiety. Social networking in the community and community participation help to improve cognitive health and also improves health related behaviour [37]. Personal and family experiences of negative life events in the past year were associated with depression and hypertension in our study participants. These events, as expected, would increase their anxiety level, economic burden if they included loss of children or relative or even loss of a care giver.

However, the results of our study should be interpreted considering the limitations. This current report is based on cross sectional data and subject to the limitations associated with such studies including recall bias which could have reduced the reported prevalence of hypertension and depression. This we think was minimal especially for hypertension as we used multiple criteria for case definition- including blood pressure measurements, self-report of previous hypertension diagnosis and use of antihypertensive medications.

Another point worth noting is the overlap between the symptoms of depression and some of our associations. While social withdrawal is a symptom of depression, it could be difficult in a cross-sectional study to distinguish from social isolation which is a known risk factor for depression. Notwithstanding, encouraging physical activity and social inclusion form the bedrock of evidence based psychosocial interventions such as problem-solving treatment, behavioural activation and re-activating of social network which are known to be effective both in the treatment and prevention of depression [38].

Conclusion

These findings suggest that there is a high rate of comorbidity of depression and hypertension which was associated with being female, having low educational attainment, occurrence of stressful life events and the absence of family and community participation. However, lack of family and community

participation emerged as the only predictor in multivariate analysis. This finding suggests that providing wholistic care to the elderly will require not just providing treatment for their physical and mental health conditions but should include psychosocial interventions capable of addressing important underlying risk factors such as the lack of family and community participation as observed in this study. Finding avenues to keep the elderly involved in family and community life will be useful in reducing the occurrence and impact of this co-morbidity. Interventions that promote continued participation of the elderly in volunteer activities, recreation and social gatherings, have been shown to improve both mental health and quality of life [39, 40].

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Risk factors for dental caries among the pre-teenagers in Ibadan

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Abstract

Background: Preteens are children not yet 13 years of age especially those between ages 9 and 12 years. Generally, children are known to be affected by dental caries. Globally, 60-90% of school children have dental caries. In Nigeria, the prevalence of dental caries in the 1970s and early 1980s was high. It ranged between 32.2% and 48%. Recent studies showed irregular prevalence in both semi-urban and urban settlements across the country which ranges between 10.9% and 33.5%. Some of the risk factors for dental caries include diets, bacterial plaque, tooth morphology and developmental defects, salivary flow, fluoride exposure and previous caries experience, age, gender, race and ethnicity, body mass index, special healthcare status, socio-economic status, parental and maternal age, lifestyle and attitude.

Aim: This study was aimed at determining the prevalence and risk factors of dental caries among pre-teenage children in primary and secondary schools in Ibadan.

Methodology: This study was carried out among children who were between the ages of 7 and 12 years that attend public schools in Ibadan North Local Government. Three primary schools and 3 secondary schools were randomly selected by balloting. An interviewer-administered questionnaire was used in obtaining the demographic information. Intra-oral examination was carried out under sun light to avoid distortion of findings. Caries detection was done using the classification of carious lesions by G.V. Black with its modification, and the World Health Organization (WHO) code description for scoring caries experience. Sterile mouth mirror and CPI probe were used for this purpose. Data was analyzed using the Statistical Package for the Social Sciences version 21. Summary statistics were performed to determine the prevalence and risk factors of dental caries.

Results: Two hundred and seventy pupils participated in this study, among who are 126(46.7 %) males and 144 (53.3%) females. Among the different age groups, 23(8.5%) were 7-8yrs, 73(27.0%) were 9-10 yrs 174 (64.5%) were 11-12years. Majority (62.2%) were in primary schoolwhile37.8% were in JSS 1-3. The prevalence of dental caries was 11.1%. The factors that were statistically significant include age, frequency of snacking, deep pits and fissures, and gingivitis.

Conclusion: The prevalence of dental caries among the pre-teenage school children in Ibadan is as high as it has been for many years. The identified risk factors for dental caries in this study include age, frequency of snacking, presence of deep pits and fissures, and gingivitis.

Keywords: *School children, Dental caries, Risk factors*

Résumé

*Contexte***:** Les préadolescents sont des enfants de moins de 13 ans, en particulier ceux âgés de 9 à 12 ans. En général, les enfants sont connus pour être atteints de caries dentaires. Dans le monde, 60 à 90% des écoliers ont des caries dentaires. Au Nigéria, la prévalence des caries dentaires dans les années 70 et au début des années 80 était élevée. Il variait entre 32,2% et 48%. Des études récentes ont montré une prévalence irrégulière dans les habitations semi-urbains et urbains du pays, qui varie entre 10,9% et 33,5%. Certains des facteurs de risque de caries dentaires comprennent les régimes alimentaires, la plaque bactérienne, la morphologie dentaire et les anomalies du développement, le flux salivaire, l'exposition au fluorure et l'expérience antécédente de la carie, l'âge, le sexe, la race et l'origine ethnique, l'indice de masse corporelle, le statut de santé particulier, le statut socio-économique, âge des parents et de la mère, style de vie et attitude.

Objectif: Cette étude visait à déterminer la prévalence et les facteurs de risque des caries dentaires parmi les préadolescents des écoles primaires et secondaires d'Ibadan.

Méthodologie: Cette étude a été menée parmi les enfants âgés de 7 à 12 ans qui fréquentent les écoles publiques dans la commune d'Ibadan Nord. Trois

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écoles primaires et 3 écoles secondaires ont été sélectionnées au hasard par scrutin. Un questionnaire administré par intervieweur a été utilisé pour obtenir les informations démographiques. Un examen intra-oral a été réalisé sous la lumière du soleil pour éviter la distorsion des résultats. La détection de la carie a été effectuée en utilisant la classification des lésions carieuses par GV Black avec sa modification, et la description du code de l'Organisation Mondiale de la Santé (OMS) pour l'évaluation de l'expérience de la carie. Un miroir buccal stérile et une sonde CPI ont été utilisés à cet effet. Les données ont été analysées à l'aide de SPSS version 21. Des statistiques sommaires ont été réalisées pour déterminer la prévalence et les facteurs de risque des caries dentaires.

Résultats: Deux cent soixante-dix élèves ont participé à cette étude, parmi lesquels 126 (46,7%) garçons et 144 (53,3%) filles. Parmi les différents groupes d'âge, 23 (8,5%) étaient de 7-8 ans, 73 (27,0%) étaient de 9-10 ans 174 (64,5%) étaient de 11-12 ans. La majorité (62,2%) étaient à l'école primaire tandis que 37,8% étaient dans les classes de Sixième à la Quatrième. La prévalence des caries dentaires est de 11,1%. Les facteurs statistiquement significatifs comprennent l'âge, fréquence de grignotage, fosses et fissures profondes, et la gingivite.

Conclusion: La prévalence des caries dentaires parmi les écoliers préadolescents d'Ibadan est aussi élevée qu'elle l'a été depuis de nombreuses années. Les facteurs de risque identifiés pour les caries dentaires dans cette étude comprennent l'âge, fréquence de grignotage, présence de fosses et de fissures profondes et la gingivite.

Mots clés: *écoliers, caries dentaires , facteurs de risque*

Introduction

Preteens are children (boys and girls) not yet 13 years of age especially those between ages 9 and 12 years [1]. However, these days, children between ages 7 and 8 years are said to develop the pre-teen mind-set [2]. Generally, dental caries is a condition known to be common among children [3, 4]. Worldwide, 60-90% of school children are said to have dental caries [5, 6]. Among many studies carried out between years 2001 and 2008 in countries like the Philippines, China, Mexico, United Kingdom, Norway, United States of America, and Palestine, prevalence of dental caries ranges between 20% and 90% [7, 8]. Also, prevalence in Northwest Russia among the 12 year old was found to be 83.4% [9].

In Nigeria, the prevalence of dental caries in the 1970s and early 1980s was high. It ranged between 32.2% and 48% [10-11]. Recent studies however observed irregular prevalence in both semi-urban and urban settlements across the country which ranges between 10.9% and 33.5% [12-14]. In Ile-Ife, a prevalence of 13.9% with a mean DMFT of 0.14 among 12-year old suburban children was documented while in Ibadan a prevalence of 11.2% among 12-14 year old school children with a mean DMFT of 1.90 ± 1.00 was reported[15,16]. In Lagos, dental caries prevalence of 10.9% among pre-school children was reported [17]. In contrast to these reports, a prevalence as high as 33.5% was found among 12-15 year old school children in Benin [12].

Some of the risk factors for dental caries include diets, bacterial plaque, tooth morphology and developmental defects, salivary flow, fluoride exposure and previous caries experience, age, gender, race and ethnicity, body mass index (BMI), special healthcare status, socio-economic status, parental and maternal age, lifestyle and attitude [18,19]. In addition, many previous studies have also identified poor oral hygiene and type of tooth cleaning material as significant risk factors for dental caries among different categories of children [20, 21].

It has also been established in a previous study that teenagers were prone to dental caries due to some behaviours which include increased consumption of aerated drinks and refined carbohydrate, increase in the number of sugar exposures in between meals, inadequate knowledge about the different brushing techniques, toothpaste used, and other oral hygiene practices, improper timing of eating among the teens, and inadequate rinsing after meals. These factors may lead to retention of food and increased incidence of dental caries [22]. Therefore, the present study was aimed at determining the prevalence and the risk factors for dental caries among the pre-teenage children in primary and secondary schools in Ibadan.

Methodology

This study was carried out among children aged 7 - 12 years that attend public schools in Ibadan North Local Government. Three primary schools and 3 secondary schools were randomly selected by balloting. An average of 45 pupils were selected at random by balloting system from all those aged 7 – 12 years who gave their assent to participate, having obtained consent from their parents through the schools' authorities. These were assembled at the school's assembly hall for the administration of questionnaire and intra-oral examination.

Approval for the study and the list of public primary and secondary schools in Ibadan North Local Government Area were obtained from the Local Education Authority.

An interviewer-administered questionnaire was used in obtaining the demographic information (age and gender) of each child, frequency of tooth cleaning, tooth cleaning materials and frequency of daily snacking in between meals.

The risk factors of dental caries assessed include frequency of daily snacking in between meals, tooth cleaning materials and the frequency of tooth cleaning. Also, presence of visible plaque on anterior teeth, presence of gingivitis using the gingival index of Löe and Silness [23], presence of white spot lesions on drying each tooth with manual pump, presence of teeth with enamel hypoplasia, retentive pits and fissures, and oral hygiene using Simplified Oral Hygiene index of Greene and Vermillion [24] were assessed. Intra-oral examination was carried out under sun light to avoid distortion of findings. Caries detection was done using the Classification of carious lesions by G.V. Black with its modification, and the World Health Organization (WHO) code description for scoring caries experience. Sterile mouth mirror and Community Periodontal Index (CPI) probe were used for this purpose.

Data was analyzed using the Statistical Package for the Social Sciences version 21(SPSS Inc., Chicago Illinois, USA). Summary statistics (frequency, percentage) were performed to determine the prevalence and risk factors of dental caries. *P*-value was set at 0.05. Chi square and fisher's exact were used for categorical variables while t-test was used for continuous variables in determining the association between the risk factors and dental caries.

Results

Two hundred and seventy pupils participated in this study, among who were 126(46.7 %) males and 144 (53.3%) females. Among the different age groups, 23(8.5%) were 7-8yrs, 73(27.0%) were 9-10 years and 174 (64.5%) were 11-12years. Majority (62.2%) were in primary school, while37.8% were in JSS 1-3 (Table 1).

Majority (98.5%) of the children were involved in the consumption of sugary snacks and drinks daily. Also, most (81.1%) of the children cleaned their teeth only once daily. Concerning oral health behaviour, it is just 5.2% of the children had ever visited dental clinic before. The prevalence of dental caries was 11.1% (Table 1).

Table 1: Frequency distribution of the participating children

Variable	N	%
Gender		
Male	126	46.7
Female	144	53.3
Total	270	100
Age		
7 – 8	23	8.5
9 – 10	73	27.0
11 - 12	174	64.5
Total	270	100.0
Class		
Primary 1 – 6	168	62.2
JSS 1 – 3	102	37.8
Total	270	100.0
Snacking habit		
Sugar snack and drinks		
Yes	266	98.5
No	4	1.5
Total	270	100.0
Frequency of snacking		
None	1	0.4
Less than thrice daily	236	87.4
Three or more times daily	3	12.2
Total	270	100.0
Oral hygiene practices		
Who cleans for respondents		
Caregiver	8	3.0
Self	262	97.0
Total	270	100.0

Those who were affected by dental caries were 11.9% and 10.4% among the males and the females respectively. This is however not statistically significant (Table 2).

The factors that were statistically significant include age (p = 0.04), frequency of snacking (p = 0.03), deep pits and fissures (p = 0.03), and gingivitis (p = 0.03) (Table 2).

Furthermore, 16.7% of those with enamel hypoplasia had dental caries, while it is only 11.0% of those without it that had caries. Also, 28.6% of those with previous dental visits had dental caries while it is only 10.2% of those without previous dental visits that had dental caries. Of those in primary 1 – 6 and JSS 1 – 3, 13.1% and 7.8% respectively had dental caries (Table 2).

Discussion

The prevalence of dental caries among the children in this study is very similar to a previous study in this environment where a prevalence of 11.2% was

Table 2: Association between the predictors and dental caries among the children

Risk factors	Yes N(%)	No N(%)	Total N(%)	X^2	*p-value*
Sex					
Male	15 (11.9)	111 (88.1)	126 (100.0)	0.15	0.70
Female	15 (10.4)	129 (89.6)	144 (100.0)		
Total	30 (11.1)	240 (88.9)	270 (100.0)		
Age					
7 – 8	6(26.1)	17(73.9)	23(100.0)	6.42	0.04
9 – 10	9(12.3)	64(87.7)	73(100.0)		
11 - 12	15(8.6)	159(91.4)	174(100.0)		
Total	30(11.1)	240(88.9)	270(100.0)		
Class in School					
Primary 1-6	22 (13.1)	146 (86.9)	168 (100.0)	1.77	0.18
JSS 1-3	8 (7.8)	94 (92.2)	101 (100.0)		
Total	30 (11.1)	240 (88.9)	269 (100.0)		
Tooth cleaning materials					
T/brush & paste	30 (11.3)	236 (88.7)	266 (100.0)	0.51	1.00*
T/brush &c/stick	0 (0.0)	4 (100.0)	4(100.0)		
Total	30 (11.1)	240(88.9)	270(100.0)		
Frequency of snack					
None	0 (0.0)	1 (100.0)	1 (100.0)		
Occasionally	1 (100.0)	0 (0.0)	1 (100.0)		
Less than thrice daily	24 (10.2)	211 (89.8)	33 (100.0)	8.86	0.03
Three or more times daily	5 (15.2)	28 (84.8)	235 (100.0)		
Total	30 (11.1)	240 (88.9)	270 (100.0)		
Previous dental visits					
Yes	4 (28.6)	10 (71.4)	14 (100.0)		
No	26 (10.2)	230 (89.8)	256(100.0)		
Total	30 (11.1)	240 (88.9)	270 (100.0)	4.56	0.06*
Hypoplasia					
Yes	1 (16.7)	5 (83.3)	6 (100.0)		
No	29 (11.0)	235 (89.0)	264 (100.0)		
Total	30 (11.1)	240 (88.9)	270 (100.0)	0.19	0.51*
Intra-oral appliance					
None	30 (11.1)	240 (88.9)	270 (100.0)1+		
Yes	0 (0.0)	0 (0.0)			
Total	30 (11.1)	240 (88.9)	0 (0.0)270 (0.0)	-	-
Deep pits & fissures					
Yes	2 (66.7)	1 (33.3)	3 (100.0)		
No	28 (10.5)	239 (89.5)	267 (100.0)		
Total	30 (11.1)	240 (88.9)	270 (100.0)	9.48	0.03*
Plaque on labial aspects of anterior teeth					
Yes	14 (10.9)	114 (89.1)	128 (100.0)	0.00	0.93
No	16 (11.3)	126 (88.7)	142 (100.0)		
Total	30 (11.1)	240 (88.9)	270 (100.0)		
Oral hygiene	1.99 ± 0.82	2.08 ± 1.05		0.58	0.19
Gingivitis	1.03 ± 0.24	1.14 ± 0.33		2.31	0.03

*Fisher's Exact Test values

reported among the 12 – 14 years old school children [16]. There is just a minimal reduction in the prevalence. This may be a pointer to the fact that there has not been a significant change in the lifestyle of the children concerning the risk factors of dental caries, especially diets and oral hygiene over the last one decade. The current prevalence is even higher among the boys compared to the girls. This trend had also been observed in a study by Dawani et al [20]. However, another study had reported a higher DMFT among girls than boys [25]. Meanwhile, some studies have also observed that there is no difference in the prevalence of dental caries between male and female [26, 27].

Also, it was underscored in the present study that children between ages 7 –8 years were more

prone to dental caries in comparison to those who are 9 – 10 and 11 – 12years. This may be because those of the lower age group (7 – 8 years) were mainly primary school pupils who probably will like to spend their home-given stipend on snacks and sweetened drinks. Moreover, most of the children were in the mixed dentition period where the mobile primary teeth may not be adequately cleaned due to pain and the fear of traumatic exfoliation [21]. This is in consonance with many previous studies where it was observed that the incidence of dental caries decreases with age [28, 29]. Conversely, a few other studies had reported that dental caries experience on permanent teeth worsens with increase in age [30, 31]. Meanwhile, a study had reported no difference among different age groups concerning dental caries prevalence [32].

Furthermore, in this study, it was observed that there was a significant correlation between snacking habit and dental caries. This is in agreement with many previous studies where it was observed that children with poor dietary habits of consuming snacks, carbonated drinks and confectionery frequently were more likely to develop dental caries as compared to children with no snacking habits [33-35].

Also, in this study, deep pits and fissures were found to have influence on dental caries formation. This is basically because the deep pits and fissures act as stagnation areas for the cariogenic micro-organisms and the substrates [36]. They are more difficult to clean since the crevices may not be easily accessed by the tooth cleaning material. This has been the observation of other previous studies [37].

This study also showed a strong relationship between gingivitis and dental caries. This agrees with a previous study where it was observed that periodontal disease was more common when dental caries was present **[**38**]**. Another study also concluded that those with dental caries showed some form of gingival inflammation in 94.7% of cases **[**39**]**.

A higher proportion of those who had enamel hypoplasia in this study were affected by dental caries compared to those who did not have it. This corroborates other previous studies where it was reported that dental caries experience was more common among children who had enamel hypoplasia and developmental defects of enamel in their posterior teeth than among those with none of these defects **[**40-43**]**. Enamel defects have generally been known to provide a conducive environment for cariogenic bacteria thereby enhancing the formation of dental caries **[**44**]**.

Findings in this study also revealed that previous dental visits did not confer immunity against dental caries on patients. This has been the observation of many previous studies [45-47]. It was even observed in a particular study that children with early dental visits had higher rates of disease than children who had later visits [48].

In conclusion, the prevalence of dental caries among the pre-teenage school children in Ibadan is as high as it has always been for many years. This is an indication that the lifestyle of the children in terms of caries risk factors has not changed. The identified risk factors for dental caries in this study include age, frequency of snacking, presence of deep pits and fissures, and gingivitis.

It is therefore recommended that efforts to prevent dental caries should commence early and be directed more at the very young children.

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Non-compliance with vaccination appointments and missed opportunities among care-givers of infants attending immunisation clinics in Ile-Ife, Nigeria.

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Abstract

Objectives: Vaccination is a life-saving public health measure, but poor adherence to the national routine immunization schedule reduces its effectiveness in reducing the burden of vaccine preventable diseases. Thus, this study was aimed at estimating the level of non-compliance with vaccination appointments and missed opportunities as well as factors associated with receiving vaccinations at the appropriate time among infants attending immunisation clinics in Ile-Ife.

*Methods***:** A cross-sectional analytical study was carried out in Ile-Ife among 128 caregivers of children aged one year and below attending immunisation clinics in 3 health facilities selected using simple random sampling. Data was analysed using the IBM SPSS at univariate and bivariate levels with p at <0.05.

*Results***:** Incomplete vaccination was reported in 23(18%) of the infants, distributed as: 19(82.6%) due to non-compliance and 4(17.4%) due to missed opportunities. The most prevalent reasons for missing vaccination appointments were child's illness (34%), travelling (17.4%), forgetting appointment (17.4%) and distance from the clinic (13%). Only 35.9% of caregivers had good knowledge of vaccination. Appropriate timing of vaccination in the index child was associated with a history of appropriate immunisation timing in an older sibling, (p=0.015) but not with caregiver's knowledge of vaccination, (p=0.632).

Conclusion: Non-compliance was majorly responsible for not receiving vaccination at appropriate time. Health workers should educate caregivers on the need to still attend immunisation clinics even when their children are sick and also initiate recall efforts to prevent caregiver forgetfulness of vaccination appointments.

Keywords: *Childhood immunisation, missed opportunities, incomplete vaccinations, appointments, compliance, timeliness*

Résumé

*Objectifs***:** La vaccination est une mesure de santé publique qui sauve des vies, mais le défaut d'adhérence au programme national de vaccination systématique réduit son efficacité à réduire le fardeau des maladies évitables par la vaccination. Ainsi, cette étude visait à estimer le niveau de non-respect des rendez-vous de vaccination et des occasions manquées ainsi que les facteurs associés à la vaccination au moment opportun chez les nourrissons fréquentant les cliniques de vaccination d'Ile-Ife.

*Méthodes***:** Une étude analytique transversale a été menée à Ile-Ife auprès de 128 nourrices d'enfants âgés d'un an et moins fréquentant les cliniques de vaccination de 3 établissements de santé sélectionnés par échantillonnage aléatoire simple. Les données ont été analysées à l'aide de l'IBM SPSS à des niveaux univariés et bivariés avec p <0,05.

*Résultats***:** Une vaccination incomplète a été signalée chez 23 (18%) des nourrissons, répartis comme suit : 19 (82,6 %) en raison de non-respect et 4 (17,4 %) en raison d'opportunités manquées. Les raisons les plus courantes pour avoir manqué les rendez-vous de vaccination étaient la maladie de l'enfant (34%), les voyages (17,4%), l'oubli de rendez-vous (17,4%) et l'éloignement de la clinique (13%). Seulement 35,9% des nourrices avaient une bonne connaissance de la vaccination. Le moment approprié de la vaccination chez l'enfant de référence était associé à un antécédent moment approprié d'immunisation chez un (e) frère (sœur) plus âgé (p = 0,015), mais pas avec la connaissance de la vaccination de la nourrice (p = 0,632).

Conclusion: Le non-respect était principalement responsable du fait de ne pas avoir été vacciné au moment opportun. Les agents de santé devraient informer les nourrices de la nécessité de continuer à se rendre dans les cliniques de vaccination même lorsque leurs enfants sont malades et également d'initier des efforts de rappel pour éviter que les nourrices oublient les rendez-vous de vaccination.

Mots clés: *Vaccination à l'enfance, occasions manquées, vaccinations incomplètes, rendez-vous, conformité , opportunit*é

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Introduction

To achieve significant success in childhood immunization as envisioned by the World Health Organization, vaccines must be received at recommended intervals. According to the Federal Ministry of Health in Nigeria, fully vaccinated children are those who have received a dose of BCG at birth, three doses of Pentavalent (DPT-HepB-Hib) vaccines, four doses of oral polio vaccines with one of inactivated polio vaccine, three doses of pneumococcal vaccine and one dose of measles vaccine by age 12-23months [1,2] .

Considering this, age-appropriate incomplete vaccination is seen as missing any dose of the thirteen vaccines by 12months of age according to this study. This occurrence may be as a result of the child defaulting from immunization clinic, in which case it is seen as non-compliance; or it could be that the child was brought for the appointment to which (s)he is eligible but did not receive the vaccines, in which case it is regarded as 'missed opportunity'. Varying reasons ranging from caregivers' false beliefs and misconceptions about the risks and benefits of vaccines[3], to relatively farther distance from respective homes to immunization posts[4] may be responsible for the non-compliance of children to vaccination appointments. Non-availability of vaccines or insufficiency of manpower (health workers) are some possible reasons for missed opportunities [1,5].

Globally, 1 out of every 5 children does not receive the three doses of diphtheria, tetanus and pertussis vaccines, and more than 70% of these children reside in 10 countries of which Nigeria is sadly one[6]. Studies have shown that 1 out of every 4 mortalities occurring among under-five children are vaccine-preventable and about 2.5 million deaths occur every year as a result of vaccine-preventable diseases [7]. Immunization is a cost-effective public health strategy in the eradication and control of infectious diseases all over the world. However, Nigeria seems not to have fully embraced this wonder. Despite the recommended immunization coverage rate of 95% which is necessary for the sustained control of vaccine preventable diseases[8], Nigeria has witnessed a progressive decline in this rate. For instance, according to the Federal Ministry of Health as cited by Ophori, *et al* [2], as high as 80% national immunization coverage was achieved in 1990; 3 years after, it had fallen drastically to 30%. According to the Nigerian Demographic and Health Survey, 2018, the age appropriate vaccination rate at 12 months of age is 21% [9].

Non-compliance of mothers to immunization appointments has been reported to be one of the prominent contributory factors to this occurrence [2]. Oniyiriuka in 2005 assessed a total of 174 children in Benin and found an overall default rate of recommended vaccines of 26.7% with measles vaccine being the most frequently defaulted [10]. Sadoh *et al* in 2009 provided some possible explanations for frequently defaulting measles vaccine in Nigeria [11]. They highlighted that the interval between the 6-month and 9-month vaccination appointment (when measles vaccine is given) is so long a time (3months) that one could have easily forgotten ones' next appointment. Needless to say those other immunization appointments (according to the NPI Schedule) are in intervals of 4weeks [11].

Abdulraheem *et al* in Ilorin did a cross-sectional study among children less than 11months and recorded that 36.4% of them were partially immunized [4]. They found that issues relating to objection, disagreement and fear of vaccination ranked highest (38.8%) among the reasons for incomplete immunization. For whatever reasons, children who have not been fully immunized are at far greater risk of becoming infected with serious vaccine-preventable diseases. Studies have shown that children who do not receive the measles vaccine are 35 times more likely to get the disease [12]. Thus, the decision to not completely vaccinate a child is a decision that puts the child and others at risk of contracting deadly diseases.

Several studies have been done assessing incomplete vaccination rates and its associated factors [13], as well as the effect of mothers' characteristics on the child's immunization status [14]. However, majority of these studies were either conducted among children less than 2 years as a community based study [13,15], or as documentation review of facility records. The studies on maternal characteristics assessed their perceptions or knowledge, associated with their children's immunization status as provided by the mothers [16]. This study focused on assessing the appropriateness and timeliness of the vaccines received or expected to have been received among children 12 months old or below.

The maternal characteristics assessed in this study were correlated with the direct observation of the children's immunization status using their immunization card as the reliability of immunization history has been found to be low [10]. Few studies with similar methodologies were conducted among rural population [17] and the other in a private health

facility [10]. Our study was conducted in an urban setting and in public owned health facilities. The maternal factors reported from earlier studies given in most of these studies were caregivers' logistics, opinion and views[16][18]. Not much has been said about how the intrinsic characteristics of the caregiver and family dynamics (such as the mode of delivery of the child, number of children in the family) may be related with the completeness of vaccination. This study sought to determine the non-compliance rate and look into reasons and factors affecting incomplete vaccination among children attending immunization clinic in Ile-Ife, Osun State.

Methods

The study was conducted in Ile-Ife, Osun State which is located in the South-western geo-political zone of Nigeria. Ile-Ife is an ancient town that spans a total landscape area of 1791km², with a population of 509, 035 people as at September, 2017 [19]. It is known as the cradle of the Yorubas and still conforms strongly to her traditional beliefs and myths. There are 18 primary health centres in the town, including the Urban Comprehensive Health Center, Enuwa Primary Health Center and Ile Canaan Health Center, among others.

A cross-sectional analytical study was conducted in three public owned primary health centres which were selected using simple random sampling technique. Caregivers of children aged $\leq$ 1year presenting at the public health facility for their immunization clinic were studied using the power analysis for one sample test of proportion in stata with (p) as the proportion of children with incomplete vaccination in Ilorin, which was 36.4% [4]. Assuming the required confidence interval around this proportion is a difference of ±10% (26.4% to 46.4%), and with 80% power gave an estimated sample size of 172 caregivers of an index child.

The inclusion criteria were caregivers with children less than or equal to 1 year who were registered for immunization services in the three health centres and were with the child's routine immunization card. The study also included only those who had resided in Ile-Ife for a duration longer than 6months. Ill caregivers and those who did not primarily reside in Ile-Ife were excluded. The knowledge of the respondents on the concept of immunization, their experiences during individual vaccination appointment days, and the reason for incomplete vaccination were assessed using a semi-structured interviewer-administered questionnaire.

Knowledge of caregivers on immunization was assessed by using a set of questions pertaining to the names of the vaccines, their time of administration and the disease they prevent. The vaccine names were accorded 1 mark each, as well as the time of administration, and the disease each vaccine prevents. We assessed the knowledge of caregivers using a 15-items set of questions, with a total obtainable score of 15 marks. Good knowledge was set as those who scored 8 and above, and poor knowledge for those who scored less. This cut-off was based on the University scoring system in Nigeria and particularly the medical colleges in Nigeria where below 50% is adjudged as poor performance and above it is good performance [21,22].

Incomplete vaccination in this study was defined as an occurrence whereby a child was not vaccinated against any vaccine preventable disease that is covered in the National Programme on Immunization Schedule appropriate for the age as at the time of conducting the study, for whatever reason. Non-compliance was defined in this study as an occurrence whereby a child did not receive vaccination for at least one vaccine preventable disease simply because the child was not presented in the hospital for that vaccination appointment. Missed opportunity was defined as an occurrence whereby a child who needed an immunization had contact with the health service but was not vaccinated [10].

Written informed consents were obtained. Approval was obtained from all relevant stakeholders and institutions and all the principles of Helsinki Declaration observed strictly. All respondents were free to withdraw from the study at any time without any consequence. The information provided were cross-checked and confirmed using the child's routine immunization card. The questionnaires were manually sorted out and checked for errors and omissions at the end of data collection each day. The information obtained was kept with maximum confidentiality. Data entering and data cleaning were done on completion of the data collection process and data analyzed using the IBM SPSS version 21.

Descriptive statistics, tables and figures were used to summarize variables. Respondents income was re-categorised based on the minimum monthly wage of ¦ 18,000 (USD 50) for workers in public institutions. Test of associations between the caregivers' characteristics and the vaccination status of their children were done using the chi-square statistical tool with the level of statistical significance set at $p<0.05$.

Results

Table 1: Socio-demographic Characteristics of the caregivers and children (n=128)

Variable	Frequency	Percentage
Age of caregivers		
19 years and below	2	1.6
20-39 years	118	92.2
40-59 years	8	6.3
Mean age of caregivers	28.86 ± 5.73years	
Age of children		
3 months and below	59	46.1
4- 6 months	23	18.0
7- 9 months	29	22.7
10- 12 months	17	13.3
Mean age of children	5.24 ±3.96 months	
Gender		
Female	124	96.9
Male	4	3.1
Marital Status		
Currently Married	126	98.4
Not Currently married	2	1.6
Occupation (General Social Classification System)		
Class 1- Professionals	24	9.9
Class 2- Skilled workers	52	40.6
Class 3- Partially skilled	37	28.9
Class 4- Unemployed students	15	11.7
Religion		
Christianity	96	75.0
Islam	31	24.2
Traditional	1	8.0
Ethnicity		
Yoruba	108	84.4
Igbo	8	6.3
Hausa	5	3.9
Others	7	5.5
Level of education		
Primary education	14	10.9
Secondary education	67	52.3
Tertiary education	47	36.7
Socioeconomic status (caregiver's monthly income)		
<¦ 18,000 (< USD 50)	87	68
≥18,000 (≥ USD 50)	41	32
Number of children ever born		
Less than 5 children	118	92.2
Greater than or equal to 5 children	10	7.8
Mother's attendance at antenatal clinic		
Yes	120	93.8
No	8	6.3
Mode of delivery		
Spontaneous vaginal delivery	108	84.4
Caesarean section	20	15.6
Sex of child		
Female	70	54.7
Male	58	45.3

A total of 128 caregivers were interviewed. This gave a response rate of 74.4%. The mean age of eligible caregivers was 28.9yearswith 96.9% being females. The mean age of children was 5.2months, with sex

distribution of 70(54.7%) females and 58(45.3%) males. Other details of the sociodemographic characteristics are as presented in Table 1.

