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EDITORIAL COMMENTS

Blood transfusion as a means of treatment has been in use to save life since time immemorial. However, it is not without some inherent shortcomings. One of such is the possibility of transmitting infection during blood transfusion. The first article examined the prevalence of carrier state among blood donors of some of the transmissible diseases, which we often screen for among our donors. The authors screened prospective blood donors for various infective agents and results showed higher prevalence of hepatitis surface antigens and HIV when compared with hepatitis C and syphilis. The recommendation therefore was that there is need for public awareness for the uptake of hepatitis B vaccine, improvement on quality control of screening methods and judicious use of blood products.

The next two articles were related to obstetrics practice. The first one did a retrospective study on the factors related to preterm premature rupture of membrane (PPROM) while the second discussed lack of knowledge and hesitancy of pregnant mothers towards placenta donation for research. Preterm rupture of membrane is a serious obstetrics complication which is related to many perinatal mortality and morbidity. Therefore, review of its prevalence and associated factors related to its complications will help obstetricians to improve on the management of cases. Perinatal mortality of 45.6% was observed in this study. Also, neonatal sepsis was 32.2% and it was the most common neonatal complication. Maternal mortality was 0.4%, with chorioamnionitis of 32.9% as the most typical maternal complication. It was concluded that PPRM can be a significant complication of pregnancies with associated high perinatal morbidity and mortality. The article on readiness of patients to donate placental for research revealed that only very few of the respondents understand that placental can be used for medical research. Most of them therefore declined that their placenta be used for this purpose. The authors therefore, suggested that both male partners and pregnant women should be adequately informed about the benefit of use of placenta for medical research, in order to enhance compliance.

During management of chronic kidney diseases (CKD), measurement of some essential biochemical parameters are often carried out to assist in the management of the patients. Investigation on how these analytes change during management is paramount to making appropriate decisions on patients. A research carried out in Zaria, North Central part of Nigeria examined serum levels of some analytes among their patients. They concluded that majority of the CKD patients in their study had progressive hypocalcaemia, hyperphosphatasemia, hypovitaminosis D, and secondary hyperparathyroidism.

In Africa, because of limited resources, it is important to develop innovative and cost effective ways to provide critical care services and maximize the use of limited ICU bed spaces. Also, the knowledge of the determinants of outcome in ICU patients will lead to better decision when allocating limited bed spaces. The next article reported that those patients in ICU, who required mechanical ventilation and ionotropic support during their management had poorer outcome.

Three articles in this edition in addition to the first one on transfusion transmissible infections also discussed various issues with regard to infections. One from Ekiti state University discussed factors affecting sexually transmitted diseases among undergraduates. It linked inadequate knowledge and risky sexual behaviour as the major factors. The article on bacterial resistance focussed on effect of biofilm production in relation to bacterial resistance and recommended that, effort should be made to introduce detection of biofilm production among bacterial. Another article related to infection was from Delta state and it discussed use of isoniazid among HIV infected patients. They concluded that isoniazid preventive therapy was effective in preventing the development of active TB in HIV-infected children and adolescents on ART.

Other articles that featured in this edition cut across various disciplines: such as public health, psychiatry, and dentistry.

Happy reading

AB Okesina
Editor in Chief

Current Trend of Transfusion Transmissible Infections among Voluntary Blood Donors in North Central Nigeria

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Abstract

Blood transfusion is an integral part of modern medicine which had saved many lives which would have been lost as a result of lack of blood. Although blood is needed for survival, it can also be a medium for the transmission of harmful infectious diseases. This study evaluated current trend of transfusion transmissible infections among voluntary blood donors in Nigeria.

This was a descriptive community-based study involving 600 prospective voluntary blood donors among staff and students of 5 tertiary institutions in Kwara and Kogi States. Hepatitis B surface antigen and Hepatitis C antibodies were screened for using Hepatitis B Virus Surface Antigen Bio-Inteco ELISA KIT, and Anti-HCV Bio-Inteco ELISA KIT, respectively. Screening for HIV was done with Enzyme immunoassay method using Human Immunodeficiency Virus (HIV) 1+2 Antigen Antibody ELISA KIT, product of Bio-Inteco HIV Diagnostics, UK. Testing for Syphilis was carried out using Rapid Plasma Reagin (RRR) test. Statistical analysis was done with IBM SPSS version 20. Level of significance was set at $p < 0.05$

The mean age of the subjects was 21.98 ± 5.17 years. Two thirds of the prospective blood donors were within the second decade of life and more than half were males. The prevalence of Hepatitis B among subjects were 4.7%, Hepatitis C, 0.2%, HIV 1% and Syphilis 0%.

The prevalence of hepatitis B and HIV were relatively high compared to Hepatitis C and Syphilis among voluntary blood donors, although lower than the prevalence among general population in Nigeria. In order to improve on blood transfusion safety, there is a need to increase public awareness on vaccination for

hepatitis B virus, Quality control of screening methods and rational use of Blood.

Key words: Transfusion transmissible infections, Voluntary blood donors, Screening

Introduction

The practice of transfusing blood is an essential aspect of modern medicine which has saved many lives which would have been lost as a result of lack of blood. Despite the fact that blood is needed for survival, it can also be a medium through which harmful pathogenic agents including HIV and Hepatitis are transmitted from blood donors to recipient of blood transfusion if stringent measures are not put into consideration in donor selection. Over 92 million blood from donors are obtained globally on a yearly basis, and as much as 1.6 million of these donated blood is eventually discarded on account of the presence of transfusion related transmissible infectious agents.¹ This amounts to serious wastage of scarce resources and reduction of amount of blood that is available for transfusion. In order to minimize these wastages, efforts should be geared toward collecting blood from low risk individuals.

In sub-Saharan Africa, chronically infected cases of HBV are said to be approximately 5-15% of the adults' human population and its transmission is largely attributable to transfusion of blood,³ as well as unprotected sex. According to the recent meta analyses carried out between 2000-2013, a pooled prevalence of 13.6% was reported among healthy population in Nigeria and over 21 million are currently infected with the disease in Nigeria.⁴ A study done among family replacement donor in Ilorin recorded a prevalence of 10.9%.⁵ A report of a study done among voluntary donors in North-Eastern part of Nigeria, a lower figure of 2.4% was recorded.⁶ This further shows that TTIs is lower among voluntary blood donors

Similarly, a known cause of liver disease is hepatitis C with varied prevalence among blood donors. Approximately 200 million cases of Hepatitis C infection have been recorded globally and this is a major health concern worldwide.⁷ The practice of transfusing blood that is not screened is common especially in villages and remote areas where

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awareness is low account for major identifiable medium for HCV infection transmission in Nigeria. Some other notable factors include body piercing, re-use of syringes and used needles, injury from needle stick and the act of tattooing. The use of shared razor blades, nail clippers as well as sharing tooth brush has increased the risk of transmission of infection.^{7,8} In the report of a study done in South-south, Nigeria, a figure of 5% was recorded as the prevalence rate among blood donors with majority of being commercial donors.⁹ Prevalence of 3.4% was reported in Kano,¹⁰ and 7.6% in South-Eastern State of Nigeria.¹¹

The human Immunodeficiency virus (HIV) is commonly transmitted through unprotected sexual relationships either homosexual or heterosexual, transfusions of blood and blood products and also from infected mother to the child usually during separation of placenta at delivery and breastfeeding.^{12,13} Others includes organ and tissue transplantation from infected donors or exposure of healthy person to infected blood during accidents.^{12,13} Nigeria has a high prevalence of HIV and has been ranked the second largest HIV epidemic globally.¹³ In 2018, approximately 1.9 million people living in Nigeria were infected with HIV with a recorded prevalence of 1.5% and 130,000 new cases.¹³ In Iran, the prevalence of HIV amongst blood donors was 0.004%,¹⁴ 0.08% in China,¹⁵ 0.07% in Saudi,¹⁶ and 3.1% in Osogbo, Nigeria.¹⁷

The prevalence of Syphilis varied from different regions of the world, Higher values was however reported in some part of Western and Central Africa.^{18,19,20} In Ghana a prevalence of 3.7% was reported in blood transfusion facilities.²¹ As at present, there is still no cure for AIDS as well as some other infectious agents being transmitted through blood transfusion, efforts should be geared towards proper donor selections as well as obtaining donor blood from low risk individuals especially voluntary blood donors who were non-remunerated in order to prevent morbidity and mortality associated with these infections. Our research study determines the trend of transfusion transmissible infections among voluntary blood donors in some selected tertiary institutions in North Central, Nigeria.