Knowledge of caregivers on immunization

Most of the caregivers (62.5%) had poor knowledge about the names of the vaccines. While 58.6% of the caregivers had poor knowledge about the time of administration of the vaccines, 41.4% of them had good knowledge about the same. Majority of the caregivers had bad knowledge (68.8%) about the disease prevented by the vaccines, while only about a third (31.3%) had good knowledge. Overall, it was

Table 2: Knowledge of caregivers on immunization (n= 128)

Variable	Frequency	Percentage
Knowledge about vaccine name		
Poor knowledge	80	62.5
Good knowledge	48	37.5
Knowledge about time of administration of vaccine		
Poor knowledge	71	58.6
Good knowledge	57	41.4
Knowledge about diseases prevented by the vaccines		
Poor knowledge	88	68.8
Good knowledge	40	31.3
Total knowledge of caregivers on vaccination		
Poor knowledge	82	64.1
Good knowledge	46	35.9

Table 3: Incomplete vaccination: Non-compliance and missed opportunity

Variable	Frequency	Percentage
Age-appropriate Complete Vaccination status (n=128)		
Completely vaccinated	105	82.0
Incompletely vaccinated	23	18.0
Level of overall Non-compliance and missed opportunities (n=128)		
Compliant	105	82.0
Non-compliant	19	14.8
Missed opportunities	4	3.2
Types of incomplete age-appropriate vaccinations (n=23)		
Non-compliant	19	82.6
Missed opportunities	4	17.4
Non-compliance by vaccination appointments (n=19)		
At birth	9	47.4
6weeks	3	15.8
10weeks	3	15.8
14weeks	3	15.8
9months	1	5.2
Reasons for incomplete age-appropriate vaccination(n=23)		
Caregiver's illness	1	4.2
Insufficient vaccine	2	8.7
Caregiver travelled	4	17.4
Caregiver forgot	4	17.4
Child's illness	8	34.8
Lack of money	1	4.3
Distance from the hospital	3	13.0
Categorized reasons for incomplete age-appropriate vaccination (n=23)		
Reasons associated with Non compliance	21	91.3
Reasons associated with missed opportunities	2	8.7

Table 4: Factors associated with incomplete vaccination aside caregiver's opinion

Variable	Vaccination status				
	Complete Freq. (%)	Incomplete Freq. (%)	Total Freq. (%)	χ^2	P value
Age of caregivers					
19 years and below	1 (50.0)	1 (50.0)	2 (100,0)	1.557	0.459
20-39 years	97 (82.2)	21 (17.8)	118 (100,0)		
40-59 years	7 (87.5)	1 (2.5)	8 (100.0)		
Age of children					
3 months and below	49 (83.1)	10 (16.9)	59 (100.0)	1.170	0.760
4- 6 months	20 (87.0)	3 (13.0)	90 (100.0)		
7- 9 months	22 (75.9)	3 (17.6)	25 100.0)		
10- 12months	14 (82.4)	3 (17.6)	17 (100.0)		
Occupational class of caregivers					
Class 1 (Professionals)	19 (79.2) (19)	5 (20.8)	24 (100.0)	1.227	0.746
Class 2 (Skilled workers)	45 (86.5)	7 (13.5)	52 (100.0)		
Class 3 (Partially skilled workers)	29 (78.4) (29)	8 (21.6)	37 (100.0)		
Class 4 (unskilled workers)	12 (80.0) (12)	3 (20.0)	15 (100.0)		
Religion of caregivers					
Christianity	79 (82.3) (79)	17 (17.7)	96 (100.0)	0.264	0.876
Islam	25 (80.6)	6 (19.4)	31 (100.0)		
Highest Level of education					
Primary Education	9 (64.3)	5 (35.7)	14 (100.0)	3.854	0.146
Secondary Education	55 (82.1)	12 (17.9)	67 (100.0)		
Tertiary Education	41 (87.2)	6 (12.8)	47 (100.0)		
Socioeconomic status of caregivers					
<¦ 18 000 (< 50 USD)	72 (82.8) 3372)	15 (17.2)	87 (100.0)	0.097	0.755
e"¦ 18, 000 (e" 50 USD)	33 (80.5)	8 (19.5)	41 (100.0)		
Total knowledge of caregivers on immunization					
Poor Knowledge	69 (83.3)	13 (15.7)	82 (100.0)	0.693	0.405
Good Knowledge	36 (80.0)	10 (20.0)	46 (100.0)		
Total number of children of caregivers					
< 5 children	96 (81.4)	22 (19.6)	118 (100.0)	0.467	0.494
e" 5 children	9 (90.0)	1 (10.0)	10 (100.0)		
Attendance of caregivers at antenatal clinic					
Not attended	7 (87.5)	1 (12.5)	8 (100.0)		
Attended	98 (81.7)	22 (18.3)	120 (100.0)	0.173	0.677
Older siblings missed vaccination					
Didn't miss vaccinations	101 (84.2)	19 (15.8)	120 (100.0)		
Missed vaccinations	4 (50.0)	4 (50.0)	8 (100.0)	5.940	0.015
Mode of delivery					
Vaginal delivery	89 (82.4)	19 (17.6)	108 (100.0)	0.66	0.797
Caesarean section	16 (80.0)	24 (0.0)	20 (100.0)		

deduced that only one-third (35.9) of the caregivers had good knowledge about vaccination. (Table 2.

Incomplete vaccination: Non-compliance and missed opportunity

Of the 128 children whose mothers were interacted with, a total of 105 children (82%) were found to have been completely vaccinated. Only 23(18%) children were incompletely age-appropriately vaccinated, distributed as 19 (82.6%) for non-compliance and 4 (17.4%) for missed opportunity. The vaccination appointments that respondents majorly missed were those given at birth, with a prevalence of 47.4%. The 6th, 10thand 14th week appointments had equal noncompliance rates of 15.8%. The 9th month appointment had a non-compliance rate of 5.2%. (Table 3.

Reasons for Incomplete Vaccination

Child's illness was the most reported reason (34.8%) given for incomplete vaccination. While the reasons

given with the least proportion (4.3%) each was caregiver's illness and financial constraints. When the reasons provided were categorised, 91.3% of them were attributed to non-compliance. See Table 3.

Factors associated with incomplete vaccination aside caregiver's opinion

Asides the reasons provided by respondents, some other factors were assessed to determine their association with incomplete vaccination. Of all these, older siblings missing vaccination appointments was the only factor found to be statistically significantly with incomplete vaccination of the index child. A higher proportion of incomplete vaccination was found among children of caregivers who were aged 19 years and below. In fact, the older the care-giver, the higher the proportion of their children with complete vaccination. However, these findings were not statistically significant. Also, the higher the level of education of the caregiver, the higher the proportion of their children that received complete vaccination, though also not statistically significant. Other factors assessed in the caregivers were not significantly associated with the vaccination status of their children. See Table 4.

Discussion

This cross-sectional study determined the non-compliance rate and reasons for incomplete vaccination among children attending immunization clinic in Ile-Ife. It also described the vaccination appointments that respondents were mostly non-compliant to and determined the factors that were associated with incomplete vaccination aside caregiver's opinion.

This study determined a prevalence of incomplete vaccination of 18.0% and a non-compliance rate of 14.8% out of the total population interviewed. The prevalence of incomplete vaccination reported in this study is similar to that of a cross sectional survey conducted in Ibadan [22], and an analysis of vaccination histories conducted in the United states [23], where prevalence of 19.6% and 19.0% were reported respectively. Though similarly performed in the hospital, a study conducted by Oniyiriuka [10] reported an overall default rate of 26.7%. This may be due to variation in the location and characteristics of the study population as Oniyiriuka's study was done in a private hospital, in Benin.

While the non-compliance rate from this study remains 14.8%, it is important to note that most (82.6%) of the cases of incomplete vaccination were actually non-compliance. Only 17.4% of the incomplete vaccination cases were missed opportunities. This suggests the possible improvement in the routine immunization service delivery by caregivers. It had been documented that caregivers were more liable in contributing to incomplete vaccination in their children or wards than the health service managers [22].

This study determined the particular vaccination appointment that the care-givers of the children in Ile-Ife were mostly non-compliant to. The appointment at birth (which includes BCG, OPV and HBV) was the most non-compliant to. Even though, at the next appointments, the vaccines were administered, having missed the appropriate age of receiving the vaccines was counted as an incomplete age-appropriate vaccination. The reasons given by some of the women for this was prolonged admission following a Caesarean section and subsequent forgetfulness. It might be important to investigate this further in a larger population. On the contrary, the study by Oniyiriuka reported measles, one of the vaccines administered at the 9th month appointment, as the most defaulted vaccine [10].

The mothers demonstrated a generally poor knowledge of the immunization schedule, and the diseases the various vaccines prevent against in this study. This is similar to the findings of Gentle among mothers in Rivers state, Nigeria [16] and as documented by Adebiyi *et al* [14]. However, mothers' age was not significantly associated with the child's immunization status in this study even though the higher the mother's educational status, the higher the proportion of their children who were completely age-appropriately vaccinated. This finding is similar to those reported by Adebiyi *et al* [18] and Gentle in Rivers state [16]. Other factors such as mother's occupation, socioeconomic status, level of education were not significantly associated with incomplete vaccination in this study. These findings were similar to those of Donsa in Malawi as documented in her thesis [15]. These were however contrary to the findings of Awasthi in India [24].

That an older sibling misses at least one vaccination appointment affects the completion of vaccination in an index child is an important finding from this study. This implies that all hands must be on deck to ensure that no child in any family is incompletely vaccinated as that may cause a ripple effect in that family. It is therefore recommended that programmatic efforts should ensure all first siblings are completely vaccinated, as this could singularly ensure complete vaccination in their younger siblings.

The commonest reason for incomplete vaccination in this study was the index child's illness as stated by 34.8% of caregiver. This is consistent with findings by Babalola and Adewuyi which stated child's illness as the most prevalent reason [25]. However, Abdulraheem *et al.* reported parent's objection, disagreement or concern about immunization safety as the commonest (38.8%) reason for missing vaccination [4]. Other reasons accounting for incomplete vaccination as found in our study were majorly (91.3%) caregiver related, thus, due to non-compliance while only a few (8.7%) pointed to missed opportunities.

One of the reasons for incomplete vaccination reported in this study was the long distance between the homes of caregivers and the health facility. This could be minimised by increasing the number of immunization posts in every community, such as introducing mobile posts to ease accessibility. Introducing penalties for incomplete vaccination should be considered to address caregivers' forgetfulness. It is hoped that all these measures will improve compliance.

This study suggests that though non-compliance rate to immunisation schedule and incomplete vaccination rates were similar to other studies, the contributory factors were not only care-giver dependent. Family dynamics such as illness in the index child and older sibling missing a vaccination contributed to incomplete age-appropriate vaccination status in the index child.

However, a limitation of our study is that respondents were recruited from health facilities which may increase the likelihood of recruiting mothers already with a positive attitude to infant immunisation. Thus, a community-based study using a door-to-door approach may be more representative of the incomplete vaccination rates and the range of contributory factors. Nevertheless, this study provides important information for driving interventions to improve immunisation compliance and coverage. Health workers should educate caregivers on the need to still attend immunisation clinics even when their children are sick and also initiate recall efforts to prevent caregiver forgetfulness of vaccination appointments.

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Uptake of cervical cancer screening services and its determinants between health and non-health workers in Ibadan, south-Western Nigeria.

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Abstract

Background: Female health workers' knowledge about cervical cancer screening may not translate to better uptake. This study compared the uptake of cervical cancer screening services as well as its determinants between female health and non-health workers in Ibadan, Nigeria.

Methods: A comparative cross-sectional design employing a total population survey was conducted among 602 female health and non-health workers using a semi-structured questionnaire. Data were analysed using descriptive and inferential statistics evaluated at 5% significance level.

Results: Mean age for both groups was 40.8 ± 9 years. More health workers (82.4%) compared to non-health workers (28.4%) had good knowledge of cervical cancer ($p < 0.001$). More health workers (98.4%) compared to non-health workers (84.0%) had good knowledge of cervical cancer screening services ($p < 0.001$). Health workers (23.2%) were not different from non-health workers (18.7%) in their uptake of cervical cancer screening services ($p=0.226$). Doctors were more likely to utilize cervical cancer screening services compared to other female health workers (OR: 4.40, 95% CI: 1.577 – 12.280). Non-health workers on grade level 13 and above (OR: 3.83, 95% CI: 1.495 – 9.823) were more likely to utilize cervical cancer screening services compared to those on grade level 01-06, and those with good knowledge of cervical cancer (OR: 2.11, 95% CI: 1.021 – 4.350) compared to those with poor knowledge.

Conclusion: A knowledge-practice gap exists in uptake of cervical cancer screening services among health workers. Awareness campaigns need to be intensified, particularly among health workers who are not doctors, and the middle/lower cadre non-health workers.

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Keywords: *Cervical cancer; Cancer screening tests; Uptake of Cancer screening; Healthcare workers; Knowledge of cervical cancer.*

Résumé

Contexte: Les connaissances des femmes agentes de santé sur le dépistage du cancer du col de l'utérus peuvent ne pas se traduire par une meilleure utilisation . Cette étude a comparé le recours aux services de dépistage du cancer du col de l'utérus ainsi que ses déterminants entre les femmes agentes et non-agentes de santé à Ibadan, au Nigéria.

Méthodes: Une étude transversale comparative employant une enquête de la population totale a été menée auprès de 602 femmes agentes et non-agentes de santé en utilisant un semi-structuré questionnaire. Les données ont été analysées à l'aide de statistiques descriptives et inférentielles évaluées à un niveau de signification de 5%.

Résultats: L'âge moyen pour les deux groupes était de 40,8 ± 9 ans. Plus d'agentes de santé (82,4%) par rapport aux non-agentes de santé (28,4%) avaient une bonne connaissance du cancer du col de l'utérus ($p <0,001$). Plus d'agentes de santé (98,4 %) par rapport aux non-agentes de santé (84,0%) avaient une bonne connaissance des services de dépistage du cancer du col de l'utérus ($p <0,001$). Les agentes de santé (23,2%) n'étaient pas différentes des non-agentes de santé (18,7%) dans leur recours aux services de dépistage du cancer du col de l'utérus ($p = 0,226$). Les médecins étaient plus susceptibles d'utiliser les services de dépistage du cancer du col de l'utérus que les autres agentes de santé (OR: 4,40, IC à 95%: 1,577 - 12,280). Les non-agentes de santé de niveau 13 et plus (OR: 3,83, IC à 95%: 1,495 - 9,823) étaient plus susceptibles d'utiliser les services de dépistage du cancer du col de l'utérus par rapport à celles du niveau 01-06 et à celles ayant une bonne connaissance du cancer du col de l'utérus (OR: 2,11, IC à 95%: 1,021 - 4,350) par rapport à celles qui ont de faibles connaissances.

Conclusion: Il existe un écart de connaissance-pratique dans l'utilisation des services de dépistage du cancer du col utérin parmi les agentes de santé. Les campagnes de sensibilisation doivent être intensifiées, en particulier parmi les agentes de santé qui ne sont pas médecins, et les non-agentes de santé des cadres moyens/inférieurs.

Mots clés: *Cancer du col de l'utérus; Tests de dépistage du cancer; Adoption du dépistage du cancer; Les agentes de la santé; Connaissance du cancer du col de l'utérus.*

Introduction

Cervical cancer continues to be a disease of public health importance globally. This is especially so in developing countries where it has striking and alarming incidence and mortality rates [1]. According to Ferlay and colleagues, almost nine in ten cervical cancer deaths occur in less developed regions [2]. A major contributor to this high mortality rate in developing countries is the late presentation time to heath facilities [3]. This late presentation can however be prevented if women utilize cervical cancer screening services which help detect the pre-cancerous cervical lesions early enough and this should ideally lead to the early institution of corrective measures to prevent progression to invasive carcinoma which is associated with a high mortality [4, 5].

Uptake of cervical cancer screening services has increased remarkably in the developed countries over the years and this has had striking impact in reducing the mortality from the disease in developed countries [6, 7]. The American Cancer Society statistics revealed that cervical cancer used to be one of the most common causes of cancer death among American women, but this has reduced drastically between 1930 and 2016 partly due to increased uptake of screening services [8,9]. This is not the case with developing countries\ [5]. Despite the availability of low-technology and inexpensive screening tools in low-income countries, cancer screening uptake remains a challenge [10-12].

The conventional cytology is considered as the gold standard for cervical cancer screening, especially in developed countries [13,14]. However, in low-resource settings like Nigeria, low-technology and inexpensive screening tools that could significantly reduce the burden of deaths from cervical cancer, such as Visual Inspection with Acetic Acid (VIA) or Human Papilloma Virus DNA (HPV DNA) testing, are preferred alternatives and these should be optimally utilised [13-15].

The studies on uptake of cervical screening done so far in Nigeria among populations have been among single populations such as students, non-health workers and health workers [11,12,16-18]. There is paucity of data on comparative studies on uptake of cervical cancer screening services, particularly between female health workers and other population groups. By virtue of their profession, health workers are, expectedly, supposed to be more aware and knowledgeable about health issues. Furthermore, the general populace also believes that health workers have positive health behaviors, because of their health-related knowledge. Unfortunately, this knowledge may however not necessarily translate to practice when it comes to their own health [10,19,20]. Such perception might make health workers vulnerable to being neglected by important stakeholders when it comes to their health. A comparative study among female health and non-health workers will help in determining what role the health profession plays in the uptake of cervical cancer screening services. It will also help to determine the differential reasons, if any, for the level of cervical cancer screening uptake among the two groups considering their professions. These findings will be instrumental in the implementation of group-specific cervical cancer screening interventions. In this study, we determined and compared the level of cervical cancer screening services uptake as well as the factors associated with the uptake among female health and non-health workers in Oyo State civil service, Ibadan, Nigeria.

Methods

Study setting

This comparative cross-sectional study was conducted among female health and non-health workers within the Oyo State employ. Oyo State is in the south-western part of Nigeria and has Ibadan as its capital city and administrative headquarters. The Oyo State government secretariat houses 15 state ministerial headquarters; namely, the Ministry of Agriculture, Natural Resources and Rural Development; Ministry of Education, Science and Technology; Ministry of Environment and Water Resources; Ministry of Finance and Budget; Ministry of Justice; Ministry of Information, Culture and Tourism; Ministry of Liaison and Intergovernmental Affairs; Ministry of Lands, Housing, Survey and Urban Development; Ministry of Local Governments and Chieftaincy Matters; Ministry of Special Duties; Ministry of Trade, Industry and Cooperative;

Ministry of Works and Transport; Ministry of Women Affairs, Community Development, Social Welfare and Poverty Alleviation; Ministry of Youth and Sports; and Ministry of Health.

The ministries, each headed by a commissioner, provide overall direction to all the departments, agencies, and boards under them. The Oyo State Hospital Management Board, under the Ministry of Health, provides overall direction for all the government-owned secondary health facilities within the state. Five of the government-owned secondary health facilities namely Adeoyo Maternity Hospital, Jericho Nursing Home, Oni Memorial Hospital, Ring Road State Hospital and Jericho General Hospital are located within Ibadan city. Anecdotal report states that all the government-owned secondary health facilities within the state provide cervical cancer screening services.

All consenting female workers who were permanent members of staff of Oyo State were eligible to participate in the study. The female health workers (doctors, nurses, pharmacists, laboratory scientists and hospital attendants) were recruited from the five government-owned secondary hospitals in Ibadan. While the female non-health workers were recruited from the remaining 14 ministerial headquarters.

A minimum sample size of 223 was calculated per group using the formula for estimating 2 proportions, assuming that the estimated proportion of women utilising cervical cancer screening services among civil servants was 10.2% [17]. However, a total sample of all 602 female workers available in the five government-owned secondary hospitals and the 14 ministerial headquarters in Ibadan were recruited for the study, out of which 546 (261 health workers and 285 non-health workers) completed the survey.

Data collection

Data for this study was collected using a **s**emi-structured questionnaire. The questionnaire was self-administered for staff who could complete it independently, while it was interviewer-assisted for some lower cadre workers who were not able to complete the questionnaires independently. The questionnaires were used to obtain information on the respondents' socio-demographic characteristics. It was also used to obtain information about respondents' knowledge of cervical cancer and cervical cancer screening services. Lastly, the instrument was used to obtain information on respondents' uptake of cervical cancer screening test. Data was collected in the months of May and June, 2017.

Data analysis

The data was analyzed using the Statistical Package for Social Sciences version 20.0.

Response on age at which cervical screening test should be done was considered "correct" if the respondent answered either 21 years and above for pap smear; 30 years and above for VIA; or 30 years and above for HPV DNA. Response on how often cervical screening test should be done was considered "correct" if the respondent answered either every three years for pap smear; annually for VIA; or every five years for HPV DNA.

Fifteen questions were used to assess the respondents' knowledge of cervical cancer. The maximum obtainable score was 15 and the minimum was 0. The 50^{th} percentile score was 8. Scores $\geq$ were categorized as good knowledge of cervical cancer while scores < 8 were categorized as poor knowledge of cervical cancer. Six questions were used for the assessment of the knowledge of cervical cancer screening services. The maximum obtainable score was 6 while the minimum was 0. The 50^{th} percentile score was 3. Respondents with scores $\geq$ 3 were categorized as having good knowledge of cervical cancer screening services while those with scores < 3 were categorized as having poor knowledge of cervical cancer screening services.

Uptake of cervical screening services was determined by asking the question "Have you ever had cervical cancer screening test done before?" Respondents who answered "yes" to this question were considered as having had a cervical cancer screening test done while those who answered "no" were considered not to have had a cervical cancer screening test done.

Summary statistics were generated, and these were used to describe the data. Bivariate analysis using Chi-Square test and Fisher's Exact test were used to determine associations between variables while multivariate analysis using binary logistic regression was done to determine the predictors of uptake of cervical cancer screening services. Level of statistical significance was set at 5%.

Ethical consideration

Ethical approval for this study was obtained from the Oyo State Ethical Review Committee. Permission was also sought from the Head of Service at the Governor's Office in Ibadan, Nigeria and the Chief

Table 1. Socio-demographic characteristics of respondents

Characteristics	Health workers n (%)	Non-health workers n (%)
Designation of health workers (n = 250)		
Doctors	26 (10.4)	N/A
Nurses	154 (61.6)	N/A
Pharmacists	26 (10.4)	N/A
Laboratory scientists	25 (10.0)	N/A
Hospital attendants	19 (7.6)	N/A
Designation of non-health workers (n =225)		
Level 01 – 06	N/A	89 (39.6)
Level 07 – 12	N/A	100 (44.4)
Level 13 and above	N/A	36 (16.0)
Age (in years)		
< 40	92 (36.8)	98 (43.6)
≥40	158 (63.2)	127 (56.4)
	$X^2 = 2.25$	p = 0.133
Mean age ± S.D (in years) †	40.8 ± 9	40.8 ± 9
Ethnicity		
Yoruba	239 (95.6)	214 (95.1)
Others ‡	11 (4.4)	11 (4.9)
	$X^2 = 0.06$	p = 0.800
Religion		
Christianity	193 (77.2)	179 (79.6)
Islam	57 (22.8)	46 (20.4)
	$X^2 = 0.39$	p = 0.534
Marital status		
Single	38 (15.2)	42 (18.7)
Married	205 (82.0)	171 (76.0)
Others §	7 (2.8)	12 (5.3)
	$X^2 = 3.28$	p = 0.194
Level of education		
Below tertiary	11 (4.4)	28 (12.4)
Tertiary	239 (95.6)	197 (87.6)
	$X^2 = 10.17$	p = 0.001

† *S.D – Standard deviation;* ‡ *Others – Igbo, Hausa;* § *Others – Divorced, Widowed, Separated; N/A – Not applicable*

Consultant of each of the general hospitals where the study was conducted. Written informed consent was obtained from the participants before enrolling them in the study.

Results

Socio-demographic characteristics

A total of 602 questionnaires were administered. Out of these, 546 women filled and returned their questionnaires, giving a response rate of 90.7 %. Only 475 (87%) questionnaires were fit for analysis out of the 546 that were returned. Two hundred and fifty (52.6%) were from the female health workers while 225 (47.4%) were from the female non-health workers.

More than half (61.6%) of the health workers were nurses while 44.4% of the non-health workers were civil servants on grade level 07-12. The mean age was 40.8 ± 9 years for both groups. More of the health workers (95.6% and 82%) compared to the non-health workers (95.1% and 76%) were of the Yoruba tribe and currently married, respectively. In terms of their age, ethnicity, religion, and marital status the female health workers were not significantly different from the non-health workers. (p = 0.133, 0.800, 0.534 and 0.194 respectively) However, in terms of their level of education, 95.6% of the female health workers compared to 87.6% female non-health workers had tertiary education (p = 0.001). (Table 1)

Knowledge about cervical cancer and cervical cancer screening services

Two hundred and forty-six (98.4%) health workers and one hundred and eighty-eight (83.6%) non-health

Table 2. Knowledge of respondents on cervical cancer

Variables	Health workers n (%)	Non-health workers n (%)
Ever heard about cervical cancer		
Yes	246 (98.4)	188 (83.6)
No	4 (1.6)	37 (16.4)
Source of information about cervical cancer †		
Television [no. of Yes (%)]	108 (43.2)	85 (37.8)
Radio [no. of Yes (%)]	85 (34.0)	61 (27.1)
Internet [no. of Yes (%)]	92 (36.8)	55 (24.4)
Print media [no. of Yes (%)]	63 (25.2)	28 (12.4)
Health workers [no. of Yes (%)]	191 (76.4)	74 (32.9)
Religious gatherings [no. of Yes (%)]	34 (13.6)	25 (11.1)
Family and friends [no. of Yes (%)]	35 (14.0)	40 (17.8)
Causes of cervical cancer †		
Spiritual attack [no. of Yes (%)]	17 (6.8)	14 (6.2)
Having sex at an early age [no. of Yes (%)]	92 (36.8)	43 (19.1)
Human papilloma virus [no. of Yes (%)]	179 (71.6)	51 (22.7)
Use of oral contraceptive [no. of Yes (%)]	66 (26.4)	28 (12.4)
Smoking [no. of Yes (%)]	59 (23.6)	16 (7.1)
Excessive alcohol intake [no. of Yes (%)]	41 (16.4)	18 (8.0)
Promiscuity [no. of Yes (%)]	123 (49.2)	52 (23.1)
Unprotected sex [no. of Yes (%)]	66 (26.4)	25 (11.1)
Family history of cervical cancer [no. of Yes (%)]	127 (50.8)	31 (13.8)
Symptoms of cervical cancer †		
Painful menstruation [no. of Yes (%)]	42 (16.8)	19 (8.4)
Excessive menstrual flow [no. of Yes (%)]	89 (35.6)	15 (6.7)
Bleeding after sex [no. of Yes (%)]	197 (78.8)	55 (24.4)
Bleeding after menopause [no. of Yes (%)]	114 (45.6)	26 (11.6)
Foul-smelling vaginal discharge [no. of Yes (%)]	136 (54.4)	55 (24.4)
Can cervical cancer be detected at an early stage?		
Yes	222 (88.8)	111 (49.3)
No	9 (3.6)	7 (3.1)
Do not know	19 (7.6)	107 (47.6)
Overall Knowledge of cervical cancer		
Good	206 (82.4)	64 (28.4)
Poor	44 (17.6)	161 (71.6)
	$X^2 = 140.53$	$p<0.001$

† *Multiple response*

workers have heard of cervical cancer. The top three common sources of information about cervical cancer among the health workers were from health workers (76.4%), the television (43.2%) and the internet (36.8%). Among the non-health workers, the top three common sources of information about cervical cancer were from the television (37.8%), health workers (32.9%) and the radio (27.1%). One hundred and seventy-nine (71.6%) health workers correctly identified the Human Papilloma Virus as the cause of cervical cancer compared to fifty-one (22.7%) non-health workers. Concerning detection of cervical cancer, 88.8% of the health workers correctly stated that it can be detected at an early stage while 49.3% of t non-health workers knew that it can be detected at an early stage. Overall, 84.2% of the health workers compared to the non-health workers (28.4%) had good knowledge of cervical cancer ($p < 0.001$). (Table 2)

Pap smear was recognised as a screening test for cervical cancer by 90.8% of the health workers and 35.1% of non-health workers while 18.4% of health workers and 8% of non-health workers identified Visual Inspection with Acetic Acid (VIA) as a cervical cancer screening test. Two hundred and twelve (86.2%) health workers and one hundred and eighty-three (96.3%) non-health workers could not correctly state the age at which the cervical cancer screening test should be commenced. The

frequency of the screening test was known by 66.3% of health workers and 83.2% of non-health workers. Among the health workers, 72% were aware of a screening centre around them compared to 35.8% of non-health workers. Overall, 98.4% of health workers were more knowledgeable about cervical cancer screening services compared to 84% of non-health workers ($p < 0.001$). (Table 3)

Table 3: Knowledge of respondents on cervical cancer screening services

Variables	Health workers n (%)	Non-health workers n (%)
Types of cervical cancer screening services †		
Pap smear [no. of Yes (%)]	227 (90.8)	79 (35.1)
VIA [no. of Yes (%)]	46 (18.4)	18 (8.0)
HPV DNA [no. of Yes (%)]	54 (21.6)	23 (10.2)
Age at which cervical screening should be done		
Correct	34 (13.8)	7 (3.7)
Incorrect	212 (86.2)	183 (96.3)
How often cervical screening should be done		
Correct	83 (33.7)	32 (16.8)
Incorrect	163 (66.3)	158 (83.2)
Awareness of a cervical screening centre around the respondent		
Yes	177 (72.0)	68 (35.8)
No	69 (28.0)	122 (64.2)
Overall knowledge of cervical screening services		
Good	246 (98.4)	189 (84.0)
Poor	4 (1.6)	36 (16.0)
	$X^2 = 31.84$	$p<0.001$

† *Multiple response*

Uptake of cervical cancer screening services

Health workers were not statistically different from the non-health workers with respect to their uptake of cervical screening services. Only 23.2% of the health workers and 18.7% of the non-health workers have had cervical cancer screening done ($p = 0.226$). (Table 4) The highest motivator for undertaking a cervical cancer screening test among both health workers and non-health workers who have been screened was eagerness to know their health status (48.7% and 42.9% respectively). (Table 4)

Fewer (40.6%) health workers who have not been screened for cervical cancer compared to 42.9% of non-health workers who have not been screened said they will be willing to go for the screening if it is free. Fewer (18.2%) health workers were not willing to have a cervical screening test done compared to 32.2% of non-health workers. The commonest reasons for lack of willingness to be screened for cervical cancer among health workers and non-health workers, even if it is free or at a reduced cost, is lack of interest (57.1% and 52.5% respectively). (Table 4)

Determinants of cervical cancer screening services uptake

Among the female health workers, the doctors had the highest proportion (42.3%) of staff who had been screened for cervical cancer compared to the nurses (24.0%) and other cadres of female health workers (14.3%). ($p = 0.014$) The female non-health workers who were level 13 and above had the highest proportion (38.9%) of female staff who had been screened for cervical cancer compared to female staff on level 01 – 06 (12.4%) and female staff on level 07 – 12 (17.0%). ($p = 0.002$) Female non-health workers who had good knowledge about cervical cancer had a higher proportion (29.7%) of uptake of cervical cancer screening services compared to those with poor knowledge (14.3%). ($p = 0.007$) Lastly, female non-health workers who had good knowledge of cervical cancer screening services, had a statistically significant higher proportion (22.2%) of them who had been screened for cervical cancer compared to those with poor knowledge (0%). ($p <0.001$) (Table 5)

The only predictor of uptake of cervical cancer services among the female health workers was designation. Female doctors were found to be 4