Materials and Methods

A descriptive community-focused study was conducted among students and staff of 5 Tertiary Institutions in Kwara and Kogi States both located in the North-Central part of Nigeria between August 2016 and January, 2018. A total of 905 staff and students of the tertiary institutions gave consent to participate in this study, although only 600 of them eventually completed the study as some of them were rejected based on low haemoglobin level and making them unfit for blood donation. Before the study was commenced.

Standard ethical procedure was complied with in accordance with Helsinki declaration. Permissions from the management of the Institutions were obtained and the Ethical Review Committee of the University of Ilorin Teaching Hospital which is one of the members of the National Health Research Ethics Council gave us a written approval (Ethical Approval Number and date - UERC/ASN/2015/133/ 13th August, 2015) before commencing the study.

The socio-demographic information of the participants was obtained with a designed questionnaire which was self-administered. A brief physical examination was done for each prospective donor. About five millilitre of venous blood was collected via venipuncture using aseptic technique from all participants. The samples were dispensed into well labeled vacutainer plain bottles. The blood was then allowed to clot and retract and was then centrifuged at 2500rpm for a duration of 10 minutes to obtain serum which was kept at -20°C until analyzed for Hepatitis B, HIV, anti-HCV and Syphilis. Hepatitis B and C were first analyzed using hepatitis B surface antigen test strip, an immunoassay product of Grand Medical Diagnostic, USA in accordance to the manufacturer's instructions, while antibody to hepatitis C was tested using commercially prepared test kits from ACONS, USA. The samples were further analyzed with the use of Enzyme linked immunosorbent assay using Hepatitis B Virus Surface Antigen Bio-Inteco ELISA KIT, UK and Anti-HCV Bio-Inteco ELISA KIT, UK for HbsAg and antibodies to hepatitis C virus detection respectively.

The HIV screening was subsequently done with the use of Enzyme immunoassay technique which enables the HIV P24 antigen detection as well as identification of the antibodies to both HIV 1&2 in the serum of participants using the Human HIV 1+2 Antigen Antibody ELISA KIT, Bio-Inteco HIV Diagnostics, UK and testing for Syphilis in the participants' samples was done with the use of the Rapid Plasma Reagin (RRR) test in accordance with manufacturer's instruction.

Results

Six hundred (600) participants comprising of students and staff of five Tertiary Institutions in North Central geopolitical zone of Nigeria who were fit to donate blood based on haemoglobin concentration $\geq 12.5\text{g/l}$ and who eventually donated participated in the study. The mean $\pm$ SD age of the subjects was 21.98 ± 5.17 years (ranging from 15 to 63 years). The modal age was 30 years. Most of the participants were students, single and of Yoruba ethnic origin. Table 1.

The prevalence of Hepatitis among voluntary blood donors was 4.7%, Hepatitis C, 0.2%, Syphilis 0% and HIV 1% Table 2

Table 1: The socio-demographic variables of voluntary blood donors

Variables	Frequency	Percentage
Age group		
< 20	121	13.4
20 – 29	597	82.4
30 – 39	20	2.2
≥ 40	18	2.0
Range	15 – 63	
Mean ± SD	21.98 ± 5.17	
Gender		
Male	541	59.8
Female	364	40.2
Ethnic group		
Yoruba	769	85.0
Hausa	24	2.7
Igbo	9	1.0
Nupe/ Igala/ Ebira	57	6.3
Others	18	2.0
Not stated	28	3.0
Literacy level		
Secondary	7	0.7
Tertiary	887	98.0
Quranic	6	1.0
None	5	0.3
Occupation		
Student	863	95.4
Lecturer	12	1.3
Teacher	10	1.1
Others	20	2.2
Marital status		
Married	38	4.1
Single	860	95.0
Widowed	7	0.9
Religion		
Islam	634	70.1
Christian	271	29.9
Designation		
Staff	42	4.6
Student	863	95.4

Two thirds of the prospective blood donors were within the second decade of life and more than half were males. More than three quarters of them were students of tertiary institution.

Table 2: Hepatitis B&C, Syphilis and HIV infection

Variable	Frequency (N = 600)	Percent
HBV		
Positive	28	4.7
Negative	572	95.3
HCV		
Positive	1	0.2
Negative	599	99.8
HIV		
Positive	6	1.0
Negative	594	99.0
SYPHILIS		
Positive	0	100
Negative	600	

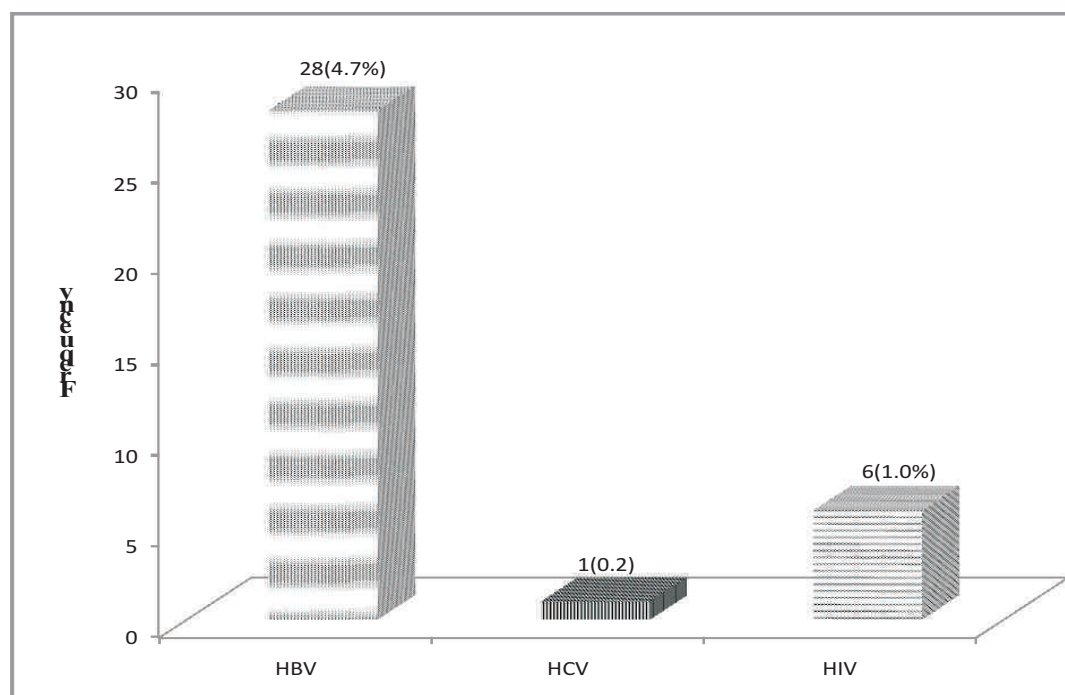


Figure 1: Prevalence of Transfusion Transmissible Infections

Discussion

Transfusion transmissible infections pose great threat to blood transfusion safety especially in sub-Saharan Africa and other developing countries due to limitation in donor blood screening, quality control measures and lack of altruism towards blood donation. The blood donor selection criteria and donor blood screening may offer some relief from the risk of TTIs but there is need for improvements in providing services aimed at reducing this risk. The mean age of the subjects was 21.98 ± 5.17 years (ranging from 18 to 63 years). 59.8% of our subjects were male. This finding is comparable to report of study done by Olookoba *et al* in which the age range of their subjects was 18-60yrs with a predominant male population.

The Prevalence of HBV infection in our study was found to be 4.7% and this was comparable to the prevalence of 4.0% revealed by Abdalla *et al* in Kenya.²² Ejileet *et al* in Southern-south and Olookoba *et al* in Maiduguri, Borno state of Nigeria however reported lower values of 1.1% and 2.4% respectively among voluntary blood donors.^{23,6} Higher prevalence rate of 10.9%, 10.6% and 13.2% was revealed by Shittuet *et al* in North-central, Esumeh FI *et al* in Southern South and Fasolaet *et al* in South West Nigeria respectively.^{5,24,25}

These studies with higher prevalence of HBsAg compared with our study were carried out among blood donors that includes voluntary, family replacement and paid donors), thus confirming the importance of ensuring blood donation from the low risk non-remunerated voluntary blood donors in which the prevalence of HBsAg was comparatively lower as shown in our study.

We found the prevalence of HBC in our study to be 0.2%, and is comparable to the prevalence of 0.2% and 0.5% recorded by Abdallaet *al* in Kenya and Ejele *et al* in Southern Nigeria respectively.^{22,23} The HBC prevalence in our study was lower than report of similar studies conducted by Matte *et al* in Southern, Nigeria and Nwodedrukoet *al* where a prevalence of 3.0% and 3.9% respectively were reported.^{26,27} There were significant differences in the reported prevalence of both hepatitis B and C infection across the different geo-political zones in Nigeria and globally and this could be due to differences in immunization coverage, the methodology adopted for screening, geographical locations and more importantly the socio-cultural behaviours including sexual practices, use of tattoos, etc.

The implementation of serological testing of blood donors has contributed significantly to reduction in transmission rate of both hepatitis B and C in Nigeria and other developing countries.²⁸ So much needs to be done to improve the accuracy of testing. Although, enzyme immunoassay technique was use for the detection of both hepatitis B and C of voluntary blood donors in our study which is more accurate than rapid kits test used in most of the studies on TTI in Africa, most blood donation centers in Nigeria and Sub-Saharan Africa rely more on the use of rapid test kit for screening tests. However, there is a need for routine validation of the test kits used for blood donors screening in sub-Saharan Africa since the precision of rapid test kits is less compared to Enzyme immunoassays and Nucleic acid testing which may be too expensive for use in developing countries.²⁹

Our study reported a prevalence of 1.0% for HIV 1 and II and this was similar to a figure of 1% and 0.87% reported among blood donors by Ejele *et al* in South-South and Ogunkolo *et al* in Southwest, Nigeria respectively^{23,30} However, it was lower than 1.5% found in Nigeria by UNAIDS.¹³ Higher prevalence of 3.1% for HIV was reported by Buseri *et al* among blood donors in Osogbo, Osun state, Nigeria.¹⁷ Amadi *et al* revealed a much higher figure of 10.6% in Aba, South-east, Nigeria.³¹ Ampofoin in a similar study carried out in Ghana found a figure of 3.8%.³² The observed variations in HIV prevalence may be related to differences in some risk behaviours like; sexual practices, use of scarification marks, awareness programs, level of education and the safety measures adopted in centers in charge of blood transfusion services.

About 10% of HIV infection recorded in Nigeria resulted from blood transfusion.³³ The limitation of detection of HIV during window period with the use of rapid screening kit and ELISA is of great concern and this can be ameliorated with the adoption of Nucleic acid testing as this will enhance improvement in the safety services. Also the transfusion of blood should be carried out only when it is absolutely necessary as there is no zero risk in blood transfusion. The prevalence of Syphilis in our study was found to be 0%. Similar result was obtained from the study carried out by Buhari *et al.* in Sokoto, North-western Nigeria.³⁴ Ejele *et al* in Niger-Delta of Nigeria, Yusuf M in Ethiopia and Kamande MW *et al* in Kenya recorded a prevalence of 0.1% respectively.^{35,36,37} Shittu *et al* in Ilorin, Nigeria, reported a prevalence of 0.84% while Damulak in Jos reported a figure of 0.9%.^{38,39} Salawu in Ile-Ife, South-West and Chikwem *et al* in Maiduguri, North-Eastern, Nigeria recorded a higher figure of 2.6% and 3.6% respectively.^{40,41} The observed variation found in the prevalence of syphilis in our study in contrast with other similar studies could be related to differences in geographical location, methodology and risk behaviours. The serological tests commonly used for blood donor screening for syphilis could be specific or non-specific. The specific test includes Treponema Pallidum Particle Agglutination Assay (TPPA) and Treponema Pallidum Haemagglutination Assay (TPHA) while the non-specific includes the Rapid Plasma Reagin (RPR) and the Venereal Disease Research Laboratory (VDRL). There are differences in sensitivity of above listed test for Syphilis.

Conclusion: The recorded prevalence of hepatitis B virus and that of HIV were moderately high when compared with that of Hepatitis C and that of syphilis among voluntary blood donors although much lower than in the family replacement and among commercial

donors of blood. To achieve significant improvement on blood transfusion safety, careful selection of donors among populace is mandatory. Awareness among the general public on immunization for hepatitis B virus, quality control of screening methods and the use of blood for transfusion only when needed are all essential strategies to achieving safe blood transfusion practices.

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References

1. World Health Organization: Blood donor selection: guidelines on assessing donor suitability for blood donation 2012 https://www.who.int/bloodsafety/publications/guide_selection_assessing_suitability.pdf
2. World Health Organization: Global status report on Blood Safety and Availability 2016. ISBN 978-92-4-156543-1
3. World Health Organization. Hepatitis B 2014
4. Musa, BM, Bussell, S, Borodo, MM, Samaila AA, Femi OL. Prevalence of hepatitis B virus infection in Nigeria, 2000-2013: A systematic review and meta-analysis. *Niger J Clin Pract* 2015; 18(2):163-72.
5. Shittu AO, Olawumi HO, Issa BA, Nwabuisi C, Durotoye IA, Yussuf AD, *et al.* Risk factor and Sero-prevalence of Hepatitis B surface antigen among blood donors in University of Ilorin Teaching Hospital, Ilorin, Nigeria. *East Afr Med J.* 2014;57-61
6. Olokoba AB, Salawu, FK, Danburam, A, Desalu O, Olokoba L, Wahab K. *et al.* Viral hepatitis in voluntary blood donors in Yola, Nigeria. *Eur J. Sci Res.* 2009; 3: 329-34
7. Ejiofor OS, Emechebe GO, Igwe WC, Ifeadike CO, Ubajaka CF. Hepatitis C virus infection in Nigerians. *Niger Med J.* 2010;51:173-6.
8. Achara G, Sadovisky R. Hepatitis C virus: An overview of Epidemiological factors and Natural History. *Internal medicine world Report* 2000; **15**: 1-27.
9. Zaccacheau, AJ, Baribefe, K, Fiekumo, B, Felix, E. Prevalence of antibodies to hepatitis C in apparently healthy Port Harcourt blood donors and association with blood groups and other risk indicators. *Blood Transfus.* 2008;6 (3)150-55.
10. KawoAH, Bala JA, Dabai YU. Sero-prevalence study of Hepatitis C virus infection