Table 4: Uptake of cervical screening services among respondents

Variables	Health workers n (%)	Non-health workers n (%)
Uptake of cervical cancer screening services		
No	92 (76.8)	183 (81.3)
Yes	158 (23.2)	42 (18.7)
	$X^2 = 1.46$	p = 0.226
Screening practice among respondents that have had screening done (N = 100)		
Number of times screening has been done		
Once	43 (74.1)	27 (64.3)
Two or more times	15 (25.9)	15 (35.7)
Last time screening was done		
≤3 years ago	44 (75.9)	30 (71.4)
>3 years ago	14 (24.1)	12 (28.6)
Factors that motivated uptake among screened respondents (n=67)		
Eagerness to know my health status	19 (48.7)	12 (42.9)
Health worker/health education	2 (5.1)	6 (21.4)
Free medical outreach/screening	4 (10.3)	5 (17.9)
Routine medical check-up	4 (10.3)	3 (10.7)
Health issues	8 (20.5)	0 (0.0)
Family and friends	2 (5.1)	2 (7.1)
Willingness to be screened among respondents that have never had screening test done (N = 375)		
Willingness to have a screening test done		
Yes; if free	78 (40.6)	79 (43.2)
Yes; if at a reduced cost	79 (41.2)	45 (24.6)
No	35 (18.2)	59 (32.2)
Reasons for lack of willingness to have screening test done †		
Not interested	20 (57.1)	31 (52.5)
Not at risk	5 (14.3)	2 (3.4)
Scared of outcome	2 (5.7)	2 (3.4)
Fear of procedure	3 (8.6)	2 (3.4)
Screening service environment is not conducive	0 (0.0)	3 (5.1)
Screening procedure is embarrassing	0 (0.0)	1 (1.7)
Would wait for a later date	1 (2.9)	6 (10.2)
Lack of time	1 (2.9)	5 (8.5)

† *Multiple response*

times more likely to have been screened for cervical cancer compared to other cadres of female health workers. (OR = 4.4, 95% CI = 1.577 – 12.280). Among the female non-health workers, designation and knowledge of cervical cancer were predictors of uptake of cervical cancer. Female non-health workers who were on level 13 and above were 4 times more likely to have been screened for cervical cancer compared to female non-health workers who were on level 01 to 06. (OR = 3.83, 95% CI = 1.495 – 9.823). Lastly, female non-health workers with good knowledge of cervical cancer were 2 times more likely to have been screened for cervical cancer compared to those with poor knowledge of cervical cancer. (OR = 2.11, 95% CI = 1.021 – 4.350). (Table 5)

Discussion

Female health workers in this study were found to be more knowledgeable about cervical cancer compared to the female non-health workers. This comparative study corroborates the findings from previous single population studies conducted among these groups. Oche and colleagues found that 98.6% of the female health workers interviewed in their study in North Western Nigeria were knowledgeable about cervical cancer [12]. Similarly, Awodele and colleagues in their study conducted in South Western Nigeria on cervical cancer screening amongst nurses in Lagos University Teaching Hospital, Lagos, Nigeria also reported a high proportion (99%) of health workers with good knowledge of cervical

Table 5: Bivariate and logistic regression analysis of predictors of uptake of cervical cancer screening

	Uptake of cervical cancer screening services							
	Non-health workers				**Non-Health workers**			
Variables	No n (%)	Yesn (%)	Adjusted OR (CI) ‡	p-value***	Non (%)	Yesn (%)	Adjusted OR (CI) ‡	p-value***
Designation of health workers								
Doctors	15 (57.7)	11 (42.3)	4.40 (1.577 – 12.280)	**0.005**	N/A	N/A	N/A	N/A
Nurses	117 (76.0)	37 (24.0)	1.90 (0.883 – 4.077)	0.101	N/A	N/A	N/A	N/A
Others †	60 (85.7)	10 (14.3)	1.00 (Reference)		N/A	N/A	N/A	N/A
	$X^2 = 8.51$	**P = 0.014***						
Designation of non-health workers								
Level 01 – 06	N/A	N/A	N/A	N/A	78 (87.6)	11 (12.4)	1.00 (Reference)	
Level 07 – 12	N/A	N/A	N/A	N/A	83 (83.0)	17 (17.0)	1.47 (0.644 – 3.357)	0.360
Level 13 and above	N/A	N/A	N/A	N/A	22 (61.1)	14 (38.9)	3.83 (1.495 – 9.823)	0.005
					$X^2 = 12.21$	P = 0.002*		
Age (in years)								
<40	72 (78.3)	20 (21.7)			85 (86.7)	13 (13.3)		
≥40	120 (75.9)	38 (24.1)			98 (77.2)	29 (22.8)		
	$X^2 = 0.17$	P = 0.676*			$X^2 = 3.34$	P = 0.068*		
Ethnicity								
Yoruba	184 (77.0)	55 (23.0)			174 (81.3)	40 (18.7)		
Others	8 (72.7)	3 (27.3)			9 (81.8)	2 (18.2)		
		P = 0.721**				P = 1.000**		

† *Others – Pharmacists, laboratory scientists and hospital attendants;* * *p-value in Chi-square test;* ** *p-value in Fisher's Exact test;* ‡ *Adjusted odds ratio in binary logistic regression (confidence interval);* *** *p-value in binary logistic regression*

Table 5: Bivariate and logistic regression analysis of predictors of uptake of cervical cancer screening

Variables	Uptake of cervical cancer screening services							
	Health workers				Non-health workers			
	No n (%)	Yes n (%)	Adjusted OR (CI)‡	p-value***	No n (%)	Yes n (%)	Adjusted OR (CI)‡	p-value***
Marital status								
Not currently married †	37 (82.2)	8 (17.8)			46 (85.2)	8 (14.8)		
Currently married	155 (75.6)	50 (24.4)			137 (80.1)	34 (19.9)		
	$X^2=0.91$	P = 0.341*			$X^2=0.69$	P = 0.405*		
Religion								
Christianity	151 (78.2)	42 (21.8)			147 (82.1)	32 (17.9)		
Islam	41 (71.9)	16 (28.1)			36 (78.3)	10 (21.7)		
	$X^2=0.98$	P = 0.321*			$X^2=0.36$	P = 0.549*		
Level of education								
Below tertiary	11 (100.0)	0 (0.0)			24 (85.7)	4 (14.3)		
Tertiary	181 (75.7)	58 (24.3)			159 (80.7)	38 (19.3)		
		P = 0.073**				P = 0.615**		
Knowledge of cervical cancer								
Good	155 (75.2)	51 (24.8)			45 (70.3)	19 (29.7)	2.11 (1.021 – 4.350)	**0.044**
Poor	37 (84.1)	7 (15.9)			138 (85.7)	23 (14.3)	1.00 (Reference)	
	$X^2=1.59$	P = 0.207*			$X^2=7.16$	P = 0.007*		
Knowledge of cervical cancer screening services								
Good	188 (76.4)	58 (23.6)			147 (77.8)	42 (22.2)		
Poor	4 (100.0)	0 (0.0)			36 (100.0)	0 (0.0)		
		P = 0. 576**				**P < 0.001****		

*† Not currently married – Single, Widowed, Divorce, Separated; * p-value in Chi-square test; ** p-value in Fisher's Exact test; ‡ Adjusted odds ratio in binary logistic regression (confidence interval); *** p-value in binary logistic regression*

cancer [21]. In the same vein, previous studies conducted among non-health workers showed that the proportion of non-health workers who were knowledgeable about cervical cancer was not as high as that recorded among health workers. Two studies conducted in the North Central region of Nigeria revealed that the proportion of female non-health workers knowledgeable about cervical cancer were 50.9% and 67% respectively [17,22].

The fact that health workers are more knowledgeable about cervical cancer is not surprising and it is in fact expected. Their profession as health workers gives them an upper edge over the non-health workers. Health workers have always been in contact with the health environment since their training periods and as such have first-hand information about cervical cancer from their trainers, colleagues, co-workers, self-study and professional experience. Some of these sources of information about cervical cancer were corroborated by the findings from this current study which revealed that quite a number of the health workers (76.4%) got their information from the health workforce who can either be their trainers, colleagues or co-workers.

Like the knowledge of cervical cancer, female health workers were found to be more knowledgeable about cervical cancer screening services compared to the female non-health workers in the overall analysis for knowledge of cervical cancer screening services. A high proportion of health workers were aware of Pap smear compared to non-health workers and which has also been documented in other studies [12, 17]. However, in other domains used to measure the overall knowledge of cervical cancer screening services we recorded a low proportion in both groups. Very few female health and non-health workers were aware of VIA and HPV DNA. Also, very few respondents in both groups knew the correct age at which cervical cancer screening tests should commence and the interval for the screening. This finding underscores the need to raise awareness on this information among females irrespective of their occupation for the derivation of maximum benefit from these services.

It was a bit surprising and disturbing to find that health workers were not different from non-health workers in their uptake of cervical cancer screening tests in this study. As health workers, due to their knowledge and role in the prevention and treatment of cervical cancer, one would expect that more health workers will undertake cervical cancer screening. This is however not the case as revealed by this study. Being a health worker does not guarantee the fact that a woman will go for a cervical cancer screening test and this indicates a huge knowledge-practice gap. Prevention programs should not assume health workers will go for cervical cancer screening, rather health workers should be one of the major target groups for prevention so that they do not become neglected.

Apart from the fact that health workers were not different from non-health workers in their cervical screening uptake, the proportion of respondents who have had cervical cancer screening done among the two populations that were assessed in our study was a bit low. Previous studies conducted separately among these groups in Nigeria reported similarly low values. Ugwu and colleagues reported an uptake of 14.1% among female health workers in South Eastern Nigeria [18]. Oche and colleagues reported an uptake of 10% among health workers in Northern Nigeria [12]. Ehiemere and colleagues also reported an uptake of 26.4% in a more recent study among health workers [11]. A similar pattern of uptake had also been observed in studies among the non-health workers. Owoeye and colleagues reported an uptake of 13% among Federal civil servants in the Niger Delta region of Nigeria [23]. Hyacinth and colleagues reported an uptake of 10% among federal civil servants in North Central Nigeria [17], while, more recently, Modibbo and colleagues reported an uptake of 38.8% among Nigerian women that were selected from the general population [24].

From our study, a major reason why some of the women in both groups have not had cervical screening test done was cost. They were willing to screen for cervical cancer if it was made free or even if it was available at a reduced cost. This finding underscores the need to further subsidize the cost for cervical cancer screening by important government and non-governmental agencies involved. Hopefully, this will help increase the coverage of cervical cancer screening among eligible women. In addition to cost subsidy, there is also an urgent need to engage in aggressive awareness messages to all women who are eligible for cervical screening irrespective of their occupation if a reduction in the cervical cancer burden is truly desired. This assertion was also made by Abiodun and colleagues [25].

These awareness programs should include motivational messages to heighten the interest of eligible women as some women who were not willing to go for cervical cancer screening in this study said they were not going to assess cervical cancer screening services because they were just not

interested, even if it is free or at a reduced cost. The awareness program should also address other barriers associated with uptake of cervical cancer screening services in sub-Saharan Africa which was documented in a recent systematic review [26]. This includes improving cervical cancer education and addressing cultural beliefs and practices.

In moving forward, the result of our logistic regression helps us to identify the group of health workers and non-health workers that should be prioritized when designing the intervention packages. Among the health workers, other health workers like the pharmacists, laboratory scientists and health attendants should be the target. This finding sounds to reason. This group of health workers may not have enough information on how screening could help to prevent cervical cancer when compared to the doctors and nurses who are more clinically oriented. Hence, they may not see a need to utilize cervical cancer screening services for prevention. Among the non-health workers, officers on salary grade level 01 to 12 with poor knowledge of cervical cancer should be the target for improved education on cancer screening services.

A major limitation in this study was the sample size. The sample size used for each group in this comparative study was not large enough. Hence, a few cells in the bivariate analysis had zero counts and such variables could not be fitted into the logistic regression model. Despite this limitation however, this study was able to highlight some important information which will be useful in improving the uptake of cervical screening among health workers and non-health workers.

Conclusions

This study demonstrated that female health workers were not different from female non-health workers with regards to their uptake of cervical cancer screening services despite their better knowledge of cervical cancer and cervical cancer screening services. This implies a knowledge-practice gap among health workers and is a major cause for concern.

To address the low uptake of cervical cancer screening services in both groups, awareness efforts should be intensified by concerned stakeholders while also further subsidizing the cost of the cervical cancer screening services. The awareness program should target female health workers who do not have much clinical orientation and the middle and lower cadre non-female health workers.

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Clinical success rate of apicectomy in a teaching hospital: a 12 month follow-up

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Abstract

Introduction: The continued justification for the use of apicectomy as a treatment option especially in the light of emerging treatment options such as implant treatment will depend on its success rate. Therefore, there is the need for new evidence on the success rate of apicectomy in our environment.

Aim: To determine the success rate of apicectomy by types of teeth, diagnosis, age group, and gender.

Method: Forty apicectomies were performed in 33 patients of whom 19 were males (57.6%) and 14 were females (42.4%). Patients were followed up clinically and radiographically for 12 months.

Results: The overall success rate of apicectomy in this study was 80.0%. Females had 93.3% compared to 72.0% in males, 100% success rate for all participants above 30 years with the least success rate at age 21-30. Maxillary central incisors were the most frequently apicectomized teeth 22 (55%) followed by maxillary lateral incisors 9 (22.5%). A higher success rate was recorded in the upper anterior teeth than in the upper posterior teeth and in the maxilla than in the mandible. A lower success rate (71.4%) was found among those who presented with failed root canal therapy/retreatment than those with radicular cysts (81.3%).

Conclusion: The overall success rate after one year follow up was high. Also variations in the success rate of apicectomy were noted with females, those above 30 years of age, anterior teeth, maxillary teeth and those diagnosed as radicular cysts having higher success rates.

Keywords: *Apicectomy, root canal treatment, Success rate.*

Résumé

Introduction: La justification continué de l'utilisation de l'apicectomie comme option de traitement, en particulier à la lumière des options de traitement émergentes telles que le traitement implantaire, émergentes telles que le traitement implantaire, dépendra de son taux de réussite. Par conséquent, il est nécessaire de disposer de nouvelles preuves sur le taux de réussite de l'apicectomie dans notre environnement.

Objectif: Pour déterminer le taux de réussite de l'apicectomie par type de dents, diagnostic, groupe d'*âge et sexe.*

Méthode: Quarante apicectomies ont été réalisées chez 33 patients dont 19 hommes (57,6%) et 14 femmes (42,4%). Les patients ont été suivis cliniquement et radiographiquement pendant 12 mois.

*Résultats***:** Le taux de réussite global de l'apicectomie dans cette étude était de 80,0%. Les femmes avaient 93,3% par rapport à 72,0% chez les hommes, un taux de réussite de 100% pour tous les participants de plus de 30 ans avec le taux de réussite le moins élevé entre 21 et 30 ans. Les incisives centrales maxillaires étaient les dents les plus fréquemment apicectomisées 22 (55%) suivies des incisives latérales maxillaires 9 (22,5%). Un taux de réussite plus élevé a été enregistré dans les dents antérieures supérieures que dans les dents postérieures supérieures et dans le maxillaire que dans la mandibule. Un taux de réussite inférieur (71,4%) a été trouvé chez ceux qui ont présenté un échec de thérapie / retraitement de canal radiculaire que ceux avec des kystes radiculaires (81,3%).

Conclusion: Le taux de réussite global après un an de suivi était élevé. Des variations du taux de réussite de l'apicectomie ont également été notées chez les femmes, ceux âgés de plus de 30 ans, les dents antérieures, les dents maxillaires et celles diagnostiquées comme kystes radiculaires ayant des taux de réussite plus élevés.

Mots clés : *Apicectomie, traitement de canal radiculaire, taux de réussite.*

Introduction

Investigations into the clinical success rate of apicectomy as treatment option in endodontics is very important to justify its continued relevance in the light of recent advances in restorative dentistry

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such as implants. Furthermore, the increase in the number of patients requiring such interventions especially after unsuccessful endodontic treatments is noted. It is important to have a baseline data so as to give the patient proper information to be able to make informed decision.

Earlier studies have reported wide disparity in the success rate of apicectomy [1-3]. However, such disparities could be explained by the nature of those studies, the different sample sizes, the period of recall and most importantly, the criteria used for evaluating clinical and radiographic parameters of healing. Other determinants of success include; patients demographics and systemic condition, tooth involved (type, number and location), amount and location of bone loss, quality of previous root canal treatment or retreatment, coronal restoration, occlusal microleakage, surgical materials and techniques, and the surgeon's skill [4-6]. For example, a review of literature by Chandler and Koshy reported a success rate ranging from 34% to 99%, with the mean success rate of 82.5% [7].

The variation in the success rates of the studies could be attributed to the varied lengths of follow-up and the non-uniform criteria to characterize success of treatment. In another study, a success rate of 64% was reported, with the best results found when root filling and apicectomy were carried out at the same visit and when periapical lesions were less than 5mm in diameter [3]. These studies reviewed treatment outcomes in both the anterior and posterior teeth. However, a retrospective study of apicectomies on anterior teeth showed a remarkable higher success rate of 71.9% after a follow-up period of 2 to 4 years [8]. The result of this study is in agreement with some other previous studies that investigated the outcome of apicectomy treatment in anterior teeth [3,5].

Studies evaluating apicectomy of the posterior teeth are limited with many of them showing lower success rate compared to the anterior teeth. A retrospective study of apicectomies performed on posterior teeth revealed clinical success rate of 62% as determined by radiographic and clinical criteria [9]. Furthermore, Friedman et al reported a success rate of 44%, uncertain in 23% and unsuccessful in 33% of the 136 roots where the apicectomy procedure was performed on premolars and molar teeth [10]. However, a more recent study which claimed to utilize a more rigorous surgical protocol in both anterior and posterior apicectomies but with more number of posterior teeth, found a success rate of 91% using both radiographic evaluation criteria and clinical evaluation of signs and symptoms of disease or loss of function [11]. The high success rate could be due to well-defined case selection including elimination of cases with severe periodontal diseases, vertical root fracture, perforation of furcations, resorptive processes involving more than the apical third and inadequate final restoration before surgery.

As a result of the disparities in success rates from various studies, this study attempted to overcome some of the confounders implicated in earlier studies by determining the success rate of apicectomy by types of teeth, diagnosis, age group and gender. This would also provide a baseline data for future comparative purposes.

Method

The study is a prospective study to determine the success rate of apicectomy after 12 months follow up period. Study population consisted of all consecutive patients that presented at Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, requiring apicectomy as treatment option, within a period of 12 months. Ethical approval was obtained from the ethics committee of the Hospital. Included were subjects that required and had apicectomy as treatment option in our centre, subjects in which the root anatomy of the tooth allowed conventional debridement of the root canal who gave their informed consent and completed 12 month recall visits. Excluded were subjects in which the tooth had roots with obliterated canals, grossly broken crowns, advanced periodontal disease, vertical fractures and those that declined to participate in the study. Detailed relevant history such as patient demographics and the past dental and medical history was taken to rule out any systemic diseases of importance such as uncontrolled diabetes mellitus and bleeding disorder. .

Detailed extra- and intra-oral examination and investigations such as pulp vitality and radiological investigations were carried out. Clinical symptoms and signs such as pain, swelling, sinus, tooth mobility, and tenderness to percussion were noted. Preoperative radiographs Clinical indications for apicectomy such as radicular cysts, chronic apical infections, failed endodontic treatments and failed retreatment were documented. Teeth with blocked/ obliterated canals, badly broken crown, severe periodontitis and those with vertical fractures were excluded. All the patients were treated under local anesthesia using 2% lignocain HCl with 1: 80000 lignocaine adrenaline vasoconstrictor. Access was

made into the canals through coronal access cavity in all cases and conventional canal debridement was done using K-type reamers and files. In cases of failed conventional root canal treatments, old canal obturations were removed and canal cleaning were repeated. During the instrumentation, canals were irrigated with 5.25% sodium hypochloride solution alternate with normal saline solution. After raising full thickness mucoperiosteal flap, the overlying cortical bone was removed with a bone-cutting bur using very light, brushing strokes under continuous normal saline irrigation until the apex of the tooth was exposed. When present, pathologic tissues located around or adjacent to the root were removed by curettage. This was accomplished with curved surgical bone curettes which were used to detach the soft tissue from the bone. Once loosened, tissue forceps were used to grasp the tissue gently as it was teased from its position with a bone curette. The recovered soft tissue was placed in a labelled bottle containing 10% formal saline and sent for histopathologic examination. Root-end resection was performed with bur at high speed, with about 2 mm of resection. The resection was done with a bevel angle of about 45 degree facing the buccal surface for canal visibility and access for the root-end filling material.

Following the apical resection, root canals were thoroughly irrigated with normal saline and dried with paper points. Root canal obturations were done with gutta percha and zinc oxide eugenol based sealer using lateral condensation technique. The placement of gutter percha was such that it protruded beyond the resected root apex. Excess filling materials were removed from the apical region using fine diamond bur at high speed. A small oval root-end cavity preparation was created using diamond bur and root-end filling of ethoxybenzoic acid modified zinc oxide eugenol (Super-EBA) was placed in the cavity. A fine diamond bur was used to polish the super-EBA and the apical surface. The coronal access cavities were sealed with amalgam. Although amalgam phase down is been advocated in clinical dentistry, its use is still appropriate for now.

After thorough irrigation of operation site with normal saline and achievement of hemostasis, the reflected tissues were re-approximated to their original position and sutured with non-absorbable suture (3/0 black silk suture). Antibiotics (caps ampiclox 500mg 6 hourly x 5days, tabs metronidazole 400mg 8 hourly x 5days) and non-steroidal anti-inflammatory analgesics (tabs ibuprofen 400mg 8hourly x 3days) were routinely prescribed prophylactically except in patients with peptic ulcer disease which were given paracetamol 500 mg 8hly for 3 days. Postoperative instructions were given in verbal and written forms.

Patients were seen within 1 week for postoperative radiographs and suture removal. Patients were recalled at 6 and 12 months post operatively and assessed clinically for signs and symptoms such as pain, tenderness, swelling, sinus and tooth mobility. Also radiographs were taken during each review session using standardized radiographs taken at similar angulations for comparison with those taken 1 week post operatively for evidence of bone healing. All radiographs were taken by the same radiographer who was initially calibrated for the procedure. The extent of periapical destruction was defined as the average of 2 greatest diameter of bone cavity measured in millimeters on radiographs taken 1 week after operation [5].

The examinations and treatments of all the patients were done by the author (JO). The treatment outcomes were assessed by the author (JO) and an independent observer (AO) who was blinded to the objectives of the study Evaluation of healing results was based on clinical and radiographic observations. Clinically the teeth were assessed for tenderness to percussion or palpation of the mucoperiosteal tissue overlying the apical region, evidence of fistula, presence of swelling or tooth mobility. The patient was also asked for any symptoms such as pain since the last visit. Radiographic evaluations were done using Rud's *et al.* classification [12] as follows:

1. Complete healing (successful): Complete bone regeneration around the apex with or without a recognizable periodontal ligament space.
2. Incomplete healing (scar tissue): A periradicular rarefaction (in comparison with a postoperative or previous follow-up radiograph), either decreased or stationary, the rarefaction is irregular and often has asymmetrical outline and an angular connection to the periodontal ligament.
3. Uncertain healing: A rarefaction located symmetrically around the apex, with a funnel shaped connection to the periodontal ligament space; the size of the rarefaction is less than it appears to be on the 1 week postoperative radiograph.
4. Unsatisfactory healing (failure): The same radiographic signs as those of uncertain healing, except that the area of the rarefaction is either enlarged or unchanged in comparison to the

immediate postoperative condition. Overall treatment results were classified as:

Successful- Criteria for successful healing included absence of clinical signs/symptoms and a radiographic classification of complete or incomplete healing.

Doubtful- Criteria for doubtful cases included absence of clinical signs/symptoms and a radiographic classification of uncertain healing.

Unsuccessful\Failure-Criteria for failure included the presence of any clinical signs/symptoms and/or a radiographic classification of unsatisfactory healing.

Data were analyzed using IBM SPSS for Windows version 22.0. Analysis included frequency, cross tabulations and calculation of means. Associations between discrete variables were tested by Chi-Square and Fisher's exact test as appropriate. Differences were taken as significant at $p<0.05$.

Table 1: Gender Distribution

Gender	No of patient	%	No of teeth treated	%
Male	19	57.6	25	62.5
Female	14	42.4	15	37.5
Total	33	100.0	40	100.0

Table 2: Treatment outcome related to gender.

Gender	Teeth treated No (%)	Successful No (%)	Doubtful No (%)	Failure No (%)
Male 19	25 (62.5)	18 (72.0)	4 (16.0)	3 (12.0)
Female 14	15 (37.5)	14 (93.3)	- -	1 (6.7)
Total 33	40 (100.0)	32 (80.0)	4 (10.0)	4 (10.0)

Table 3: Treatment outcome by Age categories after correction for age

Age Categories (years)	Successful	Doubtful	Failure	Total
16 – 20	5 (83.3)	1(16.7)	0 (0.0)	6 (100.0)
21 – 30	21(75.0)	3(10.7)	4 (14.3)	28 (100.0)
31 – 40	2 (100.0)	0 (0.0)	0 (0.0)	2(100.0)
41 – 50	1(100.0)	0 (0.0)	0 (0.0)	1(100.0)
Above 50	3 (100.0)	0 (0.0)	0 (0.0)	3(100.0)
Total	32 (80.0)	4(10.0)	4(10.0)	40 (100.0)

Results

Forty apicetomies were performed in 33 participants out of which 19 were males (57.6%) and 14 were females (42.4%) (Table 1). Of the 40 apicectomies, 25 (62.5%) were done in males while 15 (37.5%) in females. The females had 93.3% success rate compared to 72.0% in males (Table 2). However, when doubtful and failure outcome were combined as not successful for the purpose of statistical analysis, there was no significant gender difference on the treatment outcome. (Fisher's exact test = 0.219)

There was 100% success rate for all participants above 30 years. The least recorded success rate was in age 21-30 category (Table 3). There was no significant age difference in the treatment outcome. (Fisher's exact test = 1.000) The maxillary central incisors were the most frequently apicectomized teeth 22 (55%) followed by the maxillary lateral incisors 9 (22.5%). Thirty five teeth that were treated were in the maxilla representing 87.5% while only 5 teeth (12.5%) were in the mandible. More successful outcome (82.9%) was found in the maxilla than in the mandible (60.0%).

However the difference in jaw location in relation to treatment outcome was not statistically significant (Fishers exact test p= 0.556). The success rate recorded in the upper anterior was higher than those reported in the upper posterior (Table 4).

The general success rate of this study (80.0%), is consistent with the upper limits of different cited reports; 25-90% [14] and 58-96% [1-3]. This could possibly be due in part to both rigorous case selection and surgical technique. A similar approach to the control of these variables was used by Rubinstein and Kim in which a success rate of 96.8% was reported after a one-year assessment [15]. In this study, cases were classified as successful after one year in the absence of clinical signs and symptoms

Table 4: Treatment outcome according to tooth type and jaw site

Type of Teeth	Treatment outcome			
	Successful	Doubtful	Failure	Total
Upper Central Incisor	18 (81.8)	2 (9.1)	2 (9.1)	22 (100.0)
Upper lateral Incisor	8 (88.9)	0 (0.0)	1(11.1)	9 (00.0)
Upper premolars	3 (75.0)	1(25.0)	0 (0.0)	4 (100.0)
Lower central incisor	2 (50.0)	1(25.0)	1(25.0)	4(100.0)
Lower molars	1(100.0)	0 (0.0)	0 (0.0)	1(100.0)
Total	32 (80.0)	4 (10.0)	4 (10.0)	40 (100.0)

The most frequent clinical diagnosis was radicular cyst 32 (80%) and the success rate was found to be 81.3%. A lower success rate was found among those who presented with failed root canal therapy (Table 5).

Table 5: Clinical diagnosis related to treatment outcome

Clinical Diagnosis	Successful	Doubtful	Failure	Total
Radicular cyst	26 (81.3)	3(9.4)	3(9.4)	32(100.0)
Chronic apical periodontitis	1(100.0)	0 (0.0)	0 (0.0)	1(100.0)
Failed RCT/Retreatment	5 (71.4)	1(14.3)	1(14.3)	7(100.0)
Total	32 (80.0)	4(10.0)	4(10.0)	40 (100.0)

Discussion

The present study soughteek to determine the success rate of apicectomy treatment in a group of Nigerian patients with a view to justifying its use as a treatment option in our environment. Furthermore, the majority of previously published works on the success rate of apicectomy was done outside the country. Hence this study provides a baseline data on the success rate of apicectomies in our local environment.

Failure to debride the root canal system is the most significant factor in potential case failure following periradicular surgery [13]. This factor was eliminated or minimized by selecting cases for this study that would allow conventional debridement of the root canal (excluding cases with obliterated canals). Similarly, cases with badly broken crown, severe periodontal disease and vertical fractures, which are common causes of failure following periradicular surgery were eliminated.

and radiographic classification of complete and incomplete healing, as suggested by Grung *et al*. and Molven *et al*. [16,17].

The age and sex of the patients did not significantly affect the success rate of apicectomy in this study, in agreement with most other studies on apicectomy [18,19]. In this study, as in most other studies, [3,5,8] maxillary incisors were the most frequently apicectomized teeth (55.0% and 22.5% centrals and laterals respectively). In the previous studies of traumatized anterior teeth in Nigeria, maxillary central incisors were the most frequent [20,21]. Hence it was not surprising that most of the apicectomized teeth were maxillary central incisors.

The higher success rate of 82.9% in the maxilla than 60% in the mandible is in agreement with most studies [3,19]. The difference may be explained by the greater difficulty involved in performing apicectomy in the mandible. To improve the visibility of the apical region in the mandible, there

must be an exaggerated bevel of the root apex, but acute bevel increase the surface area of cut dentinal tubules. As tubule contamination is a documented factor in endodontic failure, this may be a significant consideration [22,23]. In addition, the lingual extension of the retropreparation may result in lingual perforation that may probably be undetected. Acute bevels may also result in resections that do not remove apical ramifications on the lingual aspects of the roots [24,25].

The clinical diagnosis of radicular cyst made in this study was based on the radiographic size of the apical lesion and character of the border (greater than 10mm and clearly defined border). Previous studies using the clinical and radiographic methods had produced similar diagnosis as the histopathological method [26]. It was therefore suggested that a periapical lesion with a diameter greater than 10mm on a standard periapical radiograph (long cone paralleling technique) and clearly defined border is more likely to be a cyst than a granuloma [27].

Most cases (80.0%) in this study were clinically diagnosed as radicular cyst and tended to heal better following surgery than failed root canal treatment/retreatment group. Healing of radicular cyst will proceed unhindered once the cystic lining is completely enucleated and the canal is cleaned and well obturated. However, failed root canal treatment or failed retreatment is usually due to the difficulty in eliminating canal irritants and infection and if left in place, there may be delayed leakage and surgical failure.

Some authors recommend that cases with incomplete healing should be followed by a longer period of time however, Molven *et al*. concluded that cases clearly showing features of incomplete healing (scar tissue) with no clinical signs and symptoms of inflammation at the regular follow-up of 1 year after surgery could be regarded as successful [2,28,29]. Similarly Jesslen *et al.,* supported the validity of one-year evaluation period to determine success [30]. The uncertain/doubtful healing group may progress later to complete healing radiographically so that this may therefore increase the success rate further [12,31]. Also, a proportion may progress to failure hence increasing the existing failure rate of 10% in the long term.

Four (10.0%) of the cases in this study were identified as failure. The clinical findings associated with these cases were pain, discharging sinus, mobility and/or tenderness to percussion. Radiographically, the cases showed an increased or no change in the periapical appearance when compared with the initial assessment. Whilst all of these features make the diagnosis of failed surgical case very easy, the actual cause of the failure is often times more elusive. Finally, the adherence to a rigorous surgical protocol based on sound biological principles in all cases may possibly have impacted on the success obtained.

A major limitation of the study is the small sample due to the strict patient selection criteria used. Therefore, this did not allow for adequate samples when the population was stratified according to age and reasons for treatment [32,33]. However, our sample size is comparable with the studies of Oginni and Olusile, Freidman, and Marin-Botero *et al.*, and large enough to allow the use of statistical tests [8,34,35].

Conclusion

The success rate of apicectomy in this study when performed on carefully selected patients and followed up clinically and radiographically for 12 months was high (80%) with female, those above 30 years, anterior teeth, maxillary teeth, and those cases diagnosed as radicular cysts showing higher success rates. Further studies are however recommended for better statistical values.