- among blood donors attending selected blood banks in some Local Government Areas in Kano, Nigeria. *JPublic Health and Epid.* 2012; 4 (6): 178-83.
11. Chukwurah EF,Ogbodo SO, Obi GO. Seroprevalence of Hepatitis C(HCV) infection among blood donors in a South-Eastern State of Nigeria. *Biomed Res.* 2005;16(2):133-35
 12. Plummer FA, Simonsen JN, Cameron DW, Ndinya-Achola JO, Kreiss JK, Gakinya MN. *et al.* Cofactors in male-female sexual transmission of human immunodeficiency virus type1. *J Infect Dis.* 1991;163:233-39.
 13. UNAIDs Data 2019. HIV and AIDs in Nigeria
 14. AminiKafi-abad S, Rezvan H, Abolghasemi H, Talebian A. Prevalence and trends of human immunodeficiency virus, hepatitis B virus, and hepatitis C virus among blood donors in Iran, 2004 through 2007. *Transfusion.* 2009;49(10):2214-20.
 15. Yang S, Jiao D, Liu C, Lv M, Li S, Chen Z. *et al.* Seroprevalence of human immunodeficiency virus, hepatitis B and C viruses, and Treponemapallidum infections among blood donors at Shiyan, Central China. *BMC Infect Dis.* 2016;16(1):531.
 16. Elbjeirami WM, Arsheed NM, Al-Jedani HM, Elnagdy N, Elsha HM, Abdulwahab A, *et al.* Prevalence and Trends of HBV, HCV, and HIV Serological and NAT Markers and Profiles in Saudi Blood Donors. *J Blood Disord Transfus.* 2015; 6 (3): 280.
 17. Buseri FI, Muhibi MA, Jeremiah ZA. Sero-epidemiology of transfusion-transmissible infectious diseases among blood donors in Osogbo, south-west Nigeria. *Blood Transfus.* 2009;7(4):293-9.
 18. Dionne-Odom J, Mbah R, Rembert NJ, Tancho S, Halle-Ekane GE, Enah C, *et al.* Hepatitis B, HIV, and Syphilis Seroprevalence in Pregnant Women and Blood Donors in Cameroon. *Infect Dis Obstet Gynecol.* 2016;2016:4359401..
 19. Okoroiwu, H.U., Okafor, I.M., Asemota, E.A, Okpoma DC. Seroprevalence of transfusion-transmissible infections (HBV, HCV, syphilis and HIV) among prospective blood donors in a tertiary health care facility in Calabar, Nigeria; an eleven years' evaluation. *BMC Public Health.* 2018;18: 645-52.
 20. Issa BA, Fadeyi A,Durotoye IA, Yussuf AD, Salami AK, Shittu AO. *et al.*Sero-Prevalence of Syphilis among Patients with Mental Illness: Comparison with Blood Donors. *West African J Medicine.* 2013; 22 (3):210-15
 21. Sarkodie F, Hassall O,Owusu-Dabo, E, Owusu-ofori S, Bates I, Bygbjerg C. *et al.* Syphilis Screening Practices in Blood Transfusion Facilities in Ghana. *Int J Infect Dis,* 2016;43:90-4.
 22. Abdalla F, Mwanda OW, Rana F. Comparing walk-in and call-responsive donors in a national and a private hospital in Nairobi. *East Afri Med J.* 2005; 82(10):532-36
 23. Ejele OA., Erhabor, O, Nwauche CA. The risk of transfusion-transmissible viral infections in the Niger-Delta area of Nigeria. *Sahel Med J.* 2005; 8(1):16-19.
 24. Esumeh FID, UgbomoikoJO,Isibor. Seroprevalence of HIV and Hepatitis B surface antigen (HBsAg) among blood donors in central hospital, Benin city, Nigeria. *J. Med Lab Sci.* 2003;12 (2):52-5.
 25. Fasola FA, Kotila TR, Akinyemi JO. Trends in transfusion-transmissible viral infections from 2001 to 2006 in Ibadan, Nigeria. *Intervirology.* 2008;51(6):427-3.
 26. Matee MI, Lyamuya EF, Mbena EC, Magessa PM, Sufi J, Marwa GJ. *et al.* Prevalence of transfusion-associated viral infections and syphilis among blood donors in Muhimbili Medical Centre, Dar es Salaam, Tanzania. *East Afr Med J.* 1999;76(3):167-71.
 27. Nwokediuko SC, Ibegbulam OG, Ugwu T. Hepatitis C virus sero-prevalence in blood donors at the University of Nigeria Teaching Hospital, Enugu. *IntJ Med and Health Devel.* 2007;12(2):85-8
 28. Chiavetta JA, Escobar M, Newman A, Yaohua H, Driezen p, Deeks S. *et al.* Incidence and estimated rates of residual risk for HIV, hepatitis C, hepatitis B and human T-cell lymphotropic viruses in blood donors in Canada, 1990–2000. *CMAJ.* 2003; 169 (8): 767-73.
 29. Chameera, E, Noordeen, F, Pandithasundara, H,Abeykoon, A. Diagnostic efficacy of rapid assays used for the detection of hepatitis B virus surface antigen. *Sri Lankan JInf Dis.* 2013; 3(2):21–27.
 30. Ogunkolo OF, Adenaike FA, Amballi AA, Olukoya T. Prevalence of HIV positive blood donors among screened volunteers who satisfied the criteria for blood donation in a semi-urban

- Nigeria population. *Afr J Biotechnol*. 2006;5(7):553-54.
31. Amadi AN, Mba LE. Distribution of HIV infection in Abia State, Nigeria. *Niger J Med Invest Pract*. 2001;2:38-40
32. Ampofo W, Nil-Trebi N, Ansah J, Abe K, Naito H, Aidoo S. Prevalence of blood-borne infectious diseases in blood donors in Ghana. *J Clin Microbiol*. 2002;40:3523-5
33. HIV and AIDS in Nigeria (2007). <http://www.avert.org/aidsnigeria.ht>.
34. Buhari H, Usman I, Abubakar W, Adias TD, Udomah F, Yakubu A. *et al*. Is there Need for Continued Donor Screening for Syphilis in Sokoto, North Western Nigeria. *American Journal of Microbiology and Biotechnology*. 2014;1(2):71-6.
35. Shittu AO, Fadeyi A, Olawumi HO, Babatunde AS, Omokanye KO, Ogunfemi MK. Screening for Syphilis Among Blood Donors in Nigeria: Application of General Quality Principles. *Africa Sanguine*. 2019. 21 (2):5-9
36. Damulak OD, Jatau E, Akinga E, Peter G. The prevalence of syphilis among blood donors in a centralized Nigerian Blood Transfusion Service Centre. *Niger J Med*. 2013;22(2):113-16
37. Ejele OA, Ojule AC. The prevalence of Hepatitis-B surface antigen (HBsAg), among prospective donors and patients in Port Harcourt, Nigeria. *Niger J Med*. 2004;13:336-8
38. Yusuf M, Alemayehu B. Seroprevalence of transfusion transmitted infection among blood donors of Jijiga blood bank, East Ethiopia; retrospective 4 years' study. *BMC Res Notes*. 2016;9:129.
39. Kamande MW, Kibebe H, Mokua J. Prevalence of transfusion transmissible infections among blood donated at Nyeri satellite transfusion Centre in Kenya. *IOSR J Pharm*. 2016;6:20-30.
40. Chikwem JO, Mohammed I, Okara GC. Prevalence of transmissible blood infections among blood donors at the University of Maiduguri Teaching Hospital, Maiduguri, Nigeria. *East Afr Med J*. 1997; 74:213-16.
41. Salawu L, Bolarinwa RA, Adegunloye AB, Muraina HA. HBsAg, anti-HCV and VDRL in blood donors: prevalence and trends in the last three and a half years in a tertiary healthcare facility in Ile-Ife, Nigeria. *Int J Med Med Sci*. 2010; 2(11):335-41.