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Factors influencing utilisation of breast cancer screening measures among family members of people living with breast cancer in a Nigerian Teaching Hospital.

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Abstract
Background: In Nigeria, about two-thirds of patients with breast cancer present in the hospital with advanced stages when treatment offers minimal or no benefits. Therefore, early detection remains the cornerstone of breast cancer control. A family history of breast cancer constitutes an increased risk of developing the disease. This study identified factors influencing utilisation of breast cancer screening measures among the family members of people living with breast cancer in a Nigerian Teaching Hospital.
Method: Using a descriptive cross-sectional design, 106 family members of people living with breast cancer were purposively selected. Data were collected using a 32 -item self-structured questionnaire, these were analysed using Statistical Package for Social Sciences, version 22 while the hypotheses were tested using student t-test, Analysis of Variance (ANOVA), Chi square at 0.05 level of significance.
*Results***:** More than half (53.8%) of the respondents had adequate knowledge of breast cancer, mean knowledge score $\bar{x}$ was 9.5± 2.0, 79.2% had low level of utilisation of breast cancer screening measures with the mean score of 1.6 ±0.5 . Lack of knowledge of practice of Breast Self-Examination (42.9%) and absence of breast problems (such as swelling or lumps) (39.7%) were factors associated with BSE. Feeling of wellbeing (72.5%) and ignorance of mammography (54.3%) were factors identified for non-utilisation of CBE and Mammography respectively.
Conclusion: Health education on the factors identified to be influencing utilisation of screening measures is highly recommended for individuals at higher risk and general populace to reduce the burden of breast cancer to the barest minimum.

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Keywords: *Factors, Breast cancer, Screening measures, Utilisation, Family members*

Résumé
Contexte: Au Nigéria, environ deux tiers des patientes atteintes d'un cancer du sein se présentent à l'hôpital à des stades avancés lorsque le traitement offre des avantages minimes ou nuls. Par conséquent, la détection précoce reste la pierre angulaire de la lutte contre le cancer du sein. Des antécédents familiaux de cancer du sein constituent un risque accru de développer la maladie. Cette étude a identifié des facteurs influençant l'utilisation des mesures de dépistage du cancer du sein parmi les membres de la famille de personnes vivant avec un cancer du sein dans un hôpital d'enseignement universitaire nigérian.
Méthode: En utilisant une conception transversale descriptive, 106 membres de la famille de personnes vivant avec un cancer du sein ont été sélectionnés à dessein. Les données ont été collectées à l'aide d'un questionnaire auto-structuré en 32 éléments, celles-ci ont été analysées à l'aide du progiciel statistique pour les sciences sociales, SPSS version 22, tandis que les hypothèses ont été testées à l'aide du test t de l'élève, analyse de variance (ANOVA), Chi carré à un niveau de signification de 0,05.
Résultats: Plus de la moitié (53,8%) des répondants avaient une connaissance adéquate du cancer du sein, le score de connaissance moyen était de 9,5 ± 2,0, 79,2% avaient un faible niveau d'utilisation des mesures de dépistage du cancer du sein avec un score moyen de 1,6 ± 0,5. Le manque de connaissances sur la pratique de l'auto-examen des seins (42,9%) et l'absence de problèmes mammaires (tels que gonflement ou bosses) (39,7%) étaient des facteurs associés à l'auto-examen des seins. Le sentiment de bien-être (72,5%) et l'ignorance de la mammographie (54,3%) étaient des facteurs identifiés respectivement pour la non-utilisation de la CBE et de lamammographie.
Conclusion: Une éducation sanitaire sur les facteurs identifiés comme influençant l'utilisation des mesures de dépistage est fortement recommandée

pour les personnes à risque élevé et la population en général afin de réduire au minimum le fardeau du cancer du sein.

Mots clés: *Facteurs, cancer du sein, mesures de dépistage, utilisation, membres de la famille*

Introduction

Breast cancer is the most diagnosed cancer among women and it is the second leading cause of cancer deaths after lung cancer [1]. There has been a significant increase in the incidence of breast carcinoma in sub-Saharan African countries and in other low-resource countries [2]. In comparison to western countries, breast cancer in African women tends to occur in premenopausal women with incidence peaking between the ages of 35 and 45 years [3]. Similar to African American women in the US, breast cancer in African women tend to be the aggressive triple negative [4,5], which is non-responsive to commonly used therapeutic drugs.

Women in any age range are at risk of breast cancer and the risks increases with advanced age [6]. Despite the development of advanced technology in the detection of breast cancer, the mortality rate remains high. Early detection and effective treatment can lead to improved survival rate of breast cancer patients [7]. Screening is essential for early detection and in diagnosing the breast cancer even before the occurrence of symptoms [8]. Screening helps in early detection of breast cancer as it is related to the perceptions of risk, benefit, and barriers through a reasoning process, but it is said that breast cancer screening techniques are underused [9,10]. Early detection is important for minimizing mortality from breast cancer. If detected at an early stage, breast cancer can be controlled and treated [11].

More than 90% of breast cancer patients seek medical attention only at advanced stages [12,13] and in consequence almost all breast cancer cases are detected late clinically. There are many screening methods like mammogram, breast self-examination, etc., which helps people in early detection but about 77% of the people were unaware of breast cancer screening methods [14]. To be noted, lack of knowledge about how to detect the disease at an early stage would potentially lead to misconceptions regarding its curability and the effectiveness of early detections [15].

The three-primary means of breast cancer screening are Mammography, Clinical Breast Examination (CBE) and Breast Self-Examination (BSE) [16]. Therefore, the major screening strategies considered in this study are Mammography, Breast Self-Examination (BSE), and Clinical Breast Examination (CBE). The American Cancer Society advocates for yearly mammograms for women aged 40 years and above. Generating awareness in women about the benefits of breast screening is particularly important; any changes related to health and breast feel must be reported [7]. Breast Self-Examination is a screening method in which women needs to examine their breasts once every month [17] while Clinical Breast Examination (CBE) is the process of examining the breasts with the help of clinicians.

This study identified the factors that influenced the utilization of breast cancer screening measures among the family members of people living with breast cancer in a Nigerian Teaching Hospital. Three objectives and hypotheses guided the study. These were assessing participants' knowledge, level of utilization of the screening measures; and factors that affected the uptake and looking into the relationships between level of utilization and age, educational level and knowledge of breast cancer respectively. The identified factors will be useful in planning specific interventions in the prevention of breast cancer especially amongst the high-risk groups and ultimately reducing the burden, morbidity and mortality of breast cancer.

Materials and methods

The study was carried out among family members of people living with breast cancer in University College Hospital, Ibadan, Nigeria. It is a federal teaching Hospital in Ibadan located in Queen Elizabeth Road, Oritamefa, in Ibadan North Local Government Area of Oyo State. It is an 850-bedded hospital in affiliation with the University of Ibadan. The Hospital is primarily a tertiary health institution with a track record of effective cancer care and management. It has 56 service and clinical departments and runs 96 consultative outpatient clinics per week in 50 specialties and sub specialty disciplines. The participants were contacted in the radiotherapy ward, radiotherapy and the Surgical Outpatient clinics.

The target population consisted of family members of breast cancer patients attending the University College Hospital. A descriptive cross-sectional design was used to collect data from 106 family members using purposive sampling technique. Family members who met the inclusion criteria (willing to participate, verbally consented and at least 18 years of age) completed the questionnaire with the assistance of the researchers. The exclusion criteria include non-consenting family members and

family members with dementia or other conditions which may impair the cognition of an individual.

The instrument consisted of a 32-items self-report instrument of three parts developed by the researchers. Part one was made up of seven questions that assessed the socio demographic characteristics of the respondents, part two consisted of thirteen questions that focused on the knowledge level of the participants in relation to breast cancer, three was made of six questions that assessed their level of utilization of screening measures while the last section consisted of three open-ended questions that elicited information about factors associated with utilization of the screening measures. The reliability of the instrument was ascertained through a pilot study with a sample of 15 family members of people living with breast cancer drawn from the oncology clinic in Our Lady of Apostle Catholic Hospital, Oluyoro, Ibadan. Corrections were made on the instrument based on findings from the pilot study.

Permission to use the study sites were obtained from the head of each unit who were presented with copies of the approval from the Joint Institutional Review Board (IRB) of University of Ibadan and University College Hospital, Ibadan. The questionnaires were distributed to the family members who met the eligibility criteria after proper information on the purpose of the study and its benefits. Although, the instructions on how to complete the questionnaire were part of the introductory note, they were equally explained to ensure a good level of understanding. The questionnaires were returned after completion.

Data obtained were entered and coded into the spreadsheet. The analysis was done using Statistical Package for Social Sciences, SPSS version 22. Firstly, they were summarized using frequencies and percentages. Then, the hypotheses were tested with student t test, analysis of variance (ANOVA)

Results

Majority of the respondents were females (83%), had tertiary education (70.8%) with a mean age of 37.3±11.5. In addition, they were majorly of the Yoruba tribe (66.7%) and more than half were married (56.6%). (Table 1).

Table 1: Socio- demographic characteristics of the respondents

Variables	Frequency	Percentage	
Age (years)			
<40	60	56.6	
40-49	33	34.9	
50 and above	13	8.5	
Total	106	100	×=37.3±11.5
Sex			
Male	18	17	
Female	88	83	
Total	106	100	
Tribe			
Yoruba	70	66.7	
Others	36	33.3	
Total	106	100	
Educational status			
Secondary education and below	31	29.2	
Tertiary education	75	70.8	
Total	106	100	
Marital status			
Married	60	56.6	
Single	37	34.9	
Others	9	8.5	
Total	106	100	
Occupation			
Civil servant	35	33	
Retired	3	2.8	
Trading	28	26.4	
Unemployed	40	37.8	
Total	106	100	

The respondents had adequate knowledge of breast cancer since the mean knowledge score was 9.5 out of a total of 13. Although, this mean knowledge score was slightly lower than the average rating score which served as the cut-off for knowledge (9.75), 53.8% of the respondents had adequate knowledge of breast cancer. (Table 2).

Table 3 on the participants' level of utilization of screening measures revealed that the mean score was 1.6 out of a total of 6.0. This is about 50% lower than the average rating score which served as the cut-off for utilization (3.0). Majority (79.2%) of the participants were inconsistent with the utilization of breast cancer screening measures.

Table 2: Level of knowledge of breast cancer

Variable	Score	Frequency	Percentage	Average Rating Score	Remark
	5.0	6	5.7		Poor
	6.0	4	3.8		Poor
	7.0	7	6.6		Poor
	8.0	15	14.2		Poor
Knowledge	9.0	17	16.0	9.75	Poor
	10.0	18	17.0		Adequate
	11.0	25	23.6		Adequate
	12.0	11	10.4		Adequate
	13.0	3	2.8		Adequate
Mean 9.5±2.0					

Table 3: Frequency distribution of participants' level of utilization of breast cancer screening measures

Variable	Score	Frequency	Percentage	Average Rating Score	Remark
	0.0	28	26.4		Low
	1.0	32	30.2	3.0	Low
Utilization	2.0	24	22.6		Low
	3.0	9	8.5		High
	4.0	5	4.7		High
	5.0	8	7.5		High

Table 4: Factors influencing the utilization of breast cancer screening measures

Factors	Frequency	Percentage
BSE 'I don't know how to do it"	27	42.9
It is for those with breast problems'	25	39.7
'No time''	10	15.8
It is difficult to detect breast changes'	1	1.6
CBE		
'I am healthy, I don't have cancer''	58	72.5
I am a man''	13	16.3
I don't know I'm supposed to'	3	3.8
'No time'	5	6.3
'I don't like coming to the hospital and exposing my body'	1	1.1
Mammography		
'I don't know about mammography'	25	54.3
'I think it is expensive'	17	37.0
'I don't have cancer'	4	8.7

Table 5: Relationship between level of utilization of screening measures and demographic characteristics

Variable	Mean Knowledge Score	SD	N	t/F	P value
Marital Status					
Married	1.92	1.46	60		
Single	0.97	1.34	37	5.375	0.006*
Others	2.00	1.41	09		
Age					
<40	1.28	1.42	60		
40-49	2.09	1.51	33	3.379	0.038*
50+	1.62	1.26	13		
Occupation					
Civil servant	2.17	1.58	35		
Retired	2.50	3.54	3	7.485	0.000*
Trading	1.75	1.14	28		
Unemployed	0.80	1.04	40		
Tribe					
Yoruba	1.67	1.57	70	0.889	0.376
Others	1.40	1.26	36		
Sex					
Male	0.94	0.73	18	2.033	0.045*
Female	1.70	1.55	88		
Educational level					
Below secondary	1.03	1.02	31	2.535	0.013*
Tertiary	1.81	1.58	75		

*denotes significance

Most (79.2%) of the study participants did not utilize breast cancer screening measures for various reasons. For BSE, the highest reason for nonperformance of Breast Self-Examination was lack of knowledge of how to do it (42.9%). This was followed by absence of breast problems (39.7%) while lack of time (15.8%) and difficulty in detecting breast changes were the least factors.

Not being diagnosed and a feeling of wellbeing (72.5%) was the highest reason for not engaging in Clinical Breast Examination (CBE). Other factors were the male gender (16.3%), lack of knowledge (3.8%) and lack of time (6.3%).

More than half (54.3%) of the participants above forty years of age did not know about mammography. Financial burden (37%) and not being diagnosed of breast cancer (8.7%) were the other factors identified.

Results showed a significant relationship between participants' sex (P=0.045), age (P=0.038), occupation (P= 0.000), marital and educational status (P=0.006 and P=0.013 respectively) and their level of utilizing breast cancer screening measures. (Table 5).

Discussion

A larger percentage (42.9%) are ignorant of how to perform Breast Self-Examination. This is in congruent with findings of Ojedokun [18] where it was opined that lack of awareness regarding the conduct of BSE was the most important factor. Samuel and Onuoha in 2015 also stated that the strongest reason for non-practice of BSE was ignorance [19]. This result calls for an intense and more aggressive health education strategies especially for individuals who have a family history of breast cancer.

According to this present study, 72.5% of the participants have never had a Clinical Breast Examination because they were 'well and healthy'. This is similar to the study of Okobia *et al* [20] where it was said that the main reason for not having a CBE was not having a breast problem. The public should be made to be aware that CBE should not be delayed until when they are sick but at least a yearly examination is recommended for women of child bearing age.

Furthermore, study participants that are forty years and above reported a lack of knowledge about

mammography. Although, this conforms to the reports by Akpinar et al [21], this is worrisome as individuals of this age group are expected to be proactive in their health promotion behaviou as breast cancer risk increases with age. However, this contradicts the study of Oche *et al* in 2012 [22] where 84% of the study participants were aware of mammography as a breast cancer screening measure.

Another factor delineated from this study is the financial burden associated with the uptake of mammography. 37% of the study participants have never done mammography because of the cost and its financial implications. This reinforces the study report of Olajide et al and Okoronkwo *et al* [23,24] which highlighted that financial barriers limit the ability of women to utilize screening and treatment services for early diagnosis and treatment of breast cancer [24]

This study also showed a significant association between participants' age, sex, occupation, educational level and marital status and their level of utilization of breast cancer screening measures. This is in congruent with the findings of Lee *et al* [25] where age, educational level and marital status were identified as factors associated with breast cancer screening.

Conclusion

In conclusion, findings from this study revealed adequate knowledge of breast cancer but low level of utilization of screening measures. The identified factors associated with utilization of these screening measures include ignorance, cost, absence of breast problems amongst others. A detailed and result oriented health education program on the benefits of breast cancer screening should be encouraged especially among those with a higher risk of the disease in order to reduce the burden of breast cancer.

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Status of C-reactive protein, total plasma peroxide, nitric oxide and immunoglobulin (IgG, IgM and IgA) classes in workers occupationally exposed to lead.

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Abstract

*Background***:** Exposure to different levels of lead (Pb) has been demonstrated to elicit varied degrees of pathogenicity in animal models. But this is yet to be demonstrated in human beings. The present study determined the levels serum Pb, immunoglobulin classes, total plasma peroxide, nitric oxide and C-reactive protein in three groups of professionals exposed to different levels of lead.

Methods: Thirty–eight Pb-exposed workers, including 18 battery chargers (BC), 10 spray painters (SP) and 10 mechanics (MC) volunteered to participate in this study. Fifteen apparently healthy health workers of University College Hospital, Ibadan, Nigeria, served as controls. Serum levels of immunoglobulins G,M,A (IgG, IgM and IgA respectively) and C-reactive protein (CRP) were determined using single radial immunodiffusion techniques, Pb was determined using atomic absorption spectrophotometry technique, while total plasma peroxides (TPP) and nitric oxide (NO) were determined using spectrophotometry methods in the study groups (BC, SP and MC) and controls.

Results: The study shows significantly ($p<0.05$) higher levels of Pb in the BC and SP (BC> SP) compared with the controls. The mean levels of serum TPP was significantly ($p<0.05$) higher in BC, SP and MC compared with the controls. Significantly ($p<0.05$) lower levels of IgM were observed in BC, SP and MC compared with the controls. The serum levels of IgG was significantly ($p<0.05$) lower in BC and SP (BC< SP) but not in MC ($p>0.05$) when compared with the controls. There were no significant ($p>0.05$) differences in the levels of IgA in BC, SP and MC compared with the controls. Also, there were no significant ($p>0.05$) differences in the serum levels of NO observed in BC, SP and MC compared with the controls. But the mean levels of CRP were significantly ($p<0.05$) higher in BC, SP and MC (BC> SP> MC) compared with the controls. Significant ($p<0.05$) correlations were observed between serum Pb and IgG in BC ($r= -0.50$, $p = 0.04$) and between serum Pb and IgM in MC ($r=-0.85$, $p=0.002$).

Conclusion: It could be concluded in this study that the nature of a profession determines the level of Pb in the exposed workers. Oxidative stress and inflammation are possible consequences of Pb exposures, while the toxicity effects of Pb on serum IgG and IgM may depend on the levels of Pb exposures.

Keywords: *lead-exposures, immunoglobulin classes, oxidative stress, CRP.*

Résumé

Contexte: Il a été démontré que l'exposition à différents niveaux de plomb (Pb) induit divers degrés de pathogénicité dans des modèles animaux. Mais cela n'a pas encore été démontré chez les êtres humains. La présente étude a déterminé les niveaux de Pb sérique, les classes d'immunoglobulines, le peroxyde de plasma total, l'oxyde nitrique et la protéine C-réactive dans trois groupes de professionnels exposés à différents niveaux de plomb.

Méthodes : Trente-huit travailleurs exposés au plomb, dont 18 chargeurs de batterie (BC), 10 peintres en aérosol (SP) et 10 mécaniciens (MC) se sont portés volontaires pour participer à cette étude. Quinze agents de santé apparemment en bonne santé du Collège Hospitalier Universitaire, Ibadan, Nigéria, ont servi de témoins. Les taux sériques d'immunoglobulines G, M, A (IgG, IgM et IgA respectivement) et de protéine C-réactive (CRP) ont été déterminés à l'aide de techniques d'immunodiffusion radiale unique, le Pb a été déterminé en utilisant la technique de spectrophotométrie d'absorption atomique, tandis

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que les peroxydes de plasma totaux (TPP) et l'oxyde nitrique (NO) ont été déterminés à l'aide de méthodes de spectrophotométrie dans les groupes d'étude (BC, SP et MC) et les témoins.
Résultats: L'étude montre des niveaux significativement plus élevés ($p < 0,05$) de Pb dans BC et SP (BC>SP) par rapport aux témoins. Les niveaux moyens de TPP sérique étaient significativement ($p < 0,05$) plus élevés dans BC, SP et MC par rapport aux témoins. Des taux d'IgM significativement plus faibles ($p < 0,05$) ont été observés dans BC, SP et MC par rapport aux témoins. Les taux sériques d'IgG étaient significativement ($p < 0,05$) plus faibles dans BC et SP (BC <SP) mais pas en MC ($p > 0,05$) par rapport aux témoins. Il n'y avait pas de différences significatives ($p > 0,05$) dans les niveaux d'IgA dans BC, SP et MC par rapport aux témoins. De plus, il n'y avait pas de différences significatives ($p > 0,05$) dans les taux sériques de NO observés dans BC, SP et MC par rapport aux témoins. Mais les niveaux moyens de CRP étaient significativement ($p < 0,05$) plus élevés dans BC, SP et MC (BC> SP> MC) par rapport aux témoins. Des corrélations significatives ($p < 0,05$) ont été observées entre Pb sérique et IgG dans BC ($r = -0,50$, $p = 0,04$) et entre Pb sérique et IgM dans MC ($r = -0,85$, $p = 0,002$).
Conclusion : On pourrait conclure dans cette étude que la nature d'une profession détermine le niveau de Pb chez les travailleurs exposés. Le stress oxydatif et l'inflammation sont des conséquences possibles des expositions au Pb, tandis que les effets de toxicité du Pb sur les IgG et IgM sériques peuvent dépendre des niveaux d'exposition au Pb.

Mots clés: *Expositions au plomb, classes d'immunoglobulines, stress oxydatif, CRP.*

Introduction

Lead (Pb), an ubiquitous metal is a major constituent of materials used in the construction and manufacturing processes [1, 2]. It is a common pollutant associated with occupations [2]. Despite the fact that Pb poisoning is the oldest occupational disease recognized in the world, it still has widespread commercial applications i.e. in the production of batteries, automobile parts, toys, pipes, metal alloys like brass, steel, bronze and also in the production of ammunition, paints, pigments and ceramics. Occupational exposure to Pb is mainly peculiar to workers in battery manufacturing plants, smelting operations, construction sites, radiator repair shops, spray paint and automobile outlets [1]. In paint industries, lead is used as a component of pigment and drying agents. It has been documented that more than 40,000 metric tons of Pb ends up in landfills every year [2].

Pb poisoning is an increasing health hazard in developing countries and has become an environmental justice issue with wide-ranging consequences [3,4] because of its cumulative toxicity that affects multiple body systems [4]. In view of this, lead poisoning could be an epidemic in countries where industries have poorly managed industrial effluents [5]. The factors enhancing Pb toxicity include rapid urbanization, environmental pollution, professional exposure, the use of leaded fuels, and industrial pollution *[6, 7]*. Most of the environmental Pb is absorbed in the gut, adsorbed through the skin or inhaled into the lungs. It accumulates in the bone marrow [8], brain and cells of the immune system [9], but brain capillaries show a preferential accumulation of Pb where it inhibits cNOS activity and increases the iNOS [10].

Various pathologic consequences of Pb toxicity include aneamia, neurological disorders, miscarriage and chronic renal failure have been reported in human and animal models [11-13]. Symptoms of acute lead poisoning include muscle pains, fatigue, abdominal pains, headache, seizures and coma. Prolonged exposure may lead to chronic lead poisoning with symptoms such as neuronal defects, lack of energy, loss of appetite, learning disabilities, behavioural problems (like increased criminal behaviours), poor coordination and impaired growth [4]. The mechanisms of Pb toxicity on tissues and cellular components depend on the concentration and duration of the exposed Pb [14]. The mechanisms of toxicity range from modulation of immune homeostasis [15], inhibition of enzyme activity, generation of reactive oxygen species [16], competitive interruption of trace metal absorption in the gut, deregulation of nitric oxide synthase activity [10], to direct depletion of antioxidant reserves [17]. Many antioxidant trace metals and molecules are potential targets for Pb toxicity e.g. Pb directly inhibits enzyme activaties, competitively interrupts trace mineral absorption on which the activities of antioxidant enzymes and phagocytes depend, binds to sulfhydryl proteins, alters calcium homeostasis, and lowers the level of available sulfhydryl antioxidant reserves in the body [17, 18]. Dietert *et al* [19] reported that levels of blood Pb previously thought to be safe (below 10µg/dl) may be associated with later life immune alterations. Based on these facts, the present study was designed to determine the effects

of serum Pb on the levels of certain immunoglobulin classes, selected markers of oxidative stress (total plasma peroxide and nitric oxide) and C-reactive proteins in three groups of artisans with different levels of Pb exposures.

Materials and methods

Human materials

Thirty–eight Pb-exposed workers, including 18 battery chargers, 10 spray painters and 10 mechanics were recruited for this study. They were artisans who had practiced their professions for a period of 17 to 25 years. Fifteen apparently healthy health workers of University College Hospital, Ibadan, Nigeria, served as controls. This study was approved by the Institutional Review Board, and ethical approval obtained from the UCH/UI Ethical Committee on human research. Informed consent was obtained from every participant before the commencement of this study. Five milliliters (ml) of venous blood sample was taken from the anticubital vein of every participant into a plain bottle and allowed to clot. After retraction, the serum was separated and stored at -20^{0}C until ready for analysis.

Methods

Determination of Immunoglobulin A, G and M (IgA, IgG, IgM) and C-reactive proteins

Immunoglobulin classes IgA, IgG, IgM and C-reactive proteins were determined using Maccini techniques as described by Salimonu *et al* [20].

Determination of Nitric oxide

Nitric oxide level was determined in the serum as described by Wanchu *et al* [21],

Determination of TPP

Total plasma peroxide (TPP) was determined by using the method described by Harma *et al.*, [22]. The principle is based on the fact that Ferrous-butylated hydroxytoluene-xylenol orange complex reacts with plasma hydrogen peroxide to form a colour complex measured spectrophotometrically at 560mm. H_2O_2 was used as standard. 1.8ml of reagent 6 (F0X2) was mixed with 200µ1 of plasma. This was incubated at room temperature for 30 minutes. 100µMol H_2O_2 was used as standard. The mixture was centrifuged and the supernatant separated for reading at 560nm. *Determination of Pb*

The method of Kaneko *et al* [23] was used for the determination of Pb in the serum samples.

Statistical analysis

All statistical analyses were performed using Statistical Package for Social Sciences (SPSS) for windows, version 15.0 (SPSS Inc. Chicago, USA). The data were expressed as Mean ± SD. Student (T) test was used for comparison of lead exposed workers and controls. Pearsonian correlation coefficient (r) was calculated. The changes were considered significant, when p-values were less than 0.05.

Results

The mean levels of Pb, NO, CRP and TPP in the occupationally-exposed artisans are presented in Table 1. The serum levels of Pb increased significantly ($p<0.05$) in the BC and SP but the difference was not significant ($p>0.05$) in MC compared with the controls. The mean levels of serum Pb were in order of BC> SP>MC. The mean levels of serum TPP increased significantly in BC, SP and MC compared with the controls. Serum levels of CRP were significantly ($p<0.05$) higher in BC, SP and MC (BC> SP> MC) compared with the controls. There were no significant ($p>0.05$) changes in the mean levels of NO in BC, SP and MC when compared with the controls. As shown in Table 2, the mean levels of IgM were significantly ($p<0.05$) lower in BC, SP and MC compared with the controls. The serum levels of IgM were in order of BC< SP< MC. There were no significant ($p>0.05$) changes in the levels of IgA in BC, SP and MC compared with the controls. The serum levels of IgG decreased significantly ($p<0.05$) in BC and SP while there was no significant ($p>0.05$) difference in the MC compared with the controls.

Table 1: Levels of Serum Pb, Markers of Oxidative Stress and C-reactive protein in Lead Exposed Workers and Controls

Groups	N	Pb (µg/dL)	NO (µmol/L)	CRP (Mg/L)	TPP(µmol/L. H_2O_2)
CT	15	8.0±4.0	28.0±15.0	3.0±2.0	12.7+5.2
BC	18	54.0±15.0*	35.0±13.0	17.0±13.0*	45.2+10.8*
SP	10	36.0±10.0*	22.0±9.0	11.0±6.0*	53.4+17.6*
MC	10	10.0±2.0	41.0±16.0	6.0±3.0*	46.0+23.6*

CT=controls BC= battery chargers SP= spray painters MC= mechanics= significantly different from controls.*

Significant ($p<0.05$) correlations were observed between serum Pb and IgG in BC (r= -0.50, p=0.04) and between serum Pb and IgM in MC (r) = -0.85, p=0.002) as presented in Tables 3 and 5 respectively.

Discussion

The physico-chemical nature and the concentration of Pb compound exposed to by a professional may contribute to the level of Pb in the individual. The

Table 2: Levels of serum immunoglobulin classes in lead exposed workers and controls

Group	N	IgG(Mg/L)	IgM (Mg/L)	IgA(Mg/L)
CT	15	5604±2735	176±33	204±107
BC	18	2413±1870*	71±24*	216±101
SP	10	2987±2363*	71±25*	255±66
MC	10	5231±2894	113±40*	214±100

CT=controls BC= battery chargers SP= spray painters MC= mechanics= significantly different from controls*

Table 3: correlation of Pb with immunoglobulins, nitric oxide and C-reactive protein in Battery Chargers (N=18).

Group	correlation coefficient (r)	p values
Pb/IgG	-0.5	0.04*
Pb/IgM	-0.07	0.80
Pb/IgA	0.05	0.84
Pb/NO	0.27	0.28
Pb/CRP	0.24	0.33
Pb/TPP	0.28	0.23

*= significant correlation.

Table 4: correlation of Pb with immunoglobulins, nitric oxide and C-reactive protein in Spray Painters (N=10).

Group	correlation coefficient (r)	p values
Pb/IgG	0.02	1.71
Pb/IgM	0.44	0.21
Pb/IgA	0.31	0.40
Pb/NO	0.04	0.91
Pb/CRP	0.07	0.81
Pb/TPP	0.36	0.41

*= significant correlation.

Table 5: correlation of Pb with immunoglobulins, NO, and CRP in Mechanics (N=10).

Groupcorrelation	coefficient (r)	p values
Pb/IgG	0.41	0.24
Pb/IgM	-0.85	0.002*
Pb/IgA	0.43	0.213
Pb/NO	-0.22	0.55
Pb/CRP	0.3	0.41
Pb/TPP	0.24	0.43

*= significant correlation.

occupationally exposed workers recruited for this study had different levels of Pb exposures due to the dissimilarity in the nature of their professions and the materials exposed to. To the knowledge of the authors, this study is the first to compare the effects of different levels of Pb on the serum immunoglobulin classes in professionals exposed to Pb. Direct contact with concentrated Pb in battery and paints could contribute to higher levels of Pb in the battery chargers and spray painters recruited for this study. Since most environmental Pb is absorbed through respiratory tract and the gut, battery chargers and spray painters could be more exposed to a higher amount of Pb from the components of the battery and paints. Significantly higher level of Pb in our spray painters agrees with the findings of Thomas [24] who reported significantly higher levels of serum Pb in spray painters and artists using leaded paints. In different studies conducted by David *et al.* [25], Mielke *et al* [26] and Stroop *et al.* [27]; toxic blood Pb levels were reported in residents of houses painted with Pb-based paints. This Pb poisoning was associated with continuous ingestion of small amount of a lead-containing product such as a paint chip or a sip of glaze by these painters [25, 28]. Since many of the battery chargers recruited for this study recycled battery, higher level of Pb in them could be the consequence of their exposure to a part of an estimated 2,600,000 metric tons of Pb reported to be the constituent of vehicle batteries [2].

Unlike in battery chargers and spray painters, serum level of Pb in the mechanics did not show significant increase. This could indicate that our mechanics probably had little exposure to Pb. This finding contradicts that of Arinola *et al*. [29] whose study showed that mechanics could present with Pb toxicity; although, their study was carried out when leaded fuel was still being used in Nigeria automobiles. Kitman [30] and Godfrey Lean [31] recently reported that Pb has been phased out of motor fuel and replaced with less toxic additives such as ferrocene (an organometallic compound of iron), benzene, ethanol, oxygenates, synthetic iso-octane, alkylate, benzene and other high-octane aromatics. Since leaded fuel has been completely phased out continent-wide on 1 January 2006, after a ban initiated from the 2002 Earth Summit; it is possible that the mechanics recruited for this study had less contact with vehicles using leaded fuel [31].

There is a groundswell of evidence that Pb toxicity induces free radical generation. Our study also showed that levels of serum TPP (an index of free radical) increased significantly in all Pb-exposed professionals recruited for this study. Surprisingly, the mechanics that didn't have significantly higher level of serum Pb also demonstrated significantly higher serum TPP. This corroborates the report of Dietert *et al* [19] that levels of blood Pb previously thought to be safe (below 10 µg/dl) may be associated with later life immune alterations. Several previous studies show that Pb enhances free radical generation in Pb exposed individuals. Hemolytic action of Pb commonly encountered in Pb-exposed workers has been linked with the lipid peroxidation (28). A groundswell of evidences unveiled the effects of Pb-induced oxidative stress in bone marrows and cells of the immune system [2]. These free radicals are then built up in the heamatopoietic stem cells causing their dysfunction as well as loss of quiescence and alterations of heamatopoietic stem cell cycling [33]. The result of this study agrees with that of Miller *et al* [34] and Heo *et al* [35] who had demonstrated immunotoxicity effects of Pb in animal models. Other previous workers reported significantly higher oxidative damage in peripheral blood mononuclear cells and livers from Pb-exposed rats [36]. Dardenne [37] associated the impaired immunologic activities in lymphocytes and macrophages observed in Pb toxicity to inhibition of gut absorption of nutritionally essential trace metals and the direct toxicity effects of Pb on the cells of the immune system. Another study implicated Pb toxicity as a factor causing impaired responsiveness of lymphocytes to mitogen stimulation, that reduced the delayed hypersensitivity reaction even at levels of blood Pb previously thought to be safe [19, 38]. Studies of globulin chain synthesis from a case of Pb poisoning indicate unbalanced chain synthesis and immunoglobulin deficiency [34, 39]. Ercal *et a*l [36] also reported that rats exposed to 2,000 ppm of Pb acetate in their drinking water for 5 weeks demonstrated significant reductions in serum levels of IgA, IgM, and IgG. These previous reports and ours therefore contradict that of McCabe *et al.* [40] and Sarasua *et al*, [41] who reported that Pb activates TH2 rather than TH1 to enhance Pb-induced hyperglobulinaemia. It could be hypothesized in this study that Pb inhibits synthesis of immunoglobulins G and M in the exposed workers.

Higher levels of TPP observed in this study have the potential to oxidize and inactivate nitric oxide in vascular endothelial cells, or generate peroxy-nitrite (a highly reactive oxygen specie) that can damage lipids and nucleotides and thereby creating a nitric oxide deficiency [42]. Surprisingly, this study did not show significant changes in the serum levels of NO in the three groups of Pb-exposed workers. This could be explained by the reports of Quinn *et al* [43]

and Blazka *et al* [44] which state that NO synthesis was up regulated in the kidney but inhibited in the brains of Pb exposed rats. This regulatory mechanism may agree with Harvey *et al* [45] who reported that plasma and urinary NO concentrations were not significantly altered in Pb- treated rats.

Higher serum CRP levels observed in the Pb-exposed professionals recruited for this study has been reported by previous researchers. *Gabay et al* [46] reported that Pb enhances the production of IL-6 *(*inflammatory cytokine*) which stimulates the hepatocytes to synthesize CRP.* Our finding corroborates that of Yiangou [47] who reported significantly higher level of Pb in the exposed rats. *Such higher levels of CRP in Pb-exposed workers have been* associated with a higher risk of future cardiovascular events even in apparently healthy lead-exposed individuals [11, 16, 48]. The higher levels of Pb observed in this study could therefore be the consequence of increased circulating IL-6 and free radicals in the Pb-exposed professionals

Conclusion

It could be concluded in this study that the nature of a profession determines the level of Pb the workers are exposed to. Oxidative stress and inflammation are indicated in all levels of Pb exposures, while the toxic effects of Pb on serum IgG and IgM are dependent on the amount of Pb exposed to.

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Single versus multiple-visit endodontics: Preference amongst dental practitioners in the Federal Capital Territory, Abuja, Nigeria.

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Abstract

Background: There is no consensus on the preferences of dental practitioners for the single-visit or multiple-visits endodontic treatment, also there is often no agreement on the factors that influenced these preferences.

Objective: To explore preference for either single visit or multiple visits amongst dental practitioners in FCT, Abuja and to identify the reasons for their preference

Method: This cross-sectional survey employed the use of semi-structured questionnaire, which was administered to a convenience sample of one hundred and twenty-six dental practitioners in Federal Capital Territory, Nigeria. Out of this, one hundred and twenty-one questionnaires were correctly filled and returned. Data were analyzed using SPSS version 23 and level of significance was set at $p \leq 0.05$.

Results: The majority (94.2%, n=114) of the practitioners in the study preferred multiple visits RCT and the main reason was to take advantage of the positive effects of inter-appointment medications (70.2%, n=80, p<0.001). Those who preferred single visit RCT among the private practitioners did so because it was time saving, cost effective and saved materials while among public dental practitioners, it was because it prevented patient and operator's fatigue. Also, dental surgeons with more than 10 years after graduation from dental school were more likely to use multiple visits RCT.

Conclusion: Majority (94.2%, n=114) of the practitioners preferred multiple visits RCT and the main reason for that was to take advantage of the positive effects of inter-appointment medications (70.2%, n=80, p<0.0005).

Keywords: *Single-visit RCT, multiple-visit RCT, root canal treatment, preference.*

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Résumé

Contexte: Il n'y a pas de consensus sur les préférences des dentistes pour le traitement endodontique à visite unique ou à visites multiples, et il n'y a souvent pas d'accord sur les facteurs qui ont influencé ces préférences.

Objectif : Pour explorer la préférence pour une visite unique ou plusieurs visites parmi les dentistes de FCT, Abuja et identifier les raisons de leur préférence

Méthode : Cette enquête transversale a utilisé l'utilisation d'un questionnaire semi-structuré, qui a été administré à un échantillon pratique de cent vingt-six praticiens dentaires du Territoire de la Capitale Fédérale, au Nigéria. Sur ce total, cent vingt et un questionnaires ont été correctement remplis et renvoyés. Les données ont été analysées à l'aide de la version 23 de SPSS et le niveau de signification a été fixé à $p \leq 0,05$.

Résultats : La majorité (94,2%, n = 114) des praticiens dans l'étude ont préféré des visites multiples ECR et la principale raison était de profiter des effets positifs des médicaments d'inter- rendez-vous (70,2%, n = 80, p <0,001). Ceux qui préféraient les ECR à visite unique parmi les praticiens privés le font parce que cela permet de gagner du temps, de réduire les coûts et d 'économiser du matériel, tandis que chez les dentistes publics, c'est parce que cela évite la fatigue du patient et de l'opérateur. De plus, les chirurgiens-dentistes ayant plus de 10 ans après avoir obtenu leur diplôme de l'école dentaire étaient plus susceptibles d'utiliser des ECR à visites multiples.

Conclusion : La majorité (94,2%, n = 114) des praticiens ont préféré des visites multiples ECR et la raison principale en était de profiter des effets positifs des médicaments d'inter-rendez-vous (70,2%, n = 80, p <0,0005).

Mots clés: *ECR à visite unique, ECR à visites multiples, traitement de canal radiculaire, préférence.*

Introduction

Endodontic therapy can simply be defined as the treatment done to maintain the health of a vital pulp or the treatment of a damaged or necrotic pulp to allow the tooth to remain functional in the dental arch [1]. It aims to maintain the integrity of natural dentition through elimination of protein degradation products, bacteria and bacterial toxins from necrotic root canals through adequate root canal instrumentation, disinfection and obturation [2].

Conventional endodontic treatment requires multiple visits [2], but some clinicians have queried this practice and proposed that single-visit treatment is a veritable alternative. Single-visit and multiple-visits endodontic treatment both have their advantages and disadvantages. The main reason for multiple endodontic is the short chair-side time which helps to avoid patient fatigue [3]. However, some of the disadvantages include inter appointment contamination and flare ups caused by leakage or loss of temporary seal, inability to provide esthetic restorations on time in case of traumatically damaged crowns and missed appointment leading to prolonged treatment time resulting in operator's fatigue [4]. Also, the tooth may be susceptible to reinfection through failed temporary filling and dressing during the interim period [5].

The concept of a single-visit root canal treatment was described as early as the 1880s [6] but was actively propagated by Ferrantiin 1950s [2]. He described the most important criteria for achieving successful results as the proper shaping and cleaning of the canal [2] and not dependence on intracanal medicaments for elimination of bacteria from the root canals. These principles have stood the test of time and are still being applied, as the important criteria for successful single visit treatment [3]. Furthermore, root canal therapy has become increasingly automated and can be performed more quickly with the use of contemporary endodontic techniques and equipment, such as rubber dam, magnifying devices, electronic apex locators, engine-driven rotary nickel titanium files. These instruments do not only increase the success rate of endodontic treatment but also, shorten the time needed for the treatment to a single visit [7].

On the contrary, some dentists believe that the traditional multiple-visits protocol has a long history and a high clinical success rate, hence prefer multiple-visits endodontic treatment. The preference for selection of either single-visit or multiple-visits endodontic treatment appears to be based on significant cultural differences. For example, two surveys from the US reported that 70%and 90% of respondents, respectively, would consider single-visit endodontic treatment, after proper case selection [8,9]. Another survey from Australia documented that a majority of the Australian endodontists preferred the multiple-visits approach based on their experience, unrelated to the biological concerns or patient interest [10] Similarly, a study from Japan indicated that single-visit endodontic treatment was not popular among the dentists in Japan [11].

The argument for single visit treatment relies heavily on convenience, patient acceptance and reduced postoperative pain. Some researchers argue that bacterial eradication cannot be predictably maximized without Ca(OH)2 dressing between appointments thus, the potential for healing may be compromised [12]. This assertion is however not supported by clinical studies [6,7,13] which posited that no additional benefit is provided by the use of an inter-appointment antibacterial dressing. In contrast, one study documented that the healing (success) rate of single visit appeared to be slightly higher by 6.3% compared to multiple visits root canal therapy (RCT), although it was not statistically significant [13]. Therefore, complete elimination of bacteria may not be strictly necessary for successful outcome but maximum reduction of bacteria and effective canal filling may be sufficient for healing. While infection at the time of root filling will adversely affect the outcome of treatment, the presence of pathogen alone, is not sufficient for the persistence of the disease [9,14].

The demand for endodontic treatment is on the rise in Nigeria due to the treatment cost subsidy by the National Health insurance scheme. The burden of cost of treatment increases with multiple visits for both the patient and the dentists, and may also have negative impact on school or work-related activities. Any decision for single or multiple visits must be based on evidence and follow well thought out clinical guideline. An appraisal of dentists' preference for either single or multiple visits and the reasons for such is needed in Nigeria to fine tune both the undergraduate and post graduate curricula to align with the global best practice in endodontics. Unfortunately, there are only a few studies that documented the preference of Nigerian dentists for single or multiple visit RCT and the reasons for their choice. These earlier studies also present small sample sizes and did not include detailed reasons for their preferences. The present study attempts to fill the gap and further add to the body of knowledge especially in the north central geopolitical zone where no such study had been carried out before. Therefore, the aim of this study was to explore preference for either

single visit or multiple visits RCT amongst dental practitioners in Federal Capital Territory (FCT), Abuja and to identify reasons for their preference.

Materials and methods

This was a cross-sectional survey of a sample of 121 dentists in Nigerian capital city of Abuja. The instrument for data collection was a semi-structured self-administered questionnaire that consisted of sixteen questions with multiple options regarding the practice of endodontics. Ethical clearance for the study was obtained from the Ethics Committee of the University of Abuja Teaching Hospital, Gwagwalada, Nigeria.

The study was conducted between July and September 2018 and the data collected included the demographic details of participants, their knowledge of RCT, their preferred treatment regimen and the possible reasons for their choice.

The reliability and validity of the questionnaire was ensured by pre-testing the questionnaire among dental practitioners at a Federal Medical Centre and a private dental clinic in a state which is about 30km from the study area to avoid sensitizing the study participants and diluting the findings of the study. At the end of the pre-test, ambiguous questions were rephrased and appropriate modifications made.

The questionnaires were taken to the practice locations of the dental surgeons by the principal investigator (S.O). It was administered only to the dental surgeons who consented to and were willing to participate in the study. Filled questionnaires were collected and inspected for appropriate responses and completeness.

The minimum sample size calculated was 101 and representation of dental surgeons in private and public practice was ensured by using a stratified random sampling technique. The participants were then serially recruited into the study until the calculated minimum sample size was attained. A dental practitioners' list sourced from Inter-Country centre for Oral Health (ICOH) 2013 report was used.

Data analysis was done using IBM Statistical Package for Social Science version 23 (SPSS 23). Analysis included frequencies and cross tabulations. The differences between categorical variables were tested using fishers exact test. Significant difference was inferred at $p \leq 0.05$.

Results

Out of the one hundred and twenty-six dentists, responses from one hundred and twenty-one dentists who returned correctly and completely filled questionnaire were included in the study giving a

Table 1: Socio-demographic characteristics of dental practitioners

Variables	Frequency (n=121)	%
Age group (years)		
<=30	46	38.0
31-40	44	36.4
>=41	31	25.6
Sex		
Male	80	66.1
Female	41	33.9
Highest professional qualification		
BDS	107	88.4
Fellowship	7	5.8
Diploma	1	0.8
Others	6	5.0
Post BDS (Years)		
<=5	56	46.2
6-10	29	24.0
>=11	36	29.8

Table 2: Reasons for preference for single visit RCT (n = 7)

Reasons	Yes (%)	No (%)
Time-saving	6 (85.7)	1 (14.3)
Patient compliance	3 (42.9)	4 (57.1)
Cost effectiveness	3 (42.9)	4 (57.1)
Less wasteful of materials	3 (42.9)	4 (57.1)
Rotary endo kit/Traumatic pulpal injury	3 (42.9)	4 (57.1)
Less wasteful of manpower	2 (28.6)	5 (71.4)
Better suited to the patient needs in the Nigeria setting	1 (14.3)	6 (85.7)
Not aware of multiple visits	0 (0.0)	0 (0.0)
That was the only method taught in school	80 (0.0)	0 (0.0)

Fisher's Exact Test: p = 0.2468

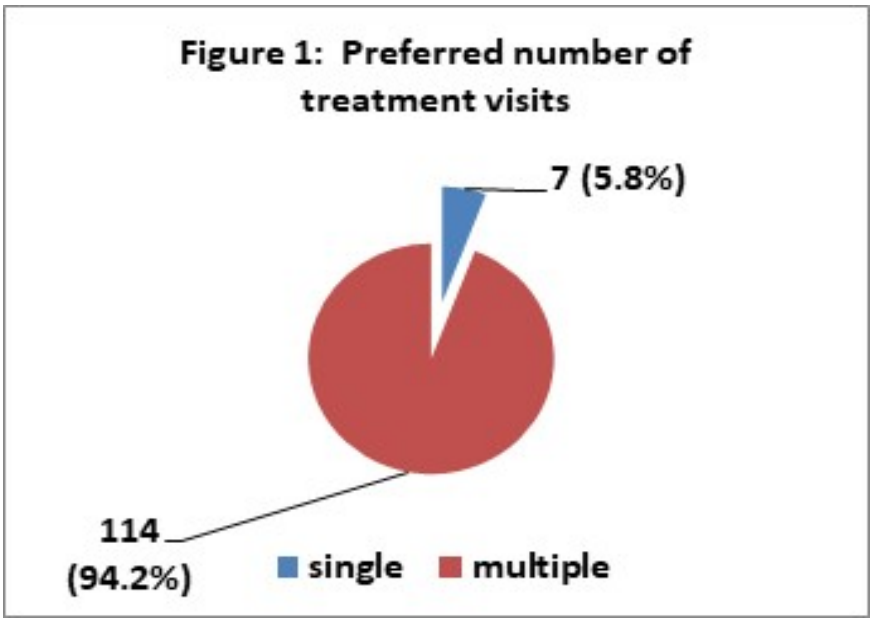

Fig 1: Frequency of single and multiple Visit RCT

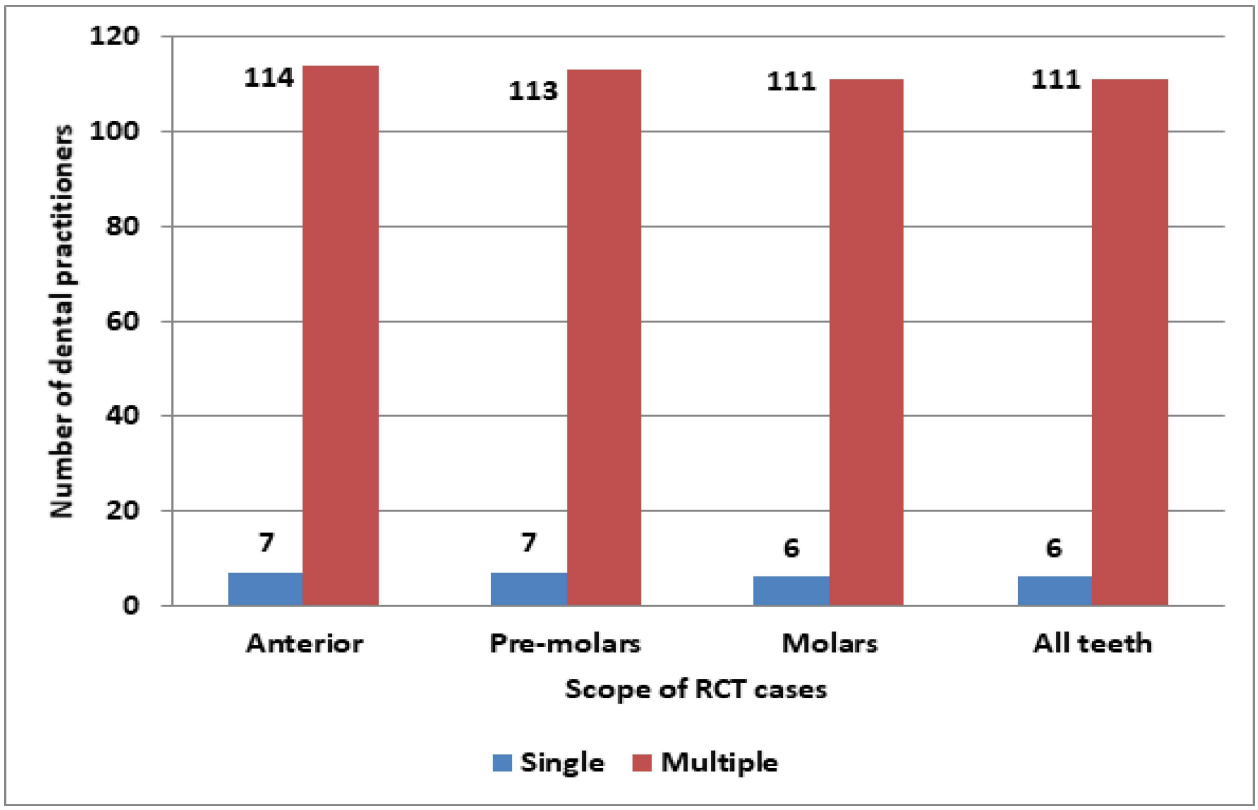

Fig.2: Number of treatment visits and dental practitioners' scope of RCT cases

response rate of 96%. More males (66.1%) participated in the survey than females (33.9%) with age ranging from 23 to 64 years with a mean age of 35.95 years.

The majority (88%) of the dentists interviewed had Bachelor of Dental Surgery (BDS) as their highest professional qualification and 54% of them had practiced for at least six years post-graduation. There was no significant difference

Table 3: Reasons for preference for multiple visits RCT (n = 114)

Reasons	Yes (%)	No (%)
To take advantage of inter-appointment medications	80 (70.2)	34 (39.8)
To avoid patient fatigue	55 (48.2)	59 (51.8)
To avoid operator fatigue	40 (35.1)	74 (64.9)
Teeth with multiple canals, abscessed teeth etc.	23 (20.2)	91 (79.8)
Better suited for Nigeria setting	22 (19.3)	92 (80.7)
That was the only method taught in school	8 (7.0)	106 (93.0)
Change to single visit is difficult	3 (2.6)	111 (97.4)
Not aware of single visit	2 (1.8)	112 (98.2)

Fisher's Exact Test: p = 0.0005

Table 4: Distribution of dental practitioner by type of dental practice and number of treatment visits.

Type of practice	Number of visits		
	Single visit	Multiple visits	Total
Public	2 (2.9)	68 (97.1)	70 (100.0)
Private	5 (9.8)	46 (90.2)	51 (100.0)
Total	7 (5.8)	114 (94.2)	121 (100.0)

Fisher's Exact test: P = 0.131

between the public and private dentists on their preference for either single or multiple visits RCT. (Table 4)

Discussion

The choice of treatment varies and the reasons for the choice may be based on the practice type (private or public), experience, expertise, cost, time or any other consideration [2]. This study was undertaken to explore preference for either single visit or multiple visits RCT amongst dental practitioners in FCT, Abuja and to identify reasons for their preference. A total of one hundred and twenty-one filled questionnaires were evaluated out of one hundred and twenty-six dental practitioners surveyed in the study. A high response rate from any sample is essential for the data to be representative of the entire population. Although opinions differed as to a response rate high enough to eliminate nonresponse- response bias, but reported to be commonly between 70-80% [15], the response rate in this study was 96%.

Different studies [15,16] have documented the dental practitioners' point of view on treatment philosophy, rationale and preference regarding single and multiple visits root canal treatment along with the basis on which the choice of treatment is made. The present study showed that_multiple visit was preferred by 94.2% of the respondents irrespective of age, gender and years since graduation. A similar result among dentists from the eastern part of Nigeria was documented by Udoye *et al* [17]. Even though the preference was similar for multiple visit, the reason in the previous study was different and it was reported to be due to low professional qualification. A study carried out in India, showed that 93% of 500 endodontists preferred to do multiple visits root canal treatment [18]. However, they reported that single visit root canal treatment was preferred mostly in vital teeth. Likewise, other studies done in Saudi Arabia, Australia, North Jordan, Pakistan and Sudan reported preference for multiple visits over single visit RCT [19-23]. On the contrary, studies conducted in Chennai, Indian [24] and the US (56.61% and 70% respectively) revealed that single visit root canal therapy was commonly performed and most endodontists would treat teeth with a necrotic pulp and chronic apical abscess in one visit. This finding is different from that of our study which showed that only 5.8% preferred single RCT in such cases. The reason for the differences in their study and ours may be due to better facilities available in USA and also the work culture in the USA may not permit patients to have time for frequent dental visits.

With regards to the decision to choose a single-visit or multiple-visits endodontic treatment, clinicians

may be influenced not only by effectiveness, complications and cost but also by factors such as patient and/or operator comfort, preference and satisfaction [16]. Some clinicians' choice may have been affected by what they were taught when they were dental students, and their training would have varied between dental schools. For example, Inamoto and colleagues suggested that single-visit endodontic treatment was not popular in Japan [11] due to cultural belief that multiple visit was more effective. The major concern of participants who preferred a multiple-visit approach was bacterial control and management of infected canals irrespective of pulpal health status. However, a study in Brazil reported that endodontists preferred multiple-visit over single-visit endodontic treatment when the tooth had pulp necrosis [25]

A further exploration of the reasons for the high preference for multiple visit in this study indicated that it was to take advantage of interappointment medications due to its antibacterial property which they perceive to help in complete elimination of bacteria (Table 3). This agrees with Wong's finding where endodontists preferred multiple visits RCT due to the positive effects of interappointment medications [16]. However, Udoye *et al* [17] reported the level of professional training as the major reason for multiple visits RCT .

Another commonly reported reason is the shorter chair side time[16] for single-visit treatment than multiple-visits treatment. The present study found out that, 85.7% of those who preferred single visit RCT believed that it was timesaving. One would have expected that the private dental practitioners would have preferred single visit to multiple visits RCT, however, the majority of them prefers the multiple visit RCT. The reason may be due to the prevailing educational culture in dental schools that does not expose the undergraduate students to rotary endodontics but places emphasis on manual root canal cleaning and shaping which is cumbersome and requiring multiple visits to achieve.

Conclusion

The results of this study show that most of the practitioners in the study area preferred multiple visits RCT and the main reason for that is to take advantage of inter-appointment medications. The majority of those who opted for single visit did because it is timesaving. Generalizability of this study may be limited, as it represents only views of practitioners in FCT. Practitioners in other parts of the country and world may have different educational background, practice philosophy and belief systems. Further studies with larger sample sizes involving multiple centres across the six geopolitical zones of the nation is however recommended to provide more evidence for use of single and multiple visit RCT.

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Pattern of bone metastases in breast cancer patients

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Abstract

Background: Breast cancer is the most frequent cancer among women and is a significant contributor to cancer-related mortality. Advanced stages of the disease have been associated with distant metastasis, more prominently, to the bone. Responsible for debilitating complications such as bone pain, pathological fractures, and spinal cord compression, it is important to determine the pattern of clinical presentation of bony metastases in patients with breast cancer. The aim of this study was to determine the clinical and radiological pattern, and distribution of bone metastases in Nigerian breast cancer patients.

Methods: Sociodemographic, clinical, and radiological data of patients diagnosed with breast cancer between 2001 and 2010 were extracted from medical records.

Results: Out of a total of 311 patients with bony metastases, 41.5% presented within twelve months of diagnosis with skeletal metastases, At presentation, 46.6% were at stage III of the primary disease while 21.2% and 29.3% were in stages II and IV respectively. 30.5% had solitary bone metastasis while 69.5% had metastases to multiple bones. 89.7% presented with bone pain, 19.3% with cord compression, and 12.5% with fractures. The spine and pelvis were the most involved bones (66.6% and 34.7% respectively). 48.2% also had co-existing lung, liver, or brain metastases.

Conclusion: This study shows that patients with younger ages at diagnosis, those with axillary nodal involvement, and poorly differentiated tumors were found to have an increased risk of bone metastases. We advise that patients presenting at any stage be thoroughly screened for early detection of bone metastases.

Keyword: *Metastases, breast cancer, sociodemographic, clinical*

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Résumé

Contexte: Le cancer du sein est le cancer le plus fréquent chez les femmes et contribue de manière significative à la mortalité liée au cancer. Les stades avancés de la maladie ont été associés à des métastases distant, plus en évidence, à l'os. Responsable à des complications débilitantes telles que les douleurs osseuses, les fractures pathologiques et la compression de la moelle épinière, il est important de déterminer le schéma de présentation clinique des métastases osseuses chez les patients atteints d'un cancer du sein. Le but de cette étude était de déterminer le schéma clinique et radiologique et la distribution des métastases osseuses chez les patients nigérians atteints d'un cancer du sein.

Méthodes: Les données sociodémographiques, cliniques et radiologiques des patients diagnostiqués avec un cancer du sein entre 2001 et 2010 ont été extraites des dossiers médicaux.

Résultats: Sur un total de 311 patients présentant des métastases osseuses, 41,5% présentaient dans les douze mois suivant le diagnostic des métastases squelettiques, à la présentation, 46,6% étaient au stade III de la maladie primaire tandis que 21,2% et 29,3% étaient aux stades II et IV respectivement. 30,5% avaient des métastases osseuses solitaires tandis que 69,5% avaient des métastases à plusieurs os. 89,7% présentaient des douleurs osseuses, 19,3% avec une compression du cordon et 12,5% avec des fractures. La colonne vertébrale et le bassin étaient les os les plus touchés (66,6% et 34,7% respectivement). 48,2% avaient également des métastases pulmonaires, hépatiques ou cérébrales concomitantes.

Conclusion: Cette étude montre que les patients avec un âge plus jeune au moment du diagnostic, ceux présentant une atteinte ganglionnaire axillaire, et des tumeurs mal différenciées présentaient un risque accru de métastases

osseuses. Nous conseillons aux patients qui se présentent à tout stade de subir un dépistage minutieux pour une détection précoce des métastases osseuses.

Mots clés: *Métastases osseuses, cancer du sein, sociodémographique, colonne vertébrale, bassin*

Introduction

Breast cancer is the most frequent cancer among women with an estimated 1.38 million new cancer cases diagnosed worldwide in 2008 [1]. It is a significant contributor to cancer-related mortality, being the most common cause of cancer death among women in both developed and developing countries [1, 2]. In Nigeria, breast cancer is associated with a poor prognosis majorly because about 80% of patients often present at advanced stages of the disease when the most realistic aim of treatment can only be palliative [3].

The disease is the commonest malignancy accounting for 23% of 5000 cancer cases reviewed at a Radiotherapy center where a large proportion of these patients presented with an advanced and metastatic disease (stage III and IV) [3]. This suggests that patients are more inclined to present with metastases to distant structures. In addition, it has also been documented that many breast cancer patients who are free of overt metastases after initial local and regional treatment eventually die from recurrence of distant disease [4]. The most frequently encountered metastases during the evolution of cancer are bone metastases, which involve painful syndromes and affect the patients' quality of life greatly [5].

It is estimated that 85% of individuals with advanced disease harbor bone metastasis which is unfortunately incurable [6]. In addition, bone represents the first and most commonly affected site for distant metastasis in approximately 50% of patients with breast cancer [7, 8]. Bone metastasis is a significant cause of morbidity and reason for referrals from both specialist physicians and surgeons [9].

Skeletal metastasis accounts for many complications such as bone pain, impaired mobility, hypercalcemia, pathological fracture, spinal cord or nerve root compression, and bone marrow infiltration, and therefore has costly demands on healthcare resources [10, 11]. Management of bone metastasis is multimodal, and includes the use of analgesics, radiation therapy, bisphosphonate, and surgery.

Determining the pattern of clinical presentation of bony metastases in patients with breast cancer will help the clinician to predict which patients are more at risk of bony metastases from breast cancer. It would also help in tailoring investigations to ensure early detection before the advent of arduous symptoms that result in poor quality of life. The institution of appropriate treatment modalities will therefore be prompt, resulting in adequate prevention and/or alleviation of severe morbidity that is associated with bony metastases. This is especially important in such environments where, sadly, there is paucity of facilities and the patients are mostly indigent.

The aim of the current research was to determine the pattern of bone metastases in Nigerian breast cancer patients. Specifically, this research aimed at 1) determining the pattern of clinical presentation of bony metastases, 2) evaluating the radiological pattern of bone metastases, and 3) determining the distribution of bone metastases.

Methods

Sample population

The data for this study was obtained from clinical, radiotherapy, and treatment notes of 602 patients who had been seen and treated for breast cancer between January 2001 and December 2010 in the department of Radiotherapy, University College Hospital (UCH), Ibadan. Only 369 had documented evidence of being managed for bone metastases and just 311 met the eligibility criteria.

Case notes were selected on the basis of availability of histology reports confirming their breast cancer diagnosis, and a radiological report confirming the diagnosis of bone metastases. Suspected breast cancer cases with conflicting histology were excluded from the study.

This study was ethically approved by the Joint Ethical Review Committee of the University College Hospital, Ibadan. The study was conducted in accordance with specific principles of data confidentiality, beneficence, and non-maleficence to patients.

Measures

Available radiotherapy case notes and treatment records of breast cancer patients seen within the previously defined time frame were screened for data on patients' bio-data including age at presentation, sex, ethnic group, occupation, marital status, employment and educational level. Clinical data such as mode of presentation, stage at presentation, nodal

status, histology, grade either as well differentiated (G1), moderately differentiated (G2), or poorly differentiated (G3), hormonal status of the tumor and the sites of metastases were also retrieved. These were determined from history, physical examination and radiological tests during pretreatment, evaluation, and follow up periods.

The details of treatment received; radiotherapy, type of surgery, chemotherapy regimen, and hormonal therapy were also extracted. Other information such as sites of bone and non-bone metastases, duration of illness prior to onset of first skeletal metastases, as well as the presenting symptoms of bony metastases was extracted.

Statistical Analyses

The data obtained was analyzed using the Statistical Package for Social Sciences (SPSS) version 17.0 for Windows. Patients' demographic and clinical characteristics were presented using descriptive statistics.

Results

Sample characteristics

A sample total of 602 patients were identified as having breast cancer within the study period but only 369 had documented evidence of being managed for bone metastases, out of which 311 met the eligibility criteria earlier defined. The largest occupational group among the study subjects engaged in trading (n=84; 27%), closely followed by teaching (22.2%), house wives (15.8%) and civil servants (8.3%). The majority were Christians (n=275; 88.4%), while the rest were mostly Muslims (n=33; 10.6%) or traditional worshippers (n=3).