Outcomes of Pregnancy Complicated by Preterm Premature Rupture of Membranes in Benin City

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Abstract

Preterm premature rupture of membrane (PPROM) is a common pregnancy complication in our environment. It is a significant cause of preterm birth with its consequent high perinatal morbidity and mortality, especially in developing countries. This study determined the prevalence of PPRM in the University of Benin Teaching Hospital (UBTH), common risk factors, maternal and perinatal outcomes. This is a retrospective study of cases of PPRM among parturients in UBTH between January 2016 and December 2018. Relevant information retrieved from case notes and hospital records of patients with PPRM. Sociodemographic and clinical characteristics extracted as well as risk factors and maternofoetal outcomes. Data analysis was done using SPSS version 22 and presented as frequency tables and charts as appropriate.

There were 237 cases of PPRM out of 6308 deliveries within the period under review, giving a prevalence of 3.8%. Perinatal mortality of 45.6% documented with neonatal sepsis (32.2%) as the most common neonatal complication. Maternal mortality was 0.4%, and chorioamnionitis (32.9%) was the most typical complication. We concluded that PPRM can be a significant complication of pregnancies with associated high perinatal morbidity and mortality. With a strict maternal foetal follow-up to allow the foetus to gain gestational age and birth weight, prudent management can improve maternal foetal outcome.

Keywords: Preterm premature rupture of membrane, maternal outcomes, perinatal outcomes

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Introduction:

Premature rupture of membranes (PROM) is said to have occurred when the foetal membranes ruptured before the onset of labour.¹ Depending on the time of onset, it can be termed preterm premature rupture of membrane (PPROM) if it occurs before 37 weeks of gestation.² The resultant spontaneous leakage of amniotic fluid poses a significant maternal and foetal morbidity and mortality,^{2,3} especially when it happened over 24 hours without the onset of labour in a situation often described as prolonged premature rupture of membrane.^{1,3}

The incidence of preterm premature rupture of the membranes is 5-10% of all deliveries^{4,5}. It complicates a 3-8% of pregnancies leading to one-third of preterm deliveries amongst other perinatal and neonatal complications with a 1-2% risk of foetal death.⁵ PPRM is one of the leading causes of preterm births with attendant perinatal morbidity and mortality and maternal morbidity.^{4,5} The scenario tends to worsen in developing countries with 40-75% neonatal deaths due to inadequate neonatal facilities.^{6,7}

Evidence has shown that PPRM is associated with intrauterine infection and subsequent disruption of the membrane.⁷ While, the maternal risks of PPRM are lower socioeconomic status,^{7,8} history of the previous PPRM, poor nutrition, cigarette smoking during pregnancy and sexually transmitted disease,^{4,8} the negative impact on the maternofoetal wellbeing is directly proportional to the latency period, amniotic volume and the gestational age at onset.^{7-9,10,11-13}

The foetus may contend with prematurity, cord prolapse, cord compression, foetal distress, necrotizing enterocolitis and distorted pulmonary formation culminating in pulmonary hypoplasia and pulmonary hypertension.^{12,14,15}

The management of preterm premature rupture of the membrane can be immediate delivery or conservative management, depending on the gestational age and materno-foetal clinical condition.¹⁴ The principles of conservative

management include hospital admission for bed rest, antibiotics and corticosteroids for foetal lung maturity.^{14,15,16} Gestational age at delivery, use of corticosteroids, latency period, prolonged liquor drainage, malodorous liquor, and admission into special care baby units have been found to influence the perinatal outcome.¹⁷ Also, early presentation following preterm premature rupture of membranes has been reported to impact both maternal and perinatal outcome positively.¹⁸

Preterm premature rupture of membranes has continued to complicate pregnancies with adverse maternal and perinatal outcomes. The perinatal morbidity and mortality associated with prematurity pose a huge burden to both the patient and the society.

This study reviewed pregnancies complicated by PPROM and evaluated the associated maternal and perinatal morbidity and mortality.

Methodology

It is a retrospective study of all PPROM cases in patients at the University Hospital in Benin (UBTH) between January 2016 and December 2018. Women diagnosed with PROM between 24 and 36⁺⁶ completed weeks with speculum confirmation of liquor drainage were included. Women with rupture of membranes beyond 36 weeks and 6 days gestation and bleeding per vaginam excluded. The aim was to determine the prevalence of PPROM in UBTH, determine the common risk factors, maternal and perinatal outcomes. Information retrieved from case records of patients managed for preterm premature rupture of membranes generated sociodemographic characteristics and relevant clinical data of the study population; the pregnancy outcomes, including any maternal or foetal complications.

The social classification was done using the social classification method by Olusanya et al,¹⁹ Statistical analysis was done using Statistical Package for Social Sciences (SPSS) version 22. Statistical significance was ascertained using the chi-square test and student's t-test. The level of significance was set as $P < 0.05$.

Results

In the period under review, there were 6308 deliveries. 237 Pregnancies were complicated by preterm premature rupture of membranes with a prevalence rate of 3.8%.

The mean age distribution was 31.7 years $\pm$ 2SD, and only 4(1.7%) were single.

The Majority of the women were in low socioeconomic class 76(32.1%). Nulliparous women constituted (88)37.1%. Unbooked patients made up a substantial number of cases of PPROM, 139(58.6%). The previous history of PPROM was the most typical risk factor (31.7%), followed by idiopathic causes (30.8%). (Table 1)

Mos t53 (49.1%) of the

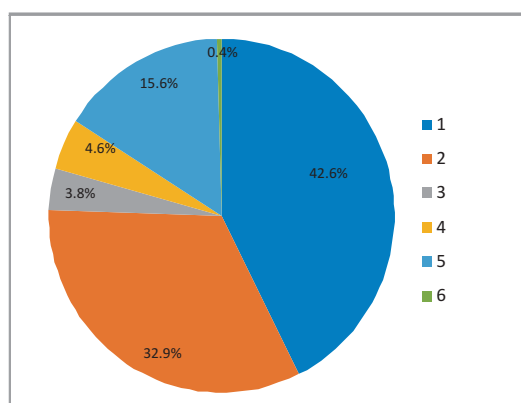
perinatal mortality occurred within 24-28⁺⁶ weeks group with birth weight <1kg and decreased with increasing gestational age and birthweight. The Majority of the patients, 195(82.2%) delivered in the first 24 hours of the onset of PPROM, and only 16(6.8%) had a latency period of more than 7days.