Table 1. Sociodemographic characteristics (n=311)

	n	%
Age (years)	Mean: 46.0 years Standard Dev.: 10.7 Range: 27-78 years	
Sex		
Female	305	98.1
Male	6	1.9
Marital status		
Married	250	80.4
Single	37	11.8
Widowed	21	6.8
Divorced	3	1.0
Education		
Formal	192	61.7
Non formal	119	38.3

Clinical characteristics

The time lag between when the patients noticed symptoms to diagnosis ranged from 2 to 96 months with a mean of 16.08 months (SD 14.12). More patients (47.9%) presented over a year after symptoms were noticed. Just a mere 1% of patients presented within 6 months of the first symptom. There was a greater predilection for the left breast in 55.6% of the patients unlike 39.5% who had the right breast as the primary tumor site. 4.9% had bilateral disease. 54.3% had palpable ipsilateral axillary nodes at presentation but 32.8% did not have any palpable axillary node. Concerning the menopausal status of the patients, 49.5% were premenopausal 48.6% post-menopausal. 26.4% of the patients had co-morbid health conditions including Diabetes mellitus, hypertension, and HIV/AIDS.

Table 2. Clinical characteristics (n=311)

	n	%
Duration prior to diagnosis (months)		
<6	56	18.0
6 – 12	106	34.1
>12	149	47.9
Tumor site		
Right	123	39.5
Left	173	55.6
Bilateral	15	4.8
Axillary nodes		
None	102	32.8
Ipsilateral	169	54.3
Contralateral	7	2.3
Bilateral	33	10.6
Menopausal status		
Premenopausal	154	49.5
Postmenopausal	151	48.6
Family history	28	9.0
Co-morbidity	82	26.4

Presentation of metastasis

41.5% developed bone metastasis within twelve months of diagnosis, but the larger majority (48.2%) presented between 1 and 5 years after diagnosis. The mean was 25 months (SD 25.7). At presentation, 46.6% were at stage III of the primary disease while 21.2% and 29.3% were in stages II and IV respectively.

198 (63.7%) patients had osteolytic lesions at time of presentation. 27.3% had osteoblastic lesions while the remaining 9.0% had mixed lesions. 30.5% already had solitary metastasis to non-contiguous bone while 69.5% had metastases to multiple bones. In 248 cases (79.7%), X-rays were used to diagnose bony metastases. 39.9% and 1.9%

had bone scan and computerized tomography scan respectively.

Bone metastasis was an incidental finding in 22 cases, while in the remaining 289 patients, diagnosis of bone metastasis was made following symptoms. 89.7% presented with bone pain, 19.3% with cord compression, 12.5% with fractures, and 5.7% with other symptoms.

Table 3. Pattern of presentation of metastases (n=311)

	n	%
Duration to metastatic disease (months)		
< 1 year	129	41.5
1 – 5 years	150	48.2
> 5 years	32	10.3
Type of lesion		
Osteolytic	198	63.7
Osteoblastic	85	27.3
Mixed	28	9.0
Number of metastases		
Single	95	30.5
Multiple	216	69.5
Imaging ModalitiesX-ray	248	79.7
Bone scan	124	39.9
CT Scan	6	1.9
Symptoms present	289	92.9
Bone pain	279	89.7
Cord compression	60	19.3
Fracture	39	12.5
Other symptoms	18	5.7

Distribution of bone metastasis

The spine was the most involved in 66.6% of cases, followed by the pelvis in 34.7%. The femur, humerus, ribs, and skull were involved in 25.1%, 19.9%, 18.0%, and 17.0% respectively. Other bones including sternum, clavicle, were involved in 61 patients. Aside bone metastases, 24.4% of the patients also had lung metastases, 12.9% with liver metastasis, and 10.9% had metastases to the brain. 12 patients had metastases to other structures including the contralateral breast and adrenal gland.

Metastases to the long bones were most common in the femur (n=78) and humerus (n=62). The other bones of the appendicular skeleton were less commonly involved. The proximal parts of long bones were more commonly involved.

Pattern of treatment

Chemotherapy was administered in 86.5% for the primary breast cancer. The commonest regimens were CAF and CMF. 63% had mastectomy while 38 patients 12.2% had breast conservation surgery.

Table 4. Pattern of bone and non-bone metastatic distribution (n=311)

	N	%
Bone metastases		
Spine	207	66.6
Pelvis	108	34.7
Femur	78	25.1
Humerus	62	19.9
Ribs	56	18
Skull	53	17
Tibia	7	2.3
Radius & Ulnar	6	1.9
Others	61	19.6
Non-bone metastases		
Lung	76	24.4
Liver	40	12.9
Brain	34	10.9
Others	12	3.9

79.1% had local radiotherapy to the chest wall, 70.1% had hormonal therapy; while just 13.5% had biphosphonate therapy for the metastatic disease.

On the other hand, over 90% of patients with confirmed bone metastases required analgesia for pain control. On account of severe pain or imminent fracture in weight bearing bones, 7% of these patients also had external beam radiotherapy administered.

Table 5. Pattern of distribution of metastases in long bones (n=311)

	Upper third	Mid third	Distal third	Total
Uninvolved				152
Radius	6	-	-	6
Ulnar	6	-	-	6
Humerus	49	9	4	62
Tibia	-	5	2	7
Fibula	-	-	-	-
Femur	57	9	12	78
Total	118	23	18	159

The dose of radiotherapy ranged from 15Gy in 3# in 45.7% of patients to 25Gy in 6# in 17.3% and 8Gy single fraction in 7.1% of patients.

Table 6. Pattern of treatment of primary disease (n=311)

	n	%
Chemotherapy (first line)	269	86.5
CAF	156	50.2
CMF	63	20.3
AC	45	14.5
Taxanes	3	1.0
Others	12	3.9
Surgery		
Mastectomy	196	63.0
Breast conserving	38	12.2
Axillary clearance	131	42.1
Radiotherapy (chest wall)	246	79.1
Hormonal therapy	218	70.1
Biphosphonate	42	13.5

CAF – Cyclophosphomide, Adriamycin, 5FU; CMF – Cyclophosphomide, Methotrexate, 5FU; AC – Adriamycin, Cyclophosphamide

Table 7. Pattern of treatment for bone metastases (n=311)

	n	%
Analgesia	281	90.3
Radiotherapy	273	87.8
Dose		
15Gy/3#	142	52.0
25Gy/6#	54	19.7
20Gy/4#	24	8.9
8Gy/1#	22	8.0
Others	31	11.3
Biphosphonate	42	13.5

Discussion

In this retrospective study, 311 patients (51.7%) out of 602 patients diagnosed with breast cancer were found to have radiological evidence of bone metastases. Earlier reports showed that bone metastases occured in 40% to 50% of patients with metastatic breast cancer, and that up to 80% of patients with recurrent breast cancer will eventually show evidence of skeletal involvement [11]. A local study showed that 86% of patients treated for breast cancer were eventually diagnosed with bone metastases [12], however, study population was smaller and therefore more selective, which may explain the high percentage when compared to our study.

The age range of the subjects was between 27 and 78 years, with a mean age of 46 years. Other studies had reported similar findings [13]. It is therefore clear that in a developing country such as this, patients tend to present at an earlier age than in developed countries, where an average age of presentation with bone metastases has been reported as 62.2 years [14]. This is further supported by the fact that in this study, more of the participants (49.5%) were pre-menopausal than 48.6% who were post-menopausal. Breast cancer is said to be more aggressive and more likely to present with distant metastases in this younger age group [15].

Late presentation has been constantly documented as a common phenomenon in patients with cancer in developing nations [16]. This study shows that the average duration of breast cancer symptoms prior to presentation in the clinic is 16 months. There was also a progressive increase in the average time that elapsed prior to presentation for increasing disease stages: 6, 10, 15 and 23 months for stages I, II, III, IV diseases respectively. Patients therefore presented more with late disease (stages III and IV) [75.9%] than with early disease (stages I and II) [21.2%]. This is likely due to the fact that access to, as well as use of, routine mammography which is grossly helpful in detecting breast cancer at early stages is still lacking in this environment [16]. Other factors that have been postulated for late presentation in this environment include religious beliefs, ill-informed perceptions about breast cancer, socioeconomic problems, readily accessible herbal and spiritual treatment options, fear of mastectomy and a gap in knowledge of health care providers about breast cancer [17].

At the time of presentation, 67.2% had positive nodes. The presence of nodes at the time of breast cancer diagnosis has been positively linked to increased risk for distant metastases including bone [4, 12, 18]. Also, 25 patients had well differentiated tumors, 32 had moderately differentiated tumors and 42 had poorly differentiated tumors. Several studies have showed a relationship between tumor grade and propensity for metastases, with poorly differentiated tumors showing a significantly higher likelihood for metastatic spread particularly to viscera [18, 19].
Within two years of diagnosis with breast cancer, the majority of the patients had developed bone metastases. 41.5% presented within the first year and another 19.3% presented within the second year. This may be associated with the pattern of late presentation. A comparative study showed that 36.7% and 33.3% of the study subjects presented with bone metastases at 1 year and 2 years of diagnosis respectively [8].

The most employed means of detecting bone metastases was X-rays (79.7%), which was followed by bone scan (39.9%) and then computerized tomography (CT) scan (1.9%). Reports have stated that routine scintigraphy is more sensitive and accurate than routine radiology for the detection of skeletal metastases, especially considering its ability to detect subclinical metastases to bone [20]. However, the poor use of bone scan may be attributed to the fact that bone scan was not available at the study location until the latter half of this study. Also, significantly higher costs of bone scan relative to X-rays may mean lower ordering of such tests amongst physicians, or declination to do it on the part of patient [21]. Nonetheless, a recent study concluded that bone scan was not as accurate in localising bone metastases, and that carefully done X-rays may have up to 92% accuracy [22]. Other forms of radiological investigations lauded to have superior benefits like MRI and PET Scans are either too expensive or scarce in this environment [10, 23].

More patients (69.5%) had multiple non-contiguous metastases. Solitary metastasis was seen in 30.5%. For a long time, it's been thought that solitary metastasis was rare in cancer patients with figures quoted to be 7% and lower [24]. However with improved screening practices and improvement in imaging equipment, more cases of solitary metastasis are now being seen. Bone scan is reputed to have a high sensitivity for detecting bone pathology and is able to pick up bone lesions long before they become symptomatic as against X-rays which require up to 50% of cortical demineralization before registering bone lesions [25]. The preponderance of the solitary metastasis has been buttressed by studies that found 14% and 76.7% of solitary bony metastases in different populations [8, 12].

Just 22 patients in this study presented with bone metastases as an incidental finding. The majority (92%) presented with one or multiple symptoms. Pain was the single most common clinical presentation of bone metastases. 89.7% presented with bone pain while 19.3% presented with signs of cord compression ranging from numbness in the limbs to frank paralysis. Pain has been serially documented as the most common presentation of metastatic disease to bone [8, 9, 26]. Other symptoms found include pathological fracture and swelling. A large proportion of patients in this study were symptomatic whereas it has been stated that even though pain is a common presenting symptom in patients with bone metastases from breast cancer, 30-50% of patients may be asymptomatic as at presentation [27]. This disparity is likely best explained by the obvious delay in diagnosis, as well as the high cost and unavailability of specialized diagnostic modalities which further delays diagnosis.

The commonest bones involved were those of the axial skeleton, in particular, the spine. 207 patients (66.6%) had radiologically demonstrable metastases to the spine, mostly the lumbar region. The pelvis was the next most affected with 34.7% of patients presenting with metastases in this area. Similar studies have pointed out that the lumbar vertebrae was the commonest site of metastases [8, 12]. Also, the most commonly affected long bones were the femur (25.1%) and humerus (19.9%). In these bones, the proximal ends were most commonly affected. Similar results have been found in other studies, albeit with slightly lesser values of 19.1% and 14.5% respectively [27]. The ends of long bones are said to be more commonly affected than the shaft because of the proximity of bone ends to the nutrient artery and confinement of red marrow to the ends of the long bones [28, 29].

86.5% of patients had chemotherapy either as neo-adjuvant or adjuvant therapy, with the commonest regimen being cyclophosphomide/adriamycin/5FU (CAF) and cyclophosphomide/ methotrexate/5FU (CMF). Surgery (predominantly mastectomy) was done in 75.2% of patients. Radiotherapy to the chest wall was used as treatment for 79.1% of patients while hormone therapy was used in 70.1%. The use of biphosphonate was relatively poor with only 13.5% of patients receiving it, mostly because of its unavailability for the most part of the study. Similar figures have been presented: 87.3% of patients with breast cancer in a similar setting had surgery, 84% had chemotherapy [30]. Just 33.3% of patients however had radiotherapy, a fact that may be accounted for by the lack of radiation treatment facilities in the centre where the study was done. As documented, patients had to be referred for treatment and compliance may have been poor [30].

Conclusion

Majority of breast cancer patients in this setting present late to the hospital when bone metastases may already be overt or occult or may develop shortly thereafter. On account of increasing survival rates amongst breast cancer patients, many will present to the oncologist repeatedly on account of the many distressing symptoms of bone metastases such as pain and spinal cord compression. Younger patients and those with axillary nodal involvement, and poorly

differentiated tumors were found to be at an increased risk of bone metastases in this study.

The axial skeleton is the most commonly affected with a preponderance of osteolytic lesions. Patients presenting with breast cancer should therefore be thoroughly investigated for early detection of bone metastases. Treatment with radiation therapy is effective in the management of bone pain and other skeletal related events. However, further studies on this modality for a consensus on the most beneficial dose and fractionating schedule is recommended. Biphosphonate therapy which is still relatively novel in this environment needs to be looked at as a way of reducing the incidence of bone metastases in patients with breast cancer. Sustained effort to establish screening procedures amongst the populace will lead to increased detection of breast cancer in early stages and help to reduce the incidence of bone metastases in our environment.

Limitations

This study faced a few limitations such as the inability to conduct immunohistochemical investigations. At the time of carrying out this study, routine immunohistochemistry was not available in the hospital until about 2010. There was also poor follow-up of patients as many of the patients were lost due to reasons such as inability to afford care, change of hospitals, and death.

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Plasmid profiles of extended spectrum beta lactamase (ESBL) producing multidrug resistant *Klebsiella* species from different clinical sources

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Abstract

Background: Resistance of *Klebsiella* species to conventional antibiotics is often implicated in increasing nosocomial infections, and is due in part to enzymatic hydrolysis either constitutively and/or inductively. Resistance plasmid factors readily spread mostly through Gram-negative bacterial isolates through conjugative plasmids.

This study investigated the presence of extended spectrum beta lactamases (ESBL), profiles of plasmids detected, and resistance to conventional antimicrobial agents among clinical isolates of *Klebsiella* species from three different sources.

*Method***:** Seventy Gram-negative bacteria and lactose fermenters from urine, wounds and sputum specimens from three hospitals in the South West region of Nigeria were studied after identification with microbial identification system. Antibiogram was determined using modified Kirby-Bauer disc diffusion method. Phenotypic detection of ESBL-production was carried out using double-disk synergy tests (DDST). Plasmid DNA were extracted by alkaline lysis method, electrophoresed, viewed by a UV-trans-illuminator, with plasmid size and number determined, following standard protocols.

*Results***:** Twenty-nine (29) or 41% of the seventy clinical isolates were confirmed as Klebsiella species distributed as: *Klebsiella pneumoniae* 89.66% (26/29); *Klebsiella oxytoca* 6.89% (2/29) and *Klebsiella ozanae* 3.45% (1/29). Among the *K. pneumoniae* isolates, 13 (50%) were from urine, 8 (30.77%) from wounds and 5 (19%) from sputum. Multidrug resistance was observed with the isolates; as 28 (96.5%) were resistant to at least four (4) different classes of antibiotics. Among the 29 isolates, 14 (48.3%) *Klebsiella* species were ESBL-producers while 15 (51.7%) were non-ESBL producers. The ESBL-producers showed higher antibiotic resistance compared to non-ESBL producers, particularly with respect to β-lactam antibiotics. Plasmid DNA, with sizes range of 0.78 - 23 kbp were detected in 17 (58.62%) of the isolates.

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Conclusion: Multidrug resistance (MDR) phenomenon was observed with *Klebsiella* species particularly among the ESBL-producers harbouring high-molecular weight plasmids. There is need for routine ESBL-production surveillance and the rational choice of antibiotics for infection management, reduction and containment of spread of antibiotic resistance in clinical settings.

Keywords: *Klebsiella species, ESBL-producers, plasmids, antibiotic resistance*

Résumé

Contexte: La résistance des espèces *Klebsiella* aux antibiotiques conventionnels est souvent impliquée dans l'augmentation des infections nosocomiales, et est due en partie à l'hydrolyse enzymatique soit de manière constitutive et / ou inductive. Les facteurs de résistance plasmidiques se propagent facilement principalement à travers des isolats bactériens Gram-négatifs par des plasmides conjugatifs.

Cette étude a examiné la présence de bêta-lactamases à spectre étendu (BLSE), les profils de plasmides détectés et la résistance aux agents antimicrobiens conventionnels parmi les isolats cliniques des espèces *Klebsiella* provenant de trois sources différentes.

Méthode: Soixante-dix fermenteurs de bactéries Gram-négatives et de lactose provenant d'échantillons d'urine, de plaies et d'expectorations provenant de trois hôpitaux de la région du sud-ouest du Nigéria ont été étudiés après identification avec un système d'identification microbienne. L'antibiogramme a été déterminé en utilisant la méthode de diffusion du disque de Kirby-Bauer modifiée. La détection phénotypique de la production de BLSE a été réalisée à l'aide de tests de synergie à double disque (TSDD). L'ADN plasmidique a été extrait par la méthode de lyse alcaline, soumis à l'électrophorèse, vu par un trans-illuminateur-UV, avec la taille et le nombre de plasmides déterminés, en suivant les protocoles standard

Résultats: Vingt-neuf (29) ou 41% des soixante-dix isolats cliniques ont été confirmés comme étant des espèces *Klebsiella* réparties comme: *Klebsiella*

pneumoniae 89,66% (26/29); *Klebsiella oxytoca* 6,89% (2/29) et *Klebsiella ozanae* 3,45% (1/29). Parmi les isolats de *K. pneumoniae*, 13 (50%) provenaient d'urine, 8 (30,77%) de plaies et 5 (19%) d'expectorations. Une résistance aux médicaments multiple a été observée avec les isolats; parce que 28 (96,5%) étaient résistants à au moins quatre (4) classes différentes d'antibiotiques. Parmi les 29 isolats, 14 (48,3%) espèces *Klebsiella* étaient des producteurs-BLSE tandis que 15 (51,7%) étaient des non producteurs-BLSE. Les producteurs-BLSE ont montré une résistance aux antibiotiques plus élevée que les non producteurs-BLSE, en particulier en ce qui concerne les antibiotiques â-lactame. L'ADN plasmidique, avec des tailles allant de 0,78 à 23 kbp, a été détecté dans 17 (58,62%) des isolats.

Conclusion: Un phénomène de résistance aux médicaments multiple (MDR) a été observé avec les espèces *Klebsiella*, en particulier parmi les producteurs-BLSE hébergeant des plasmides de haut poids moléculaire. Il est nécessaire de surveiller systématiquement la production de BLSE et de choisir rationnellement les antibiotiques pour la gestion des infections, la réduction et l'endiguement de la propagation de la résistance aux antibiotiques en milieu clinique.

Mots clés: Espèces *Klebsiella*, producteurs-BLSE, plasmides, résistance aux antibiotiques

Introduction

Klebsiella bacterial species are widely recognized as important opportunistic pathogens in hospital patients, representing 3–8% of all nosocomial bacterial infections and ranking second behind *Escherichia coli* as a cause of nosocomial Gram-negative infections [1, 2]. Infections with *Klebsiella* are caused mainly by *K. pneumoniae* and *K. oxytoca* in a proportion estimated at 2 to 1 [3], and to a much lesser degree, *K. oxytoca* has been isolated from human clinical specimens. *Klebsiella pneumoniae* accounts for a significant proportion of hospital-acquired urinary tract infections, pneumonia, septicemia and soft tissue infections [4-6]. This is because *K. pneumoniae* has the ability to spread quickly from the gastrointestinal tract of the patients and further, by hands of health care personnel to colonize other patients, and thereby lead to nosocomial clonal outbreaks [2]. Hospital outbreaks of multidrug-resistant (MDR) *Klebsiella* spp., especially those in neonatal wards, are often caused by new strains, the so-called extended-spectrum-â-lactamase (ESBL) producers.

ESBLs mediated resistance to extended spectrum â-lactams, including third generation cephalosporins and monobactams such as aztreonam are common [7]. Extensive use of broad-spectrum antibiotics in hospitalized patients has led to both increased carriage of *Klebsiella* and subsequently, the development of multidrug-resistant strains that produce ESBLs [8]. ESBLs have been reported worldwide in many different genera of Enterobacteriaceae and *Pseudomonas aeruginosa* [9]. Outbreak of *Klebsiella pneumonia*e carrying ESBLs genes has been documented [10, 11]. The prevalence of ESBLs varies among different geographical location and from country to country [12].

The genetic expression of antibiotic resistance may be plasmid or chromosomally-mediated. Plasmid - mediated ESBLs is often accompanied with resistance that is restructured to other classes of antibiotics [13, 14). These transferable plasmids enabled *K. pneumoniae* to rapidly acquire antibiotic resistance [15, 16]. There are reports of infections with ESBL-producing Enterobacteria isolates with evidence of multi-resistant plasmids, particularly among *E. coli* and *Klebsiella* species in Nigeria [17, 18]. This study investigated ESBL-production, plasmid content and their possible role in antibiotic resistance of clinical isolates of *Klebsiella* species and highlighted the public health implications.

Materials and methods

Sample collection and identification

A total of seventy (70) isolates were collected for this study and were distributed as follows. Fifty-five isolates of lactose fermenting bacteria from urine, wounds and sputum were collected from the Microbiology Departments of two hospitals in South West Nigeria: 35 isolates from the University College Hospital (UCH) Ibadan and 20 isolates from Obafemi Awolowo University Teaching Hospital (OAUTH) Ife while 15 isolates were collected from the University of Ilorin Teaching Hospital (UITH) Ilorin over a period of seven months (January – July 2014). *Klebsiella pneumoniae* ATCC 13883 used as a reference organism was obtained from the Department of Pharmaceutical microbiology, University of Ibadan, Nigeria. The isolates were identified and confirmed as *Klebsiella* spp. with the use of the Microbact® Gram-negative identification kit (Oxoid, UK).

Antibiotic susceptibility testing

Antibiotic susceptibility test was carried out by the modified Kirby-Bauer technique [19]. Antibiotic disc

used were ciprofloxacin (5µg), nitrofurantoin (300µg), ceftazidime (30µg), cefuroxime (30µg), gentamicin (10µg), cefotaxime (30µg), augmentin® (30µg), ofloxacin (5µg), imipenem (10µg) and ceftriaxone (30µg). The diameters of zone of inhibition were measured and interpreted as susceptible (S), intermediate (I) or resistant (R) according to CLSI guidelines [20].

Determination of ESBL production

Isolates were subjected to initial screen test according to CLSI guidelines using ceftazidime (30µg) and ceftriaxone (30µg) disc diffusion; isolates showing ≤ 22mm with ceftazidime (30µg), ≤ 25mm with cefotaxime (30µg) and ≤27mm with aztreonam and ≤ 22mm with cefpodoxime (10µg) were identified as potential ESBL producers. Phenotypic detection of ESBL was done using the double disk synergy test (DDST). Mueller Hinton agar plates were inoculated with strains of *Klebsiella* spp. recovered from wound, urine and sputum specimens. Amoxicillin-clavulanate disc (20µg/10µg) was then placed at the centre of each of the inoculated plates. Discs containing ceftazidime (30µg), cefotaxime (30µg) and cefepime (30µg) (Oxoid, UK) respectively were placed 20mm (centre to centre of the discs) from the amoxicillin-clavulanate disc. The plates were incubated aerobically at 37°C overnight. After overnight incubation, a clear extension of the edges of the zones of inhibition of any of the cephalosporin antibiotics towards the disc containing clavulanic acid is described as synergy indicating the presence of an ESBL [21].

Plasmid profiling

Plasmid DNA was extracted from the fourteen (14) multi-drug resistant isolates using alkaline lysis method [22]. Extracted plasmid DNA was electrophoresed at 60-100v on 0.8% agarose gel and stained with 1mg/ml of ethidium bromide. The gel was photographed with a Polaroid camera under the view of a UV trans-illuminator. DNA molecular weights and distance migrated were determined according to Kim *et al*. [23].

Determination of minimum inhibitory concentration (MIC)

Agar dilution method according to CLSI [20] was used for the determination of the MIC of ceftriaxone and ciprofloxacin on clinical isolates (n=11) of ESBL-producing *Klebsiella pneumoniae* and the reference strain. Various concentrations of the antibiotics ranged 128-0.03µg/ml were prepared in a decreasing order, and 2mls of the varying concentrations were seeded into 18mls of Mueller Hinton agar and allowed to set. Organisms from overnight broth culture with turbidity equivalent to the 0.5 McFarland standard (1.0×10^8 cfu/ml) was then streaked on each plate. All plates were incubated at 37^0C for 24 hours. The MIC was taken as the minimum concentration of the antimicrobial drug where no visible growth was detected.

Statistical analysis

Pearson's chi-square and correlation coefficient was analysed using MATLAB and R-Package software. Statistical determination of ESBL production and plasmid presence in relation to clinical sources, as well as determination of correlation between percentage resistance and plasmid positive isolates were done.

Table 1. Antibiotic resistance profile of ESBL producers and non-ESBL producers

Antibiotics	ESBL positive (n = 14)			ESBL negative (n=15)		
	R (%)	I (%)	S (%)	R (%)	I (%)	S (%)
CRX	100	0.00	0.00	86.6	6.7	6.7
CAZ	85.7	0.00	14.2	66.7	0.00	33.3
CPR	64.3	7.1	28.6	100	0.00	0.00
NIT	85.7	7.1	7.1	60	0.00	40.0
AUG	100	0.00	0.00	93.3	0.00	6.7
OFL	64.3	21.4	14.3	73.3	6.7	20.0
CXM	92.9	0.00	7.1	66.6	6.7	26.7
GEN	42.9	7.1	50.0	73.3	0.00	26.7
CTR	57.1	21.4	21.4	46.7	53.3	0.00
IPM	21.4	0.00	78.6	6.7	20.0	73.3

Key: CRX= Cefuroxime, CAZ = Ceftazidme, CPR = Ciprofloxacin NIT=Nitrofurantoin, AUG = Augmentin, OFL = Ofloxacin, CXM = Cefotaxime GEN = Gentamicin, CTR = Ceftriaxone, IPM = Imipenem; R=Resistant; I=Intermediate; S=Sensitive.

Results

A total of 29 (41.40%) of the 70 isolates were confirmed to be *Klebsiella* spp., out of which were *Klebsiella pneumoniae* 89.66% (26/29), *Klebsiella oxytoca* 6.89% (2/29) and *Klebsiella ozanae* 3.45% (1/29). Among *the K. pneumoniae* isolates, 13 (50%) were from urine, 8 (30.8%) from wounds and 5 (19.2%) from sputum (Tables 2, 3 and 4).

Antibiotic susceptibility showed that 28 (96.6%) of *Klebsiella* isolates were resistant to Augmentin®, followed by cefuroxime 26 (89.6%), cefotaxime 23 (79.3%), ceftazidime 22 (75.8%), ciprofloxacin 21 (72.4%), nitrofurantoin 21 (72.4%), ofloxacin 20 (68.9%), gentamicin 17 (58.6), ceftriaxone 15 (51.7%), and imipenem 4 (13.7%). The multiple

Table 2. Plasmid profile of sputum isolates (n=5) in relation to ESBL production

Isolates	ESBL	No of Plasmid	Plasmid size (Kbp)
S03 Kpn	+	1	23
S04 Kpn	-	-	-
S05 Kpn	-	1	1.2
S06 Kpn	+	2	22, 1.2
S07 Kpn	+	-	-

Key: Isolates from sputum (S03-S07); Kpn= Klebsiella pneumoniae; + = present; - = absent

Table 3. Plasmid profile of wound isolates(n=9) in relation to ESBL production

Isolates	ESBL	No of Plasmid	Plasmid size (Kbp)
W02 Kpn	-	-	-
W03 Kpn	+	2	19.8, 1.1
W04 Kpn	-	-	-
W05 Kpn	+	2	19.8, 0.78
W06 Kpn	+	-	-
W08 Kpn	+	1	23
W14 Kox	-	-	-
W16 Kpn	-	1	23
W18 Kpn	+	1	23

Key: *Isolates from wound (W02 - W06, W08, W14, W16, W18); Kpn= Klebsiella pneumoniae; Kox= Klebsiella oxytoca; + = present; - = absent*

Table 4. Plasmid profile of urine isolates (n=15) in relation to ESBL production

Isolates	ESBL	No of Plasmid	Plasmid size (Kbp)
U01 Kpn	-	1	23
U03 Koz	-	-	-
U06 Kpn	-	2	7.8, 2.5
U09 Kpn	+	2	6.5, 2.1
U16 Kpn	+	1	7.8
U18 Kpn	+	-	-
U19 Kox	-	-	-
U20 Kpn	-	1	1.97
U23 Kpn	-	-	-
U26 Kpn	+	1	23
U30 Kpn	-	1	23
U31 Kpn	-	-	-
U34 Kpn	+	1	23
U35 Kpn	+	1	23

Key: *Isolates from urine (U01, U03, U06, U09, U16, U18, U19, U20, U23, U26, U30, U31, U34, U35); Kpn= Klebsiella pneumoniae; Kox= Klebsiella oxytoca; Koz= Klebsiella ozanae; + = present; - = absent*

Table 5: Multiple antibiotic resistance (MAR) index of the *Klebsiella* isolates

Isolate name/ number	Resistant pattern	MAR index	Resistant category
Kpn S06	CRX, CAZ, CPR, NIT, AUG, OFL, CXM, GEN, CTR, IPM	1	MDR
Kpn W18	CRX, CAZ, CPR, NIT, AUG, OFL, CXM, GEN, CTR, IPM	1	MDR
Kpn S04	CRX, CAZ, CPR, NIT, AUG, OFL, CXM, GEN, CTR	0.9	MDR
Kpn S05	CRX, CAZ, CPR, NIT, AUG, OFL, CXM, GEN, CTR	0.9	MDR
Kpn S07	CRX, CAZ, CPR, NIT, AUG, OFL, CXM, GEN, CTR	0.9	MDR
*Kpn*W16	CRX, CAZ, CPR, NIT, AUG, OFL, CXM, GEN, CTR	0.9	MDR
Kpn U01	CRX, CAZ, CPR, NIT, AUG, OFL, CXM, GEN, CTR	0.9	MDR
Kpn U26	CRX, CAZ, CPR, NIT, AUG, CXM, GEN, CTR, OFL	0.9	MDR
Kpn U31	CRX, CAZ, CPR, NIT, AUG, OFL, CXM, GEN, CTR	0.9	MDR
Kpn U34	CRX, CAZ, NIT, AUG, CXM, GEN, IPM, CPR, OFL	0.9	MDR
Kpn U30	CRX, CAZ, CPR, NIT, AUG, OFL, CXM, GEN	0.8	MDR
Kpn U17	CRX, CAZ, NIT, OFL, CXM, CTR, CPR, GEN	0.8	MDR
Kpn U18	CRX, CAZ, OFL, CXM, GEN, CTR, CPR, NIT	0.8	MDR
Kpn W03	CRX, CAZ, CPR, AUG, OFL, NIT, GEN, CXM	0.8	MDR
Kpn U35	CAZ, CPR, OFL, AUG, NIT, CXM, CRX,	0.7	MDR
Kpn U23	CRX, CAZ, AUG, CXM, CTR, OFL, GEN	0.7	MDR
Kpn U16	CRX, CPR, AUG, OFL, NIT, CXM, CAZ	0.7	MDR
Kox W08	CAZ, CXM, AUG, OFL, CPR, CRX, GEN	0.7	MDR
Kpn W02	CRX, CXM, AUG, CPR, GEN, NIT, CAZ	0.7	MDR
Kpn W05	CRX, CAZ, NIT, AUG, CXM, CTR	0.6	MDR
Kpn U20	CRX, CAZ, CPR, AUG, OFL, GEN	0.6	MDR
Kpn U09	CRX, CAZ, AUG, CXM, NIT, CTR	0.6	MDR
Koz U03	CRX, CPR, NIT, AUG, OFL, CXM	0.6	MDR
Kpn U06	CRX, CPR, AUG, OFL, IPM	0.5	MDR
Kpn W14	CRX, NIT, AUG, CXM, CTR	0.5	MDR
Kpn W06	CRX, CAZ, AUG, CXM, CTR	0.5	MDR
Kpn S03	CRX, NIT, AUG, CXM, CTR	0.5	MDR
Kox U19	CPR, AUG, OFL, GEN	0.4	MDR
Kpn W04	CRX	0.1	

***Key**: Kpn= Klebsiella pneumoniae; Kox= Klebsiella oxytoca; Koz= Klebsiella ozanae*
Isolates numbers between 01 to 35, S= sputum, W= wound, U= urine

Table 6: MIC of Ceftriaxone and Ciprofloxacin on ESBL Producers

MIC (µg/ml) on ESBL Producing *Klebsiella* isolates Isolates	Ceftriaxone	Ciprofloxacin
Kpn S03	16.0	0.5
Kpn S06	≥128	≥128
Kpn S07	16.0	16.0
Kpn W03	8.0	2.0
Kpn W06	128	1.0
Kpn W08	2.0	1.0
Kpn W18	2.0	1.0
Kpn U16	16.0	64.0
Kpn U26	8.0	2.0
Kpn U34	64.0	8.0
Kpn U35	8.0	2.0
Kpn ATCC 13883	0.12	0.02

Key: Kpn= Klebsiella pneumoniae S= Sputum isolates, W= wound isolates, U= Urine isolates

antibiotic resistance (MAR) index (Table 5) shows that 28 (96.5%) of the isolates had a MAR index of ≥0.4.

MAR index was calculated as a/b where:

a= Number of antibiotics to which test isolates depicted resistance.

b= Total number of antibiotics to which test isolates were. evaluated for susceptibility.

Minimum inhibitory concentrations (MICs) of ceftriaxone and ciprofloxacin were determined on ESBL producing *Klebsiella* isolates (and on the reference strain *K. pneumoniae* ATCC 13883) with the result shown in Table 6. The MICs of ceftriaxone were from 2.0 to ≥128.0 while that of ciprofloxacin were from 0.5 to >128.0 on the isolates. According

to CLSI equivalent MIC breakpoint [20], out of the 11 *K. pneumoniae* isolates tested, 4 (58.1%) demonstrated ciprofloxacin resistance and 6 (5.45%) showed resistance to ceftriaxone (MIC, ≥ 16 µg/ml), while 4 (3.64%) were resistant to ciprofloxacin (MIC, ≥4). The isolates from wounds were more susceptible to ciprofloxacin than urine and sputum isolates.

ESBL production indicated on plate 1 showed that 14 (48.3%) were ESBL-producers while 15 (51.7%) were non-ESBL-producers. Antibiotic susceptibility pattern of ESBL and non-ESBL-producing isolates (Table 1) showed a higher percentage resistance in ESBL-producing isolates compared to the non-ESBL – producers, particularly with respect to beta-lactam antibiotics.

Plasmid DNA was detected in 17 (58.62%) of the isolates with plasmid size range 0.78 - 23 kbp. Twelve (12) isolates had one plasmid each, of which seven, three and two were urine, wounds and sputum isolates, respectively. Nine (9) of these one-plasmid containing isolates were 23.0 kbp in size. The other three (3) had DNA sizes of 19.8 kbp, 7.8 kbp and 1.2 kbp respectively.

Five (5) isolates had two plasmid DNA, two each from urine and wounds while the remaining one from sputum specimens, with DNA sizes range 0.78 - 22 kbp (Tables 2, 3 and 4). One urine isolate with two plasmids was ESBL-negative while three (3) isolates without plasmid was positive for ESBL-production (plate 2 and plate 3).

Statistical analysis

Using the Pearson's chi-squared test; at P= 0.05 level, result shows that the P ≥ 0.05 (P= 0.975), hence there was no significant difference among the clinical sources of ESBL producing *Klebsiella* isolates and presence of plasmids. However, using Pearson's correlation coefficient (R^2), result shows that P= 0.000 and R^2= 1.000, a high correlation was found between percentage resistance and plasmid positive isolates of *Klebsiella.*

Discussion

Klebsiella species are important pathogens in nosocomial infections [24], with increasing resistance to multiple antibiotics [25]. In recent years following extensive use of the expanded spectrum cephalosporins, outbreaks of infection caused by extended spectrum beta lactamase producing *K. pneumoniae* has been widely reported throughout the world [26]. The clinical isolates of *Klebsiella* spp. in this study were found to be multidrug resistant (MDR) with 28 (96.5%) resistant to at least 3 different antibiotics with a MAR index of ≥0.4. It was noted that MAR index values greater than 0.2 indicates high risk source of contamination where antibiotics are often used [42,43], showing that a greater proportion of the isolates, having MAR index e"0.4 are from a high risk source. The high resistance observed in this study has been corroborated by previous studies [27, 28].

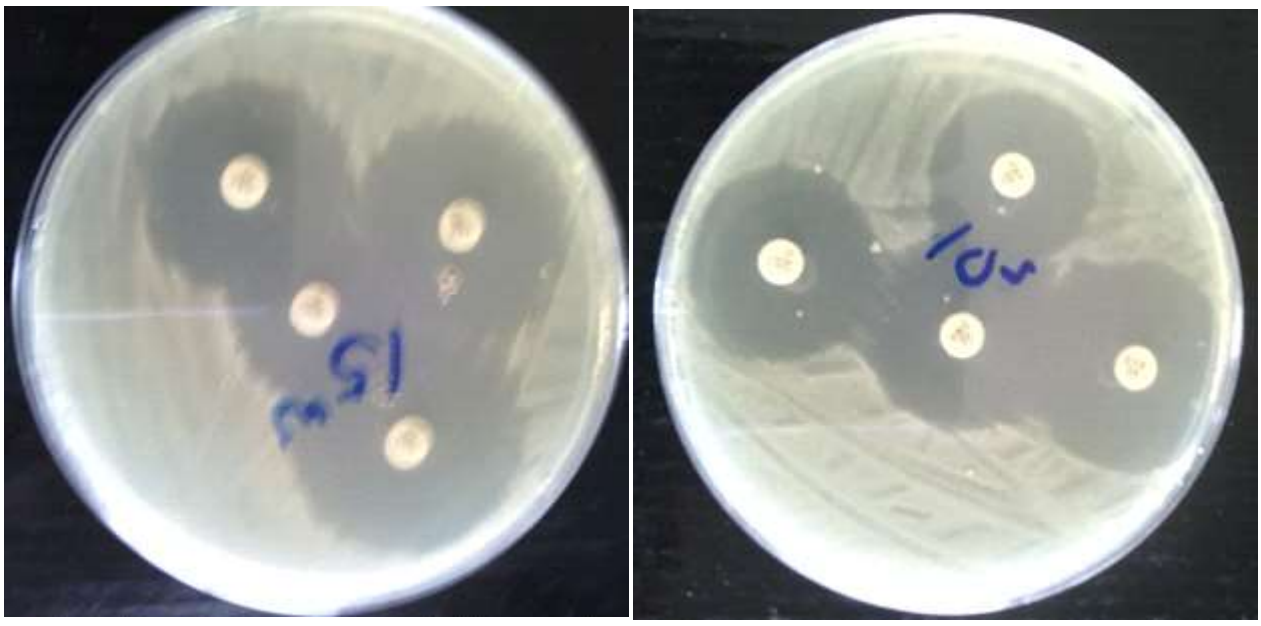

Plate 1: Characteristic (key shaped) ESBL pattern of the *Klebsiella* isolates observed on plates.

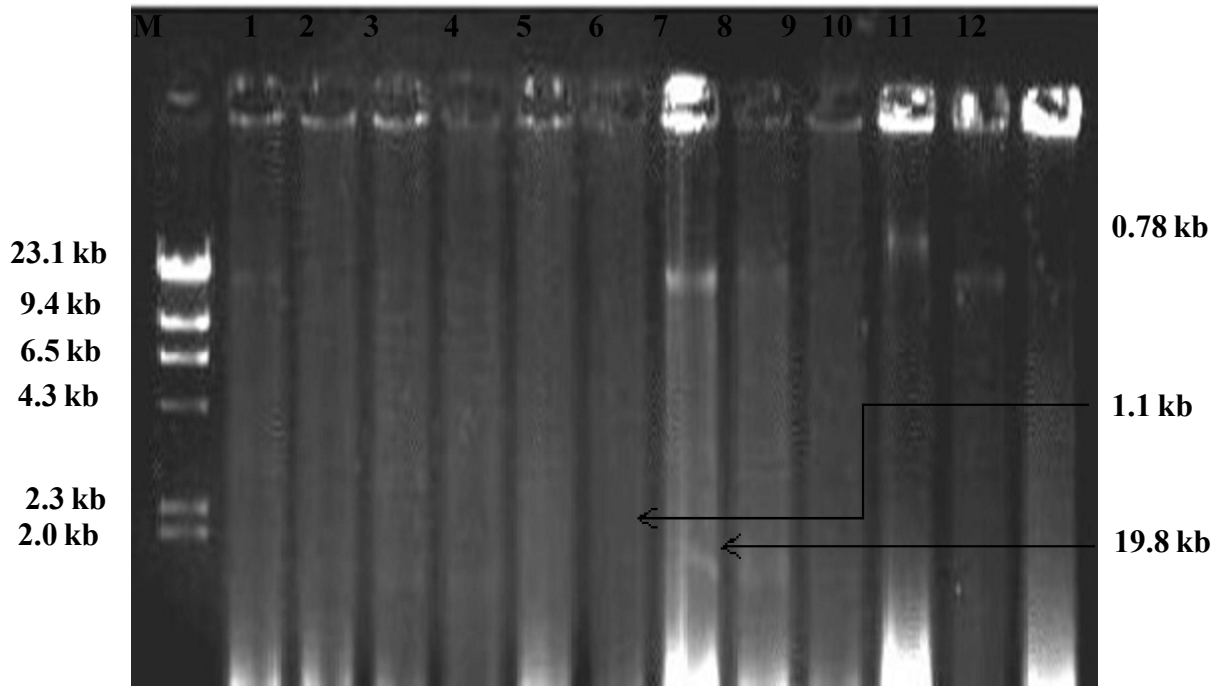

Plate 2: Agarose gel electrophoresis of plasmid DNA recovered from clinical isolates of *Klebsiella* spp. Lane M: Lambda DNA/*Hind* III marker: Lanes 1 and 11 shows different isolates carrying 23.0 kbp plasmid; Lane 7 carried both 19.8 and 1.1 kbp; Lane 8 carried both 19.8 and 0.78 kbp Lanes 2, 3, 4, 5, 6, 9, 10 and 12 lacked plasmids

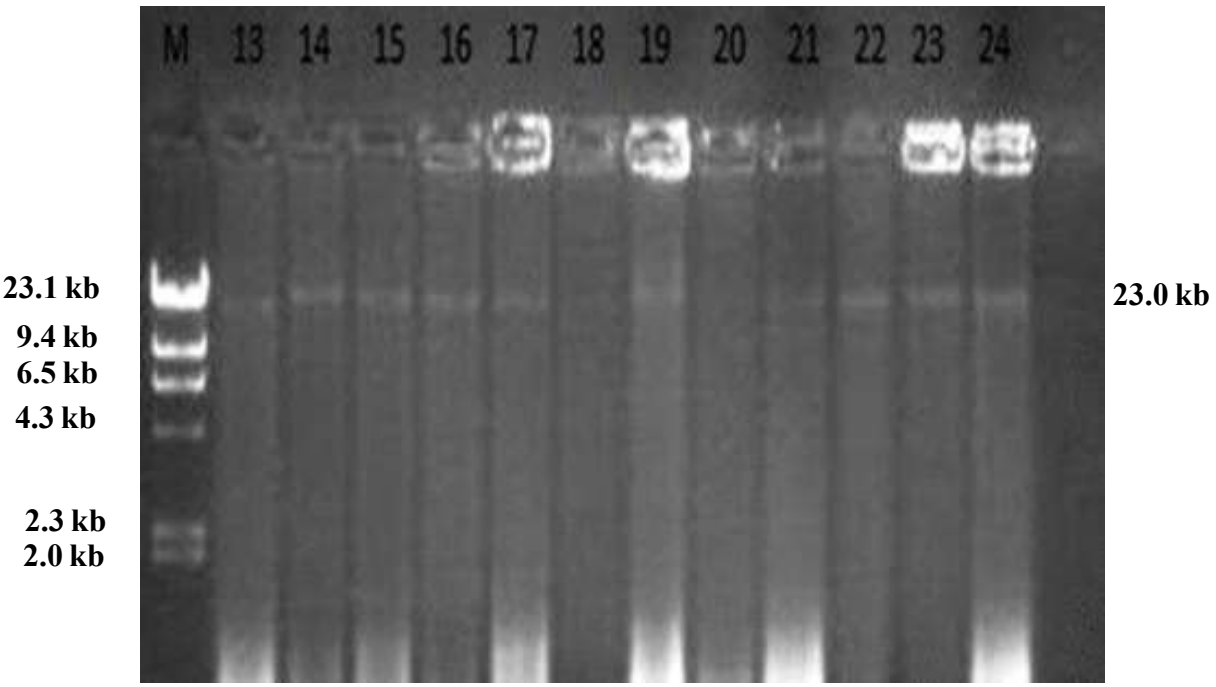

Plate 3: Agarose gel electrophoresis plasmid DNA recovered from the hospital clinical of *Klebsiella* species. Lane M: Lambda DNA/*Hind* III marker: Lane 13 shows isolate carrying 19.8 kbp plasmid; Lanes 14, 15, 16, 17, 21, 22, 23 and 24 shows different isolates carrying 23.0 kbp plasmid; Lanes 18 and 20 isolates lacked plasmids

Although significant bacteriuria has been ascribed to *K. ozanae* [29], *K. pneumoniae* (subsp. *pneumoniae*) was the most significant specie in this study. Occurrence of *Klebsiella* spp. in relation to anatomical site in this study showed that urine (51.7%) was the site where most of the isolates were isolated followed by wound (31.0%) and least is sputum (17.2%). This shows that *Klebsiella* is a significant

factor in the aetiology of urinary tract infection. Previous works had documented the isolation of *Klebsiella* species as the main causative agents of urinary tract infection [28].

Antibiotic susceptibility profile of ESBL positive isolates revealed 100% resistance to cefuroxime, cefotaxime (92.9%), ceftazidime (85.7%) and ceftriaxone (57.1%). This similar trend of resistance by ESBL producers to third generation cephalosporins have earlier been reported [30]. Cephalosporins, particularly second and third generation cephalosporins have been used for *Klebsiella* infections [31]. The isolates were most sensitive to imipenem, with 25 (86.2%) showing susceptibility; this finding is closely related to the report of the study conducted in LUTH [43]. However, considering the MIC values of ceftriaxone and ciprofloxacin on the ESBL producing isolates, according to CLSI equivalent breakpoint interpretation, the isolates were more susceptible (63.6%) to ciprofloxacin than to ceftriaxone (45.5%). Similar observations, and decreased susceptibility of ESBL producing *Klebsiella* to fluoroquinolones (ciprofloxacin) and third generation cephalosporins (ceftriaxone) have been documented [31-34]. Fluoroquinolones are the next drugs of choice to the imipenems, therefore high level resistance of ESBL producing *Klebsiella* isolates in this study and as previously reported is worrisome because of limited availability of antimicrobial alternatives.

In this study, 14 (48.3%) isolates were ESBL-producers, producing a characteristic key or T-shaped inhibition zone pattern (plate 1). This is similar to earlier study conducted by Okesola and Oni [32], where ESBL prevalence rate was 43.2%, and 40% prevalence rate was observed by Babypadmini and Appalarafu [33]. A study in Abeokuta, Nigeria reported a lower prevalence rate of 21.6% [18]. ESBL-producing organisms have been isolated with prevalence rates of 44.6% in Enugu and 6.7% in Ebonyi, Eastern Nigeria [34]. This result emphasized the need for application of ESBL-standard confirmatory tests, and even ESBL-plasmid detection assays, in hospital laboratories.

Plasmid profiles showed that seventeen isolates possessed plasmid bands of various sizes, range 0.78 - 23 kbp (Tables 2-4). The result from this study is higher than a report from a study conducted in Lagos University Teaching Hospital [35], plasmid sizes ranged from 3.0kbp to 4.9kbp but lower than those reported by other workers that revealed a very large plasmid DNA range 11.8kbp to 35.5kbp [18]. High resistance rate was observed with plasmid-bearing isolates. Five (20.8%) of MDR isolates subjected to plasmid profiling revealed the absence of plasmids. Two wound isolates were susceptible to two antibiotics each (ofloxacin and imipenem; gentamicin and imipenem), while two sputum isolates were susceptible to only imipenem, indicative of extremely resistance phenomenon (XDR) [36].

This is not also un-expected since the same antimicrobial resistance pattern can be encoded by unrelated plasmids, transposons, phages and chromosomal genes [37]. The observed differences in the plasmid sizes of clinical bacterial isolates in this study were in agreement with that reported earlier [38]. They showed that plasmids of *K. pneumoniae* isolated from human patients were distributed widely and showed great diversity.

ESBL production is encoded by genes that are prevalently located on large conjugative plasmids [39], which are easily transmitted among different members in the Enterobacteriaceae. Accumulation of these genes could be responsible for the observed multidrug resistant phenomenon, as previously reported [40, 41]. This study has revealed clinical isolates of *Klebsiella* from different specimens, with majority of them harbouring high molecular weight plasmids, with multidrug resistance.

However, this study is limited by the non-determination of minimum inhibitory concentrations of some of the antibiotics, and plasmid-curing which could have given more insight into the roles played by the plasmids or otherwise in the observed multi drug phenomenon.

Conclusion

The study revealed high multidrug resistance of *Klebsiella* species carrying plasmids which could aid the transfer of multidrug resistance to other bacterial species. The fact that all the ESBL-producers were MDR is decidedly worrisome, considering the public health implications like treatment failures and the associated morbidity and mortality. The data further showed the imperatives of rational antibiotic usage to reduce and contain the scourge of antibiotics resistance.

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Pattern of presbyopia in Kosofe, Lagos State, Nigeria

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Abstract
Aim: To determine the pattern of presbyopia in Kosofe Local Government Area of Lagos.
Methodology: A population-based descriptive cross-sectional study using multi stage sampling to select participants over 30 years of age. Ocular examination included distance visual acuity measurement, objective/subjective refraction and ophthalmoscopy. Near Visual Acuity was carried out using a near vision test types chart at 33cm with distance correction in place. Spherical convex (plus) lenses were added in increments of 0.25 dioptre until the participant was able to read at least N8. A participant was defined as having Presbyopia if he or she required an addition of at least 1.00 DS in either eye to improve near vision to N8 or better at 33cm with the distance correction in place if required. A data analysis was done with Statistical Package for Social Sciences (SPSS 17) and a p value of <0.05 was considered significant.
Results: Of the 426 participants examined, the prevalence of Presbyopia was 63.8%. On regression analysis, increasing age (OR: 14.5, 95% CI: 7.70-27.48), Female gender (OR: 1.65, 95% CI: 1.11 – 2.46), having lower level (OR 3.39, 95% CI: 2.10-5.48)and having a hyperopic refractive status (OR: 8.1, 95% CI: 4.62-14.07) significantly increased the likelihood of presbyopia. Difficulty with near tasks was associated with presbyopia (p<0.05)
Conclusion: Presbyopia is a common eye health issue in people over 30 years of age in Kosofe, Lagos State. Increasing age, female sex, lower educational level, and refractive state (hyperopia) are important risk factors. Difficulty with near vision was associated with presbyopia.

Keywords*: Presbyopia, near vision, risk factors, near task*

Résumé
Objectif: Pour déterminer le schéma de la presbytie dans la commune de Kosofe à Lagos.
Méthodologie: Une étude transversale descriptive basée sur la population utilisant un échantillonnage à plusieurs degrés pour sélectionner des participants de plus de 30 ans. L'examen oculaire comprenait une mesure de l'acuité visuelle à distance, une réfraction objective / subjective et une ophtalmoscopie. L'acuité visuelle de près a été réalisée en utilisant un tableau des types de test de vision de près à 33 cm avec correction de distance en place. Des lentilles sphériques convexes (plus) ont été ajoutées par incréments de 0,25 dioptrie jusqu'à ce que le participant soit capable de lire au moins N8. Un participant était défini comme souffrant de presbytie s'il avait besoin d'un ajout d'au moins 1,00 DS dans l'un ou l'autre des yeux pour améliorer la vision de près à N8 ou mieux à 33 cm avec la correction de distance en place si nécessaire. Une analyse des données a été effectuée avec le progiciel statistique pour les sciences sociales (SPSS 17) et une valeur p <0,05 a été considérée comme significative.
Résultats: Sur les 426 participants examinés, la prévalence de la presbytie était de 63,8%. Sur l'analyse de régression, augmentation de l'âge (OR: 14,5 ; IC à 95%: 7,70-27,48), Sexe féminin (OR: 1,65 ; IC à 95%: 1,11 - 2,46), ayant un niveau inférieur (OR 3,39 ; IC à 95%: 2,10-5,48) et avoir un état de réfraction hypermétrope (OR: 8,1 ; IC à 95%: 4,62-14,07) augmentait significativement la probabilité de presbytie. La difficulté avec les tâches de près était associée à la presbytie (p <0,05).
Conclusion: La presbytie est un problème de santé oculaire courant chez les personnes de plus de 30 ans à Kosofe, dans l'État de Lagos. L'augmentation de l'âge, le sexe féminin, un niveau d'éducation inférieur et l'état de réfraction (hypermétropie) sont des facteurs de risque importants. La difficulté de vision de près était associée à la presbytie.

Mots clés : *Presbytie, vision de près, facteurs de risque, tâche de près*

Introduction

Majority of human beings experience difficulty with near vision as they age, due to reduced amplitude of accommodation in the optical system [1]. The point at which accommodation is maximally exerted is called the near point of accommodation [2]. Amplitude of accommodation (AA) is the amount of

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accommodation required to move the focus from the far point, which is at infinity, to the near point [2]. Donders [3] found that amplitude of accommodation diminishes from 14 Dioptre (D) at the age of 10 years to 0 Dioptre at the age of 70 years. This inadequacy of accommodation is called presbyopia. *A subject is defined as presbyopic, if he or she can not read the N8 optotype or the reduced E chart at 33cm with the distance correction in place as required in the presence of normal distance vision [1, 4].*

Presbyopia is the most common physiological change occurring in the adult eye and it causes universal near vision impairment with increasing age [4]. The definition of presbyopia is fluid because there is no standard distance for near work. This is dependent on the individual's occupation as one would expect a student or a teacher to work at closer range than a farmer. People who are presbyopic may also complain of brow-aches and hold objects progressively further away from their eyes in order to focus on them. Other common symptoms are headaches, fatigue and ocular discomfort which are related to contraction of the orbicularis muscle or portions of the occipito-frontalis muscle and are thought to be associated with tension and frustration over the inability to maintain clear near vision [5]. Counseling patients about presbyopia is necessary in the areas of patient's understanding and successful treatment. Education should start during ocular examination and be reinforced at the time of dispensing and continued at subsequent visits for follow up evaluation or spectacle adjustment [5].

A presbyope will seek help when it is impossible for him/her to do his/her near work. More attention needs to be paid to presbyopia in the developing world where literacy rates are low, as presbyopia may be erroneously believed to have functional consequences amongst only those who read and write [6]. Anecdotal evidence suggests a need for good near vision even among illiterates who may need adequate near vision for tasks they carry out in the course of their daily lives like threading needles, reading the Bible or Quran, picking grains, vocational pursuits such as fine craft and technical works [1].

Although it is difficult to estimate the incidence of presbyopia due to its slow onset, it appears that the highest incidence of presbyopia is in persons aged 42 to 44years [7]. It has been found to occur earlier in Africans and it is more serious [8-10]. In Nigeria, clinic based studies [8, 11-13] done found presbyopia to be more severe in blacks with an average age onset of 35 years, occurring earlier in females, and more in hyperopes.

Non-European population based studies done [16-19] revealed associated risk of presbyopia with increasing age, female gender, alcohol intake and rural residence but there was no link between presbyopia and education, occupation or smoking.

Recent reports by WHO [18] estimates of the global burden of unaddressed presbyopia to be 826 million largely due to the neglect of this important cause of near visual impairment. Presbyopia is gaining recognition as an important cause of near visual impairment with a significant impact on quality of life, visual function and economic productivity even in societies where reading is uncommon [6].

The study aimed to investigate the pattern, prevalence, and factors associated with the development of presbyopia. And to compare difficulty with near visual tasks between presbyopes and non-presbyopes.

Methods

It was a population based descriptive cross sectional study with a quantitative method of data collection that was conducted in Kosofe Local Government Area of Lagos State, Nigeria in a 6 week period between 7th of February and 21st of March 2011. The study population was a sample of wards in Kosofe, Agboyi Ketu and Ikosi Isheri. This was carried out after ethical approval was obtained from the Lagos University Teaching Hospital Ethics and Research Committee to carry out the research adhering to the tenets of the Declaration of Helsinki.

All participants were counseled individually on the nature of the study and informed consent obtained before proceeding with the study. Inclusion criteria was consenting individuals over 30 years of age**.** The exclusion criteria were individuals less than 30years of age and those with presenting distance visual acuity of less than 6/60. Pseudophakic subjects were also excluded.

Multi-stage sampling technique was adopted and one respondent per household was included until a total of 426 subjects were enrolled. After calculating minimum sample size with the Leslie Kish formula [19].

$$n = \frac{z^2 p(1-p)}{d^2}$$

$= 1.96^2 \times 0.53(1-0.53) = 383$

0.05^2

n= minimum sample size

z= Standard normal deviate at 5% level of significance=1.96

p= prevalence from a previous similar study [20]= 53.4%

d= 0.05 degree of accuracy

After allowing for a possible 10% attrition, the sample size was estimated to be 421.

All study subjects had detailed ocular examination: Distance visual acuity (VA) using the Tumbling E-chart or Snellen's chart depending on the patient's literacy level 6m away from the patient in ambient outdoor illumination. Distance refraction was done using an autorefractor for all subjects with visual acuity of 6/12 or less after demonstrating at least one line improvement with pinhole or glasses. The distance correction was put in place for those that required it before near vision testing was done. Near vision was tested using a near vision test types chart with outdoor illumination. Patients were tested in the language they could read in, and if unable to read, the reduced E-chart was used. Measurement of a distance of 33cm from the eyes was ascertained with a tape measure. The amplitude of accommodation was roughly assessed by the push-up method [21].

This served as a guide in determining the near add. It required the participant telling the examiner at which point the fixation target became and remained blurred. The participant was asked to fixate on the smallest N optotype he/she could see at 40cm with the distance correction in place if required. To maintain the subject's attention, he or she was requested to indicate when the target started to become blurred and was asked to try and regain a clear image. The examiner stopped moving the card when the subject reported a sustained blur.

The distance was then measured in centimetres between the point of sustained blurring and the plane of the spectacles. By calculating the inverse of this distance in metres, the amplitude of accommodation was obtained in diopters. For this study, two-third of this value was taken as the available amplitude of accommodation for the subject. A reading distance of 33cm corresponds to 3diopters(D). The difference between 3D and two-third the amplitude of accommodation was used as a guide in determining near correction. A participant was defined as presbyopic if he or she required an addition of at least 1.00 DS in either eye to improve near vision to at least N8 at 33cm with distance correction if required.

Patients who were presbyopic or needed distance refraction were prescribed glasses while patients with ocular pathologies were referred to the Eye clinic of the Lagos University Teaching Hospital or Gbagada General Hospital according to patient's preference.

Data analysis

Data collected was analysed using Statistical Package for Social Sciences (SPSS 17). Bivariate analysis was carried out to assess likelihood of presbyopia with various factors. Means were compared with the

Table 1: Socio-demographic characteristics

Age group (years)	Male	Female	Total	Column Percent
30-39	58	57	115	27.3
40-49	58	91	149	34.5
50-59	47	52	99	23.3
60-69	21	31	52	12.1
70+	9	2	11	2.8
Sex	193	233	426	100
Educational level				
Non/Primary	47	94	141	32.3
Secondary+	146	139	285	67.7
Occupation				
Trading	38	169	207	46.1
Manual	97	34	131	32.4
Skilled	32	12	44	10.9
Unemployed/ retired/Housewife	13	14	27	6.4
Others	13	4	17	4.2
Marital status				
Single	22	3	25	6.4
Married	156	165	321	75.7
Divorced/separated/ widowed	15	65	80	17.9

independent Student t- test; confidence interval and p values were calculated. A chi square was used to compare two groups. A p<0.05 was considered to be significant for these analyses.

Results

A total of 426 subjects participated in the study. Table 1 shows the sociodemographic characteristics of the population studied. Mean age was 46.6±10.5 years (Median 46, Range 30-78). A total of 233 (54.3%) subjects were females. Majority was in the age group 40-49 years (34.5%). Table 2 highlights the prevalence of presbyopia in various groups and shows a crude regression analysis.

and females are 65% more likely to be presbyopic. p = 0.013. Those in the age group greater than 49 years were 14.5 times more likely to be presbyopic, showing a strong association with increasing age (P<0.0001). There was also an association with educational level, because those with no or only primary education were 3.39 times more likely to be presbyopic than those with secondary education and above (p <0.0001). Hyperopes were found to be 8 times more likely to be presbyopic than others (P <0.0001). Myopes were least likely to develop presbyopia (Table 3). Furthermore, our findings suggest that those with skilled occupation were less

Table 2. Study Prevalence of Presbyopia in various groups: Regression analysis.

Characteristic	Non presbyopes N=154	Presbyopes N=272	Total	%pres byopic	Odds/like lihood ratio	95% CI	P value
Sex							
Male	82	111	193	57.5			
Female	72	161	233	69.1	1.65	1.11 to 2.46	0.013
Age group							
<=49	142	122	264	46.2			
>49	12	150	162	92.6	14.5	7.70 to 27.48	<0.0001
Educational attainment							
None/primary	27	114	141	80.9	3.39	2.10 to 5.49	<0.0001
Secondary and above	127	158	285	55.4			
Refractive status							
Hyperope	17	136	153	88.9	8.1	4.62 to 14.07	<0.0001
None hyperope	137	136	273	49.8			
Occupation							
Trading	67	140	207	67.6	1.183	0.96 to 1.47	
Manual	44	87	131	66.4	1.119	0.83 to 1.52	
Skilled	25	19	44	43.2	0.430	0.25 to 0.76	
Unemployed/retired	11	16	27	59.2	0.824	0.39 to 1.73	
Others	7	10	17	58.8	0.809	0.31 to 2.08	

Table 3: Prevalence of presbyopia by refractive state

Characteristics	No presbyopia	Presbyopia	Total	% presbyopia
Refractive state				
Plano	76	58	134	43.2
Hypermetropia	17	136	153	88.8
Myopia	50	24	74	32.4
Astigmatism	11	54	65	83.0
Total	154	272	426	

The overall prevalence of presbyopia was 63.8% with a significant association with increasing age, p = <0.0001. Female gender had a higher prevalence (69.1%) than the male gender (57.5%),

likely to be presbyopic, the likelihood being higher with traders.

The near add increased with age till 70 years and decreased thereafter. Near add was higher in

females than in males across all age groups except in age groups 50-59 years as well as 70 years and above [Figure 1].

Table 4a: Proportion of Near-Task handicap among non-presbyopes and presbyopes.