Table 1: Sociodemographic And Clinical Characteristics Of The Study Population

Variable	frequency (%)
Age Group	
<19	5(2.1)
19-25	21(8.9)
26-30	63(26.6)
31-35	98(41.4)
36-40	41(17.3)
>40	9(3.8)
Mean age 31.7 $\pm$ 2SD	
Marital Status	
Single	4(1.7)
Married	233(98.3)
Parity	
0	88(37.1)
1-2	77(32.5)
3-4	61(25.7)
>4	11(4.7)
Social Class	
1	36(15.1)
2	48(20.3)
3	61(25.7)
4	76(32.1)
5	16(6.8)
Level Of Education	
No formal education	0(0.0)
Primary	89(37.6)
Secondary	92(38.8)
Tertiary	56(23.6)
Residence	
Urban	206(86.9)
Rural	31(13.1)
Booking Status	
Booked	98(41.4)
Unbooked	139(58.6)
Common Risk Factors	
Previous PROM	75(31.7)
UTI	29(12.2)
Febrile illness	37(15.6)
Multiple gestation	18(7.6)
Polyhydramnios	5(2.1)
None	73(30.8)

Table 2: Gestational Age At Delivery And Labour Outcome Of The Study Population

Gestational Age (Weeks)	Frequency(%)		Test Of Statistics (p-value)
	Alive (129)	Perinatal death (108)	
24-28 ⁺ 6	15(11.6)	53(49.1)	0.672
29-33 ⁺ 6	94(72.9)	48(44.4)	
34-36 ⁺ 6	20(15.5)	7(6.5)	
Time From ROM To Delivery(Days)			
<=1	195(82.2)		0.001
2-7	26(11.0)		
>7	16(6.8)		
Mode Of Delivery			
Vaginal	173(73.0)		0.001
Caesarean section	64(27.0)		
Birth Weight(Kg)			
0.5-0.99	4(3.1)	60(55.5)	
1-1.49	25(19.4)	15(13.9)	
1.5-2.49	67(51.9)	25(23.1)	
>=2.5	33(25.6)	8(7.4)	

**Fig. 1: maternal morbidities**

- 1 = None
 3 = Sepsis
 2 = Chorioamnionitis
 4 = Primary post-partum haemorrhage
 5 = Retained placenta 6 = Maternal mortality

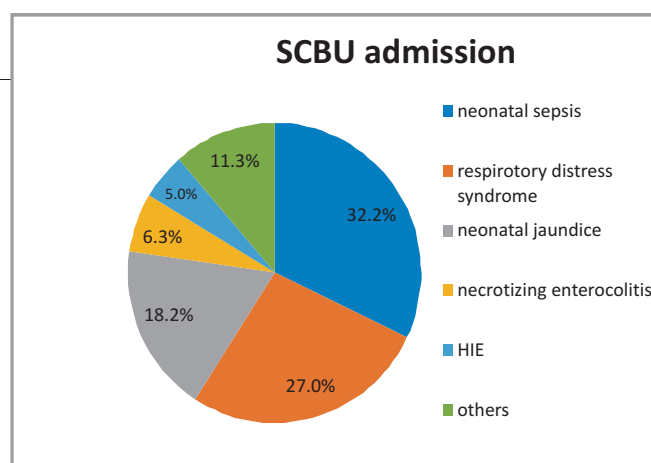
Caesarean section was done for 64(27.0%) women. (Table 2)

Chorioamnionitis was the most recorded complication (32.9%). Others were retained placenta (15.6%), postpartum haemorrhage (4.6%) and sepsis (3.8%). There was 1(0.4%) recorded maternal mortality due to overwhelming sepsis. (Figure 1)

The Majority of the neonates had neonatal sepsis, 32.2%. Others common complications include respiratory distress syndrome (27.0%), neonatal jaundice (18.2%), necrotizing enterocolitis (6.3%) and hypoxic-ischaemic encephalopathy (5.0%). (Figure 2)

Discussion

Preterm premature rupture of membrane (PPROM) complicates a large number of pregnancies, culminating in significant preterm

**Fig 2: Indications For SCBU Admission**

births with its associated maternal morbidity as well as perinatal morbidity and mortality.^{4, 7, 10, 13}

The prevalence of 3.8% in this study is comparable to the reported incidence in literature.^{5, 20} Majority (58.6%) of women with PPRM were unbooked and referred to the centre to access neonatal facilities. The centre serves as a central referral facility to most secondary facilities in the country's geopolitical zone.

The Majority of the women had primary and secondary education and were of low socioeconomic status. The report in consonance with earlier studies where the risk of PPRM was inversely proportional to the pregnant woman's socioeconomic status.^{18,19,21,23,24} These women are also at risk of poor health-seeking behaviour that could influence the early presentation.^{18,21} Thus predispose to an unfavourable maternofetal outcome. Similar to Emechebe et al.,²² history of

previous PPROM was the most typical risk factor in this study. However, our study is in variance with the study by Ilovereen et al.,²¹ that noted PPROM commonest amongst primigravidae and nulliparous women. The report could be due to the differences in the populations studied. Other risk factors noted were urinary tract infection, febrile illness, multiple gestation and polyhydramnios. When compared with similar studies,^{3,6,18} maternal-foetal outcomes were significantly affected by gestational age at onset, duration of PPROM, and latency period. Majority of the women delivered earlier (24 hours of presentation) this is inconsistent with earlier studies that revealed 50-80% of delivery within 48 hours.^{1,4,6} The difference could be due to the large proportion of the unbooked patients and late presentation with an imminent threat to delivery. Thus, compromising the benefit of administering steroid to enhance neonatal outcome. Similar to Morris et al.,¹⁴ early presentation and subsequent conservative management with adequate maternofoetal surveillance could improve maternal and perinatal outcomes. Vaginal delivery accounted for 73% of the deliveries with a caesarean section rate of 27% which is compared with findings of Ibishi et al.¹³

Puerperal sepsis accounted for most maternal morbidities and mortalities, and it is corroborated by other studies.¹⁰ This is not surprising because the most typical and identifiable complication noted in the study was chorioamnionitis, just as reported by others.^{12,13,16} Other maternal complications pointed out in the study were primary postpartum haemorrhage and retained placenta. However, the use of prophylactic broad-spectrum antibiotics confers some benefits; maternal mortality was 0.4% for overwhelming infection for prolonged PPROM due to late presentation which was lower than 1.6% reported by Endale et al.¹⁰

Perinatal death in this study was 45.6% and was lower than 56% reported in a similar study.⁶ The lower perinatal mortality outcome observed may reflect the more favourable birth weight; most of the survived neonate had a birth weight of 1.5kg and above. In contrast, perinatal death 75(69.4%) were among those below 1.5kg. The positive correlation of perinatal outcome and increasing gestational age and birth weight at delivery has documented in other studies.^{12,17} The most common cause of neonatal morbidity in this study was

neonatal sepsis in consonance with earlier studies.^{9,15} Neonatal morbidity and mortality were influenced by gestational age at delivery, birth weight, and latent period. With increasing gestational age at delivery, the better the neonatal outcome. While the administration of corticosteroids with longer latent period assisted in hasten lungs maturity and improve neonatal outcome.^{14,15,16}

Conclusion

Preterm premature rupture of membranes is still common in our environment and is associated with increased perinatal morbidity and mortality. History of previous preterm PPROM may be a useful screening tool. In the absence of materno-foetal risks or complication, expectant management and strict surveillance of maternofoetal wellbeing should be encouraged to circumvent impending catastrophes associated with low birth weight.