Near Task/ Level of difficulty	Non presbyopes		Presbyopes		p-value
	Frequency	Percent	frequency	Percent	
Reading					0.000
None	76	52.4	3	1.3	
Little	53	36.6	87	36.6	
Moderate	12	8.2	79	33.1	
Severe	4	2.8	69	29	
Total	**1**45	100	238	100	
Writing					0.000
None	137	94.5	158	66.4	
Little	5	3.4	39	16.4	
Moderate	3	2.1	20	8.4	
Severe	-	-	21	8.8	
Total	145	100	238	100	
Cooking					0.008
Non	146	94.8	226	83.4	
Little	5	3.2	24	8.9	
Moderate	2	1.4	16	5.9	
Severe	1	0.6	5	1.8	
Total	154		100		271
100					
Sorting grains					0.000
None	148	96.1	198	73.6	
Little	5	3.2	40	14.8	
Moderate	1	0.7	19	7.1	
Severe	-	-	12	4.5	
Total	154	100	269	100	
Threading needle					0.000
None	112	72.7	28	10.4	
Little	19	12.4	39	14.5	
Moderate	16	10.4	64	23.8	
Severe	7	4.5	138	51.3	
Total	154	100	269	100	

Tables 4a and 4b compare difficulty with near vision tasks between presbyopes and non presbyopes, as it pertains to their daily functional abilities including reading, cooking, threading a needle, and cutting fingernails. It shows that there are significantly higher likelihoods of difficulty with these near tasks in presbyopes compared with non-presbyopes.

Discussion

Presbyopia is commonly observed with advancing age with its sequelae progressively affecting daily living. This population-based study on the pattern of presbyopia was done in adults over 30 years in this part of the developing world. The mean age of participants was 46.6 ± 10.5 years and a substantial percentage (34.5%) was in the age group 40-49 years, which is similar to the findings of the study done by Adedeji [22] in Nigeria. This may be a reflection of the Nigerian population pyramid with a fewer number of people aged 60 years and above.

The prevalence of presbyopia was high at 63.8% and was significantly associated with increasing age, female gender, lower educational level and hyperopic refractive status. Extrapolating this to the Nigerian population estimated as 148 million where 15% of the population is 30 years and above, 14.2 million Nigerians may be presbyopic. A population-based study in rural Gwagwalada Abuja territory, Nigeria on adults aged 40 years and above showed the prevalence of presbyopia was 53.4% [20]. A higher prevalence of 63.8% in this study may be correlated with the definition of presbyopia as inability to read at most N8 at 33 cm. Some other studies in

Table 4b: Proportion of Near-Task handicap among non-presbyopes and presbyopes

Level of difficulty	Non presbyopes		Presbyopes		
	Frequency	Percent	Frequency	Percent	P-value
Cutting fingernails					0.000
None	150	97.4	224	84.2	
Little	4	2.6	16	6	
Moderate	-	-	18	6.8	
Severe	-	-	8	3	
Total	154	100	266	100	
Dressing children					0.326
None	152	99.3	262	97.2	
Little	1	0.7	2	0.6	
Moderate	-	-	3	1.1	
Severe	-	-	3	1.1	
Total	153	100	270	**100**	
Recognising faces					0.068
None	148	96.6	244	89.7	
Little	1	0.7	11	4	
Moderate	3	2	13	4.8	
Severe	1	0.7	4	1.5	
Total	**153**	**100**	**272**	**100**	
Recognising small objects					0.000
None	148	96.1	216	79.4	
Little	3	1.9	20	7.4	
Moderate	2	1.3	21	7.7	
Severe	1	0.7	15	5.5	
Total	**154**	**100**	**272**	**100**	
Lighting lamps					0.074
None	147	96.1	241	89.2	
Little	1	0.6	11	4.1	
Moderate	4	2.0	7	2.6	
Severe	2	1.3	11	4.1	
Total	154	100	270	100	

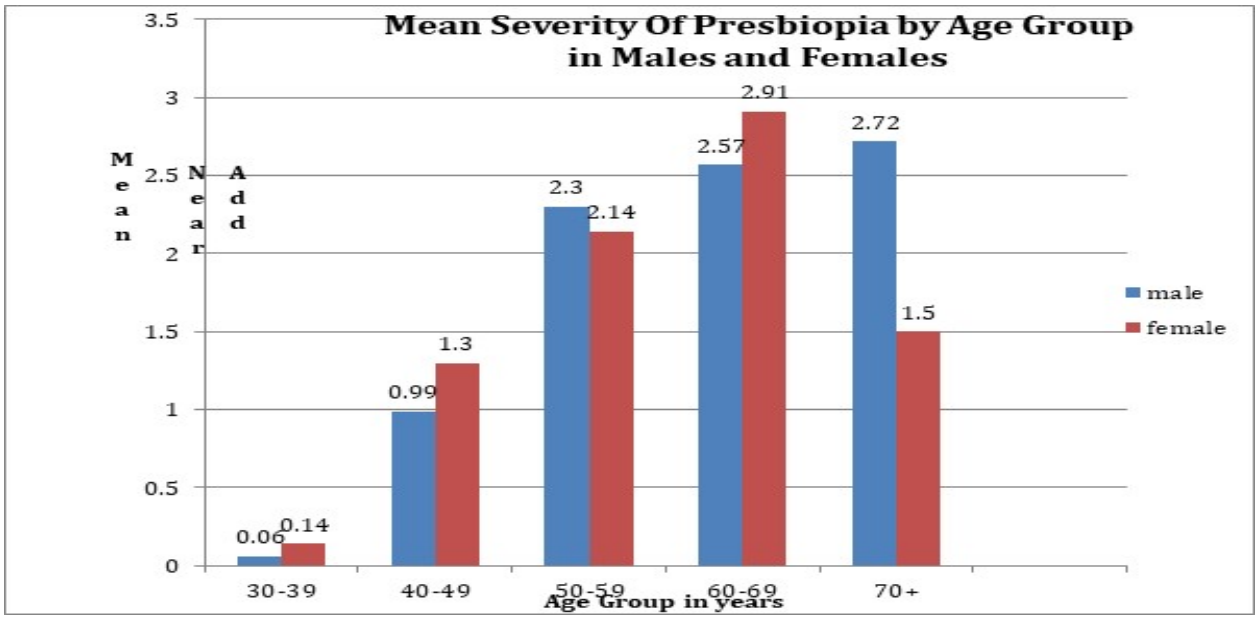

Fig. 1: Mean severity of presbyopia by age group in males and females

Nigeria [13,21,22] and Tanzania [24] have found presbyopia to be one of the most common eye conditions seen.

The Andhra Pradesh study had a prevalence of presbyopia of 55.4% [15], the lower prevalence in that study despite the inclusion of age group 30-39 years may be attributable to the fact that presbyopia has been found to occur earlier and it is more severe in blacks. Environmental factors such as high ambient temperature and greater exposure to ultraviolet radiation [25,26] may also be responsible for this disparity as Kosofe is in the tropics.

The association between age, gender and presbyopia is similar to other studies [6,8,14,15]. With those in the age group >49years being 14.5 times more likely to be presbyopic, this shows a strong association with age. The reason for this is the reduction in amplitude of accommodation as age increases [3], thereby requiring a higher near addition to compensate for the reduction. Six (3.9%) of the adults aged 60 years and above did not require a near addition to see N8 at 33cm probably because of nuclear sclerosis, senile miosis and the effect of outdoor illumination.

There was a higher prevalence of presbyopia in females than males, with females more likely to be presbyopic. This could be hormonal or related to the domestic responsibilities women have to bear more than men. There was also an association with educational level, because those with none or only primary education were 3.39 times more likely to be presbyopic than those with secondary education and above. Significant association between presbyopia and educational level is similar to the study in Bassa, Nigeria [22]. But in contrast with the Tanzania study [24], where they found a higher prevalence of presbyopia with higher education. This may be explained by the fact that literates have been exercising their accommodative muscles and may thus have a higher amplitude of accommodation, thus reflecting a lower tendency to be presbyopic, unlike illiterates who have not been exercising their accommodative muscles.

Hyperopes were found to be 8 times more likely to be presbyopic than others, with Myopes being least likely to develop presbyopia. This is similar to findings in other studies [8,11,27]. Hypermetropia is associated with excessive accommodation, which wears off with time predisposing to an earlier onset of presbyopia. Furthermore, our findings suggest that those with skilled occupation were least likely to be presbyopic, the likelihood being highest with traders. The reason may be similar to that of the illiterate/literate dichotomy above, as one may assume traders are less likely to pay attention to near work.

Near add was found to have increased progressively till age group 60-69 years then reduced afterwards. This drop in proportion of presbyopic individuals after 70 years may be due to nuclear sclerosis. Near add was also found to have been higher in females on average than males across the age groups except age groups 50-59 years and 70+ years. This may be attributable to the fact that there were fewer female participants (0.9%) in the age group 70 years and above compared to male participants (4.7%) and a higher number of female myopes in the age group 50-59 years.

When comparing difficulty with different near vision tasks, it shows that there are significantly higher likelihoods of severe handicap with these near tasks in presbyopes compared with non-presbyopes as it pertains to their ability to perform daily routine tasks such as reading, cooking, threading a needle, and cutting fingernails. This is similar to another study [22] buttressing the need for good near vision regardless of reading and writing even among illiterates who need adequate near vision for the tasks they carry out in the course of their daily living.

Conclusion

Presbyopia is a common eye health issue in people over 30 years of age in Kosofe, Lagos State. Increasing age, female sex, lower educational level, and refractive state (hyperopia) are important risk factors. Difficulty with near vision was associated with presbyopia.

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Declaration of conflicting interests'

'The Author(s) declare(s) that there is no conflict of interest'

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Preliminary safety profiles of herbal medicine, *nimreh B* for chronic viral hepatitis B infection among human

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Abstract

Background: The scourge and burden of hepatitis B infection is increasing. Hepatitis B infected patients take herbal preparation (NIMREH B) because of his proven efficacy and safety in animal without evidence of his safety in human thus the need for this study

Materials and Method: The participants in this study were 8 adult male hepatitis B infected volunteers with the viral load greater than 2000 copies/ml that were patronizing herbal therapist who consented and enrolled for this study. The baseline of clinical and laboratory parameters of each participant were measured before self administration of 10mls of NIMREH B twice daily for a month. Each volunteered participant was monitored regularly (physically) throughout the period of study for possible side effects or toxicity. Urine and blood samples were collected from all the participants at periodic intervals on herbal (NIMREH B) therapy for urinalysis and other blood parameters like Full Blood Count (FBC), Fasting Blood Glucose (FBG), liver and renal functions tests and lipid profiles.

Result: There was no derangement in physical general and systemic examinations after 30-day NIMREH B therapy. There were no significant findings in fundoscopy, chest X-ray and ECG at post therapy when compared with baseline. Likewise there was no significant difference (P>0.05) in laboratory parameters of FBG, lipid profile, FBC (PCV: 37±2 v 38±2.2; WBC: 5.5±0.03v5.4±0.02 $x10^3$, Platelet: 23±3v24±2$x10^4$), hepatic (AST: 22±2v20±2; ALT:16±2v15±2; Total bilirubin 17±2v15±3) and renal (Urea: 7.2±0.4v7.1±0.3; Creatinine: 6.2±0.2v6.0±0.2) functions tests when compared baseline with post therapy.

Conclusion: This study concluded that NIMREH B is a potential safe herbal medicine in adult male infected hepatitis B patients. This study is still on-going to determine its safety profiles in large sample size with more parameters in healthy and hepatitis B infected male and female volunteers

Keyword: *Toxicity, Renal functions, Lipid profile, viral hepatitis B infection*

Résumé

Contexte : Le fléau et le fardeau de l'infection par l'hépatite B augmentent. Les patients infectés par l'hépatite B prend la préparation à base de plantes (NIMREH B) en raison de son efficacité prouvée et l'innocuité chez les animaux sans preuve de son innocuité chez l'homme donc les besoins de cette étude

Matériel et méthode : Les participants à cette étude étaient 8 volontaires adultes infectés par l'hépatite B chez des hommes dont la charge virale détectait plus de 2 000 copies/ml et qui fréquentaient les herboristes consentants et inscrits à cette étude. La ligne de base des paramètres cliniques et de laboratoire de chaque participant a été mesurée avant l'auto-administration de 10mls de NIMREH B deux fois par jour pendant un mois. Tous les participants l'étaient. Chaque participant bénévole a fait l'objet d'un suivi régulier (physique) tout au long de la période d'étude afin d'obtenir des effets secondaires ou des caractéristiques cliniques de toxicité. Des échantillons d'urine et de sang ont été prélevés auprès de tous les participants à intervalles périodiques sur la thérapie à base de plantes (NIMREH B) pour l'analyse d'urine et d'autres paramètres sanguins comme le nombre complet de sang (FBC), la glycémie à jeun (FBG), les tests hépatiques et rénaux des fonctions et les profils lipidiques.

Résultat : Il n'y avait aucun dérangement dans les examens généraux et systémiques physiques après thérapie de 30 jours de NIMREH B. Il n'y avait aucune constatation significative dans la fundoscopie, la radiographie pulmonaire et l'ECG au post-traitement par rapport à la ligne de base. De même,

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il n'y avait pas de différence significative (Pe"0,05) dans les paramètres de laboratoire de FBG, profil lipidique, FBC (PCV: 37±2 v 38±2,2; WBC: 5.5±0.03v5.4±0.02 x103, Plaquette: 23±3v24±2x104), hépatique (AST: 22±2v20±2; ALT: 16±2v15±2; Bilirubine totale 17±2v15±3) et rénale (Urée: 7,2±0,4v7,1±0,3; Créatinine: 6,2±0,2v6,0±0,2) fonctions tests par rapport à la ligne de base avec la post-thérapie.

Conclusion : Cette étude a conclu que le NIMREH B est un médicament sûr potentiel à base de plantes chez les patients adultes infectés par l'hépatite B. Cette étude est toujours en cours pour déterminer ses profils d'innocuité en grande taille avec plus de paramètres chez les volontaires masculins et féminins infectés par l'hépatite B en bonne santé et infectés par l'hépatite B.

Mot-clé: *Toxicité, Fonctions rénales, Profil lipidique, infection virale à l'hépatite B*

Introduction

The World Health Organisation (WHO) stated that viral infection is the main cause of mortality associated with hepatitis. Hepatitis B caused infection is pandemic and the virus is one of the most pathogenic organisms in recent decades. It was estimated that 96% of deaths caused by hepatitis was due to Hepatitis B and C infection [1]. Hepatitis B infection is a major global health problem. It was estimated that in 2015, about 257 million people are living with Hepatitis B viral infection. It can cause chronic infection and puts people at high risk of death from cirrhosis and liver cancer [2]. Despite the wide availability of hepatitis B vaccine, it was reported that about 887,000 deaths in 2015 were due to Hepatitis B infection related complications [1, 2]. It was estimated that about 3.5% of the World population were living with chronic Hepatitis B viral infection and Western Pacific and Africa regions accounted for 68% of these infected people [2]. The Pacific region is the most affected with Hepatitis B infection with about 6.2% of the population harbouring the virus [1, 2]. It was documented that African continent with 6.1% prevalence rate is the second with Hepatitis B infection [1].With the advent of HIV infection, about 2.7 million persons were co-infected with Hepatitis B virus in 2015 [1]

It was reported by WHO and some studies that if Hepatitis B infection is not treated, it was estimated that about 15-40% of infected individuals may progress to liver cirrhosis [1-3]. Presently, there are orthodox drugs available for the treatment of Hepatitis B infection apart in addition to the effective vaccine. Although these drugs are becoming available at subsidized amount, but there are many infected people that cannot afford the medications especially in the low-income countries [1,2]. Some of these drugs (interferon and lamivudine) used for hepatitis B infection were associated with serious side-effects and with the advent of tenofovir or entecavir (lesser adverse reactions) are not widely available in low-income countries

There are many documented potent herbal medicines for the treatment of Hepatitis B infection [3,4]. Many of these herbal medicines used for the treatment of Hepatitis B infection are Traditional Chinese Medicines (TCM). Some of this Traditional Chinese Medicines (TCM) have been tested in the *in–vitro* (cell) and *in-vivo* (animal) experiments, with some graduated to clinical trial phases [2-4]. The extracts of*Boehmerianivea* (Linn.),Gaudich, *Polygonumcuspidatum*, *Stellaria* media (L.) Vill.,*Ligulariaatroviolacea*, *Radix Astragali*, *Oenanthejavanica*, Xiao-Chai-Hu-Tang, Qizhu granules, Fu- Zheng-Jie-Du-Tang, and cinobufacinihave undergone cellular (*in-vitro*), animals and some parts of clinical trial phases[5]. However, some of these TCM have been documented to be hepatotoxic [6]. Because of the potential deleterious effect, many patients reject herbal medicines especially when the safety profiles are not known [7].

Thus, this study aimed at investigating safety profiles (after phytochemistry and animal studies had been done) of a traditional medicine (NIMREH B) prepared in Nigeria from Kewra distilled (made from padanus plant) water, honey and black-seed as major constituents in Hepatitis B patients using it as therapy

Materials and method

Ethical approval

Ethical approval for this study was obtained from Nigerian Institute of Medical Research, Yaba, Lagos (NIMR) IRB/19/034.

Study design

This study was designed to be prospective observatory and the volunteers were Hepatitis B patients patronizing herbal therapist. The herbal therapist normally dispensed the herbal preparation for self administration by each

Inclusion criteria

The volunteer is a confirmed Hepatitis B infected patient registered with the herbal therapist, no clinical and laboratory evidence of hepatitis B complications

(eg cirrhosis, primary liver cell carcinoma etc), co-morbidities (hypertension etc), not on concurrent herbal or orthodox therapy for any illness

Procedure

The 8 adult male hepatitis B infected (viral load ≥ 2000 copies/ml) volunteers patronizing herbal therapist that consented were enrolled/recruited into this study after fulfilling the minimum inclusion criteria. Baseline clinical examination (including fundoscopy, chest X-ray, ECG, abdominal ultrasound scan, etc) and laboratory parameters were done. Thereafter, each participant self administered 10mls of NIMREH B twice daily for 30 days. Each participant was monitored every hour for 8 hours then every 2 hour for 16 hours, thereafter daily for 29 days. Blood and urine samples were taken at 12th , 24th and 72nd hour and 7th, 14th, 21st and 30th day on NIMREH B therapy for urinalysis, Full Blood Count (FBC), Fasting Blood Glucose (FBG), liver and renal functions tests and lipid profiles and analysed using standard methods. Data anaysed using Analysis of Variance (ANOVA) with P >0.05

Result

Physical examination and clinical investigation

There were no obvious anomalies on general and systemic examinations. Fundoscopy, Chest X ray, abdominal ultrasound scan and ECG were essentially normal.

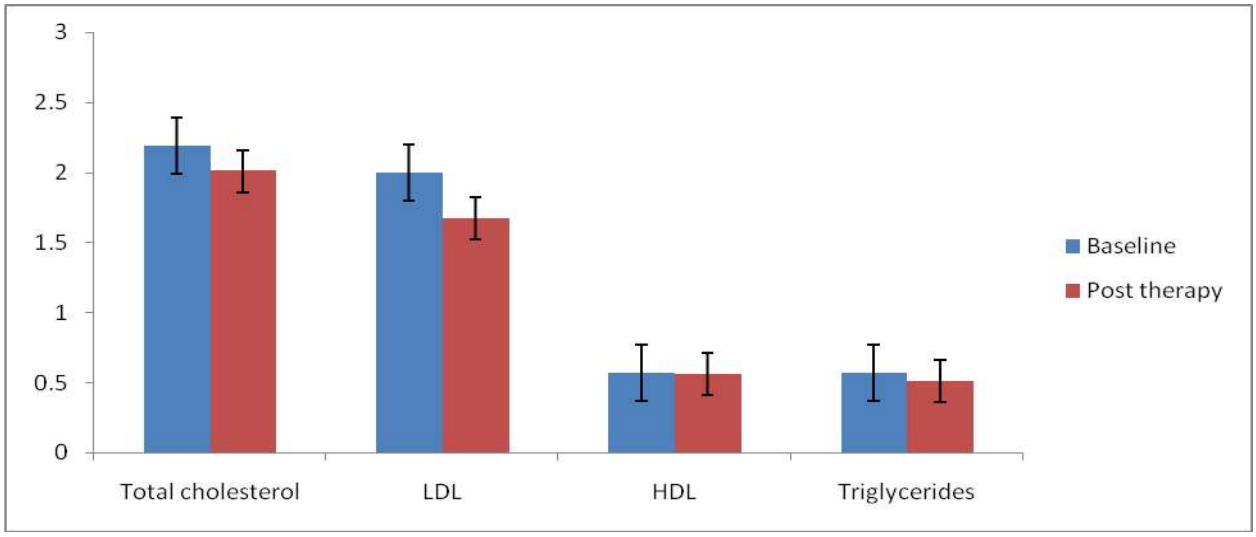

Fig.1: Lipid profiles (baseline and post therapy of Hepatitis B infected volunteers on NIMREH B therapy

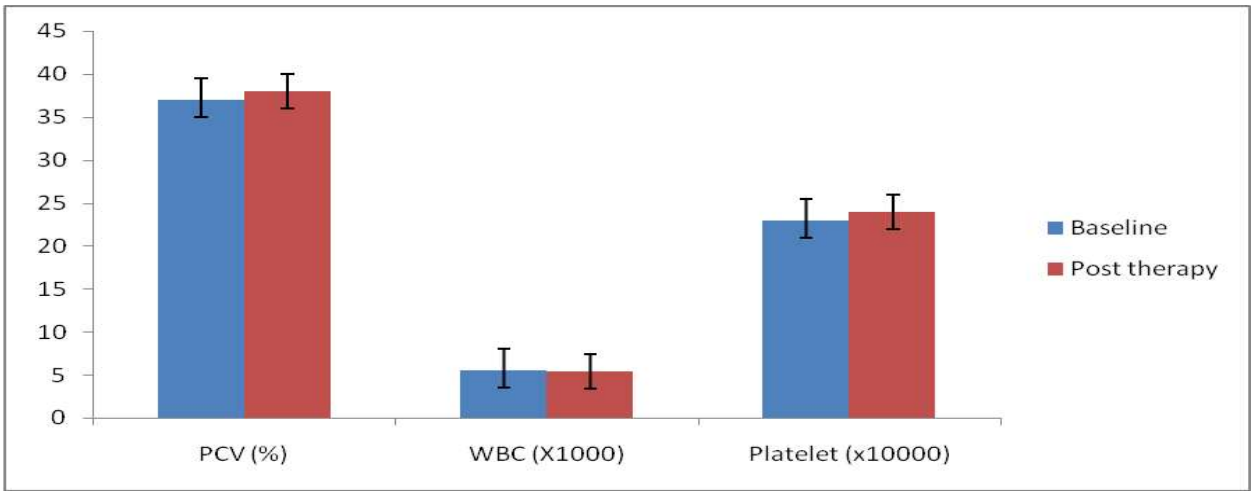

Fig.2: Liver functions test (baseline and post therapy of Hepatitis B infected volunteers on NIMREH B therapy

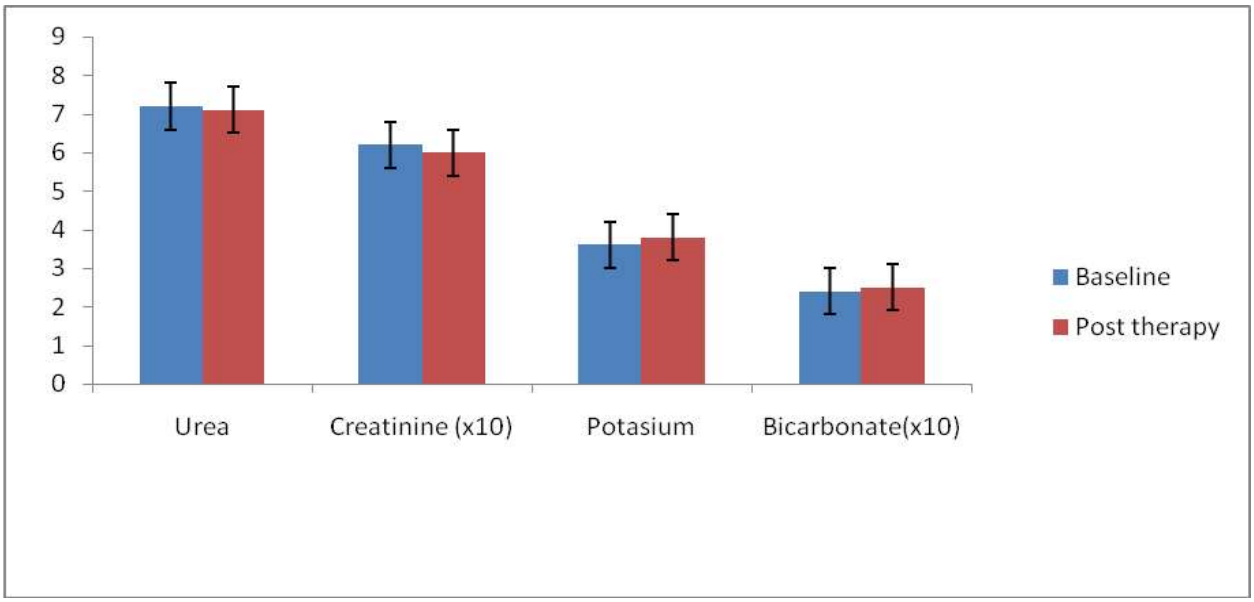

Fig.3: Renal functions test (baseline and post therapy of Hepatitis B infected volunteers on NIMREH B therapy

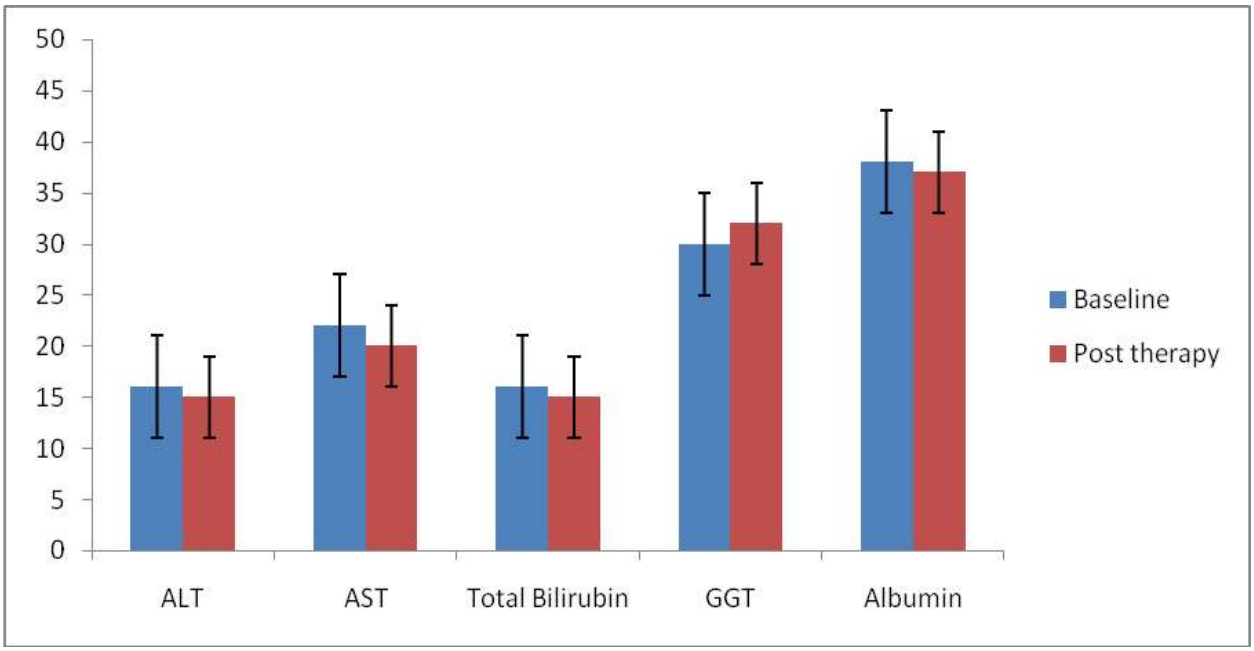

Fig. 4: Liver functions test (baseline and post therapy of Hepatitis B infected volunteers on NIMREH B therapy

Laboratory investigation

There was no remarkable difference when the baseline urinalysis and blood parameters of fasting blood glucose (FBG), lipid profile, full blood count, hepatic and renal functions tests were compared with periodic intervals (12^{th}, 24^{th}, 72^{nd} hour and 7^{th}, 14^{th} and 21^{st} day therapy. There was no significant change in Urinalysis when post therapy was compared with baseline. The FBG (5.2±0.6 v 5.1±0.5)mmol/L, lipid profile (Total cholesterol: 2.19±0.08 v 2.01±0.09; Low Density Lipoprotein[LDL]: 2.0±0.05v 1.67±0.04; High Density Lipoprotein[HDL]: 0.57±0.02v0.56±0.02; Triglyceride: 0.57±0.04v0.51±0.03)mmol/L (figure 1), FBC (PCV[%]: 37±2 v 38±2.2; WBC: 5.5±0.03v5.4±0.02 $x10^3$, Platelet: 23±3v24±2$x10^4$) mm^3 (figure 2), renal (Urea: 7.2±0.4v7.1±0.3; Creatinine: 6.2±0.2v6.0±0.2; Potassium: 3.6±0.04v 3.8±0.06, Bicarbonate[HCO_3^-]: 24±4v 25±5, Sodium[Na^+]:140±8v142±6; Chloride[Cl^-]: 98±4v 100±4) mmol/L(figure 3) and hepatic (AST: 22±2v20±2; ALT: 16±2v15±2; Total bilirubin 17±2v15 ±3; Gamma glutamyltranferase [GGT]: 30±4v 32±4; Albumin: 38±4v 37±6) functions tests parameters (figure 4) were not significantly

different ($P \geq 0.05$) when compared baseline with post therapy.

Discussion

The use of herbal medicines for the treatment of illnesses is becoming more popular [8]. However, their safety profiles especially when the constituents and mechanisms of actions are not known had been major concern. Because of the above stated reason, many herbal medicines were not assessed for use by patients even when their efficacy had been proven. There is general fear by many potential patients of becoming worse on therapy because of the documented hepatotoxic induced / effects of herbal medicines [9]. There is no doubt that hepatitis B infection is posing a major threat to nations [1]. Although hepatitis B vaccination is widely available, there are millions of people living with this virus in Nigeria [10]. Because of available information on pathogenicity of hepatitis B infection, many infected patients seek herbal medicines as a potential solution [10].

This study showed that NIMREH B did not increase total cholesterol or low-density lipoprotein (LDL) (figure 1). It may be inferred that this herbal medicine will not pose danger to a patient at the risk of syndrome X or other related cardiovascular diseases. The decrease in total cholesterol at post therapy when compared with baseline could be caused by a decrease in LDL and triglycerides. This showed that NIMREH B may reduce the risk of metabolic syndromes related to cardiovascular diseases without significant alteration in high density lipoprotein (HDL). This confirmed that some herbal medicines could reduce the risk of hyperlipidaemia [11,12].

The effect of a therapeutic agent on bone marrow is very important. Because bone marrow produces the cell lines that produce red blood, platelet and white blood cells that are very important in body functions. Herbal medicines that affect bone marrow will manifest with features of either one or all of the cell lines. This study showed that NIMREH B did not affect bone marrow functions as evidenced by normal packed cell volume (PCV), white blood cell and platelets counts (figure 2). This study showed that NIMREH B is not a potential immune-suppressive agent and not suppressing other cell lines thus may be safe for bone marrow functions

Drug excretory pathway is very important in safety. A toxic drug or its metabolites may affect renal functions. Creatinine post therapy concentration was not higher than the baseline (figure 3). Other renal functions parameters are within acceptable limits and did not increase significantly post therapy when compared with baseline. This showed that NIMREH B herbal medicine is not nephrotoxic.

There is no doubt that many oral drugs administered metabolise in the liver therefore many potential toxic drugs or foods may cause injury to hepatocytes. Severe injury on hepatocytes will impair their structures or functions. Contrary to some other herbal medicines that were hepatotoxic, it is evident that NIMREH B did not cause any significant injury to hepatocytes in acute and sub-acute phases [6]. The result of this study showed that there was no significant cytoplasmic or mitochondrial injury in hepatocytes therefore resulting in normal alanine and aspartic tranferases (ALT and AST). NIMREH B herbal medicine did not affect secretory and excretory functions of liver as demonstrated by other hepatic parameters (figure 4).

This study concluded that NIMREH B did not impair the functions of major organs in humans therefore it is potentially safe to be used by hepatitis B infected patients.

Limitation

There was difficulty in recruiting volunteers of different classes as planned

Further studies

The study is on- going recruiting more adult (male and female) healthy and hepatitis B infected volunteers for analysis of more toxicological parameters

Declaration

All the authors have no conflict of interest in this study

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