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Conflict of interest: the authors declare that they have no competing interest

References

1. Idris A, Pius S, Bukar M. Maternal and neonatal outcomes in premature rupture of membranes at the University of Maiduguri Teaching Hospital, Maiduguri, North-Eastern Nigeria. *Trop J Obstet Gynaecol*. 2019;36:15-20.
2. American College of Obstetricians and Gynecologists. Premature rupture of membranes. Practice bulletin no. 139. *Obstet Gynecol* 2013;122:981-30.
3. Maller CH, et al. Preterm Premature Rupture of Membranes. *Arch Argent Pediatr* 2018;116(4):e575-e581
4. Hamdi K, et al. Prediction of Latency

- Interval in Preterm Premature Rupture of Membranes using Sonographic Myometrial thickness. *Pakistan Journal of Biological Sciences*. 2010;13:841-846.
5. T C Okeke et al. The Incidence and Management Outcome of Preterm Premature Rupture of Membranes(PROM) in a Tertiary Hospital in Nigeria. *American Journal of Clinical Medicine Research* 2.1(2014):14-17
6. Obi SN and Ozumba BC. Preterm Premature Rupture of Foetal Membranes: The dilemma of management in a developing nation. *J Obstet Gynaecol*. 2007;27(1):37-40
7. Ekwochi U, Ndu IK, Nwoye IC, Ezenwa OU, Amadi OF, Osuorah D. Pattern of morbidity and mortality of newborns admitted into the sick and special care baby unit of Enugu State University Teaching Hospital, Enugu, Enugu State. *Niger J Clin Pract* 2014;17:346-51.
8. Kacierovsky Metal. Oligohydramnios in Women with Preterm Prelabour Rupture of Membranes and Adverse Pregnancy and Neonatal Outcomes. *PLOS ONE* 2014;9(8):e105582
9. Assefa NE, Berhe H, Girma F, Berhe K, Berhe YZ, Gebreheat G, et al. Risk factors of premature rupture of the membrane in public hospitals at Makele City, Tigray; A case-control study. *BMC Pregnancy and Childbirth*. 2018;18:386.
10. Endale T, Fentahun N, Gemada D, Hussein M.A. Maternal and Fetal Outcomes in Term Premature Rupture of Membrane. *World J Emerg Med*. 2016;7(2):147-152.
11. Osaikhuwuomwan JA. Preterm Rupture of Membranes: The Vitamin C Factor. *J Obstet Gynaecol*. 2010;12(1):60-68.
12. T C Okeke et al. Morbidities, Concordance and Predictors of Preterm Rupture of Membranes among Pregnant Women at the University of Nigeria Teaching Hospital (UNTH), Enugu, Nigeria. *Niger J.Clin Pract* 2016;19:737-41.
13. Ibishi VA, Isjanovska RD. Prelabour Rupture of Membranes: Mode of Delivery and Outcome. *Open Access Maced J Med Sci*. 2015;3(2):237-240.
14. Morris JM, Roberts CL, Bowen JR, Patterson JA, Bond DM, et al. Immediate delivery compared with expectant management after preterm prelabour rupture of the membranes close to term(PROM trial): A randomized controlled trial. *Lancet* 2016;387(10017):444-452.
15. ACOG Committee on Practice Bulletins – Obstetrics. ACOG practice bulletin No. 80: Premature rupture of membranes. Clinical management guidelines for Obstetrician-Gynecologists. *Obstet Gynecol* 2007;109:1007-19.
16. ACOG Committee Opinion. Antenatal corticosteroid therapy for foetal maturation. *Obstet Gynecol* 2017;130:e120-9.
17. Kayiga H, Lester F, Amuge PM, Byamugisha J, Autry AM. Impact of delivery mode on pregnancy outcomes in women with preterm rupture of membranes after 28 weeks of gestation in a low-resource setting: A prospective cohort study. *PloS ONE* 2018;13(1):e0190388.
18. Osaikhuwuomwan JA, Osemwenkha AP. Maternal characteristics and timing of presentation following prelabour rupture of membranes. *Niger Med J* 2014;55:58-62.
19. Olusanya O, Okpere E, Ezimokhai M. The importance of social class in voluntary fertility control in a developing country. *West Afr J Med* 1985;4:205-11.
20. Gahwagi M.M, Busarira M, Atia M. Premature Rupture of Membranes Characteristics, Determinants, and Outcomes in Benghazi Libya. *Open Journal of Obstetrics and Gynaecology*. 2015;5(9):494-504.
21. Lovereen S, Khanum A, Nargis N, Begum S, Afroze R. Maternal and neonatal outcome in premature rupture of membranes. *Bangladesh Journal of Medical Sciences* 2018;17(3):479-483.
22. Emechebe C, Njoku C, Anachuna K, Udofia U. Determinants and complications of prelabour rupture of membranes (PROM)at the University of Calabar Teaching Hospital (UCTH), Calabar, Nigeria. *Scholars Journal of Applied Medical Sciences*. 2015; 3:1912-1917.
23. Bouvier D, Forest JC, Blanchon L, Bujold E, Pereira B, Bernard N, et al. Risk factors and outcome of preterm premature rupture of membranes in a cohort of 6968 pregnant women prospectively recruited. *J Clin Med*. 2019;8(11):1-12.
24. Sahoo R, Mohanty S. Study on aetiology and risk factors in spontaneous late preterm premature rupture of membrane. *J Evolution Med-Dent Sci*. 2019;8(20):1624-1627.

Barriers to Placenta Donation for Bio-Medical Research Purposes Among Pregnant Women in a Tertiary Health Institution in Nigeria.

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Abstract

The human placenta can be described as a discoid-shaped, highly vascularised organ that functions to maintain and promote normal foetal development in utero. Over centuries, several researches done have isolated cells from different placental regions and investigated their therapeutic potentials. Currently, there are established clinical uses of placental cells, and ongoing clinical trials on the placental tissue which have shown good promise in the fields of ophthalmology, dermatology, plastic surgery, and many other sub-specialties of surgery.

This study contributes to the dearth of information currently available with regards to maternal perception of and attitude towards donation of placental tissues for biomedical research purposes in our environment.

This hospital-based cross-sectional study was conducted in the Antenatal clinic of Bowen University Teaching Hospital (BUTH), Ogbomoso, Oyo State using self-administered questionnaires on consenting pregnant women.

There were 216 consenting pregnant women of which only 200 respondents had complete data. Majority (64.5%) of subjects were within the age range of 25-34 years and were married (96.5%). More than half of the respondents had tertiary educational, only three (1.5%) of the respondents had donated placenta in the past, while majority of the respondents preferred to dispose the placenta of their babies by burying them. Only a few of the respondents (8.5%) had knowledge on the biomedical uses of placenta.

Increased male education and involvement especially during the antenatal period will help the women in decision making towards placenta donation.

Key words- Placenta, Tissue donation, Biomedical research

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Introduction

The human placenta can be described as a discoid-shaped, highly vascularised organ that functions to maintain and promote normal foetal development in utero.¹ Owing to the delicate and important nature of the placenta, it is sometimes referred to as the 'mirror of the perinatal period'.^{2,3} The placenta provides an indirect link between the maternal circulation and that of the foetus. The functions of the placenta include serving as the organ for the exchange of nutrients, gases and waste products through diffusion, and metabolic and endocrine functions such as hormone production for maintaining pregnancy, foetal weight and relaxation of the cervix during parturition.^{4,5,6}

Several researches have isolated cells from different placental regions and investigated their therapeutic potential. Currently, there are established clinical uses of placental cells and ongoing investigative clinical trials. Placenta membranes have been established to be currently utilized in the field of ophthalmology to treat a number of ocular pathologies such as corneal epithelial defects, corneal ulcers, glaucoma, pterygium, and bulbous keratopathy.^{7,8} Furthermore, the use of placental cells is also being explored in the field of dermatology, where it is cultured and processed as a monolayer and can be used to cover burns, or treat chronic ulcers.⁷ It has also been found to be of immense importance in multiple surgical procedures especially in the prevention of post-operative adhesions.⁷

Several clinical trials concerning the therapeutic use of placenta are currently ongoing. These include its use in treatment of diabetic foot ulcers, venous ulcers, laser-induced wounds, and critical limb ischaemia.⁷ Furthermore, research into its use in the treatment of intermittent claudication, pulmo-pulmonary arterial hypertension, Crohn's disease, ischaemic stroke, pulmonary sarcoidosis, active rheumatoid arthritis, and haemorrhagic cystitis, to mention but a few, are also been looked at.⁷

Existing research studies show that there is paucity of information regarding public perception of placental donation and uses in developing countries, in spite of the significant potential uses mentioned above.⁹ It is believed that the perception about placenta

donation for biomedical uses is influenced by several factors, which include social structures, ethical paradigms, cultural practices, religious beliefs as well as level of education.¹⁰ A local study carried out in Benin, South-south, Nigeria reported that sociocultural values, religious and traditional beliefs are some of the reasons for reluctance to donate placenta wholly or partly for biomedical research purposes.¹¹

This research is aimed at investigating and describing the perception and attitude of pregnant women towards donation of placental tissues for biomedical research, as well as various factors that contribute to, or affect their perception in our environment.

Materials and Methods

This is a hospital-based cross-sectional study conducted at the Antenatal clinic of the Bowen University Teaching Hospital (BUTH), Ogbomoso, Oyo State, located in South-western part of Nigeria. Systematic sampling technique was used to recruit 216 consenting pregnant women. The inclusion criterion for the study was all pregnant women who gave their consent for participation in this study, while exclusion criteria were non-pregnant and non-consenting pregnant women.

Data were collected through self-administered questionnaires, and respondents had no prior knowledge, announcements, or information to minimize bias. It was designed to provide information on placenta donation, methods of placenta disposal, disposition to and attitude towards placental donation for biomedical research. Socio-demographic variables were also recorded in the study. The questionnaire was administered over a period of four (4) months. (September to December 2020)

Ethical consideration was sought and obtained from the Research and Ethics Committee of the hospital and confidentiality of the recruited patients was ensured.

Data collected were entered and analyzed using the Statistical Package for the Social Sciences (SPSS), version 22. Variables were presented as frequencies and percentages and Chi-square test was used to compare different groups of variables, and a value of <0.05 was statistically significant.

Results

There were a total of 216 respondents in this study, of which 16 incompletely filled the questionnaire and were excluded from the analysis. Of the 200 respondents included in the study, majority (64.5%) were within the age range of 25-34 years and were married (96.5%). Christianity was the most widely practiced religion among the respondents (83.0%), with most of them belonging to the Yoruba ethnic group (94.5%) while monogamous family

Table 1: socio-demographic characteristics of respondents

Age (years)	Frequency N=200	Percentage
<24	25	12.5
25-34	129	64.5
35 and above	46	23.0
Marital status		
Single	7	3.5
Married	193	96.5
Family setting		
Monogamous	180	90
Polygamous	20	10
Educational level		
None	1	0.5
Non formal	1	0.5
Primary	10	5.0
Secondary	50	25.0
Tertiary	138	69.0
Religion		
Christianity	166	83.0
Islam	34	17.0
Tribe		
Yoruba	189	94.5
Igbo	7	3.5
Hausa	2	1.0
Others	2	1.0
Parity		
Nulliparous	82	41.0
Para 1-2	94	47.0
Para 3-4	22	11.0
Para 5 and above	2	1.0

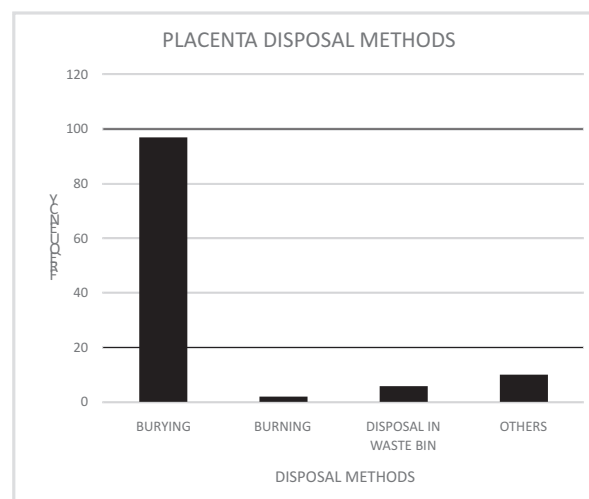


FIGURE1: METHODS OF PLACENTA DISPOSAL

Table 2: Knowledge on uses of placenta

	Frequency	Percent (%)
Aware of Medical Uses of Placenta		
Yes	17	8.5
No	177	88.5
Unsure	6	3.0
Source Of Awareness		
Parents	4	23.53
Health workers	4	23.53
Family members	4	23.53
News media	3	17.65
Others	2	11.76
Awareness Of Cultural Uses Of Placenta		
Yes	35	17.5
No	159	79.5
Unsure	6	3.0

Table 3: Attitude Towards Placenta Donation

	Frequency	Percentage
Willing to donate the placenta		
Yes	10	5.0
No	182	91.0
Unsure	8	4.0
Reason for willingness to donate placenta		
Religious	5	2.5
Social	3	1.5
Cultural	2	1.0
Others	2	1.0
Reason for not willing to donate placenta		
Religious	58	29.0
Social	38	19.0
Cultural	84	42.0
Others	8	4.0

Table 4: factors influencing willingness to donate placenta

Variable	Willing to donate placenta		P-value
	Yes	No	
Educational level			
None	0	1	0.647
Non-formal	0	1	
Primary	0	10	
Secondary	2	48	
Tetiary	8	130	
Tribe			
Yoruba	9	180	0.280
Igbo	2	5	
Hausa	0	2	
Others	1	1	
Religion			
Christianity	12	154	0.230
Islam	0	34	

setting was found in 180 (90.0%) of the respondents. Majority of the subjects had tertiary educational (138), and had one or 2 parous experience (47%). Table 1. Only three (1.5%) of the respondents gave the history of having donated placenta in the past, but these donors were not aware of the particular biomedical purposes for which the donated placenta was used for. However, majority of the respondents preferred to dispose their placenta by burying them. Figure 1 With regards to knowledge on the use of placenta, only 17 (8.5%) of subjects were aware of the biomedical uses of placenta, with parents, health workers and other family members as the main sources of this information (23.53%). Thirty-five (17.5%) respondents were aware of cultural uses of placenta, some of the respondents felt that the

placenta can be used for "money rituals". Table 2

Concerning the attitude of the pregnant women towards donation of placenta, only twelve (6.0%) of the respondents were willing to donate their baby's placenta for biomedical research, with a majority stating religious reasons as a basis for this decision. However, cultural perspective and perception were the most stated factor amongst those not willing to donate placenta (89.5%). Table 3

Although, the willingness to donate placenta was highest amongst individuals with tertiary education and of Christian religion, there is no association between willingness to donate placenta and education or religion ($p > 0.05$). All the three respondents who had previously donated placenta had

Table 5: Factors affecting placental donation

Variable	Previously donated placenta		P-value
	Yes	No	
Educational level			
None	0	1	0.000
Non-formal	0	0	
Primary	0	10	
Secondary	0	50	
Tertiary	3	135	
Religion			
Christianity	3	163	0.554
Islam	0	34	

tertiary education, and there was a statistically significant association between educational level and placental donation ($p=0.00$).

Discussion

This study was carried out to determine the perception and attitudes of pregnant women to the donation of placenta for biomedical purposes in our environment.

Findings from our study revealed that the willingness of pregnant women to donate part or whole of their babies' placenta tissue for bio-medical purposes is lower i.e about 6% when compared with a previous study in Uyo, South-south Nigeria where 34.1% of the respondents were willing to donate the placenta tissue of their babies at delivery.¹⁰ The low willingness to donate placenta observed in our study might be due to the highly valued religious and sociocultural beliefs among the residents of Ogbomoso which is a semi-urban settlement as compared to the urban city of Uyo, a state capital, where a similar study was carried out. From, our study, the level of education was found to have significant correlation with willingness to donate placenta or otherwise. The disparity in the educational level of the subjects recruited in the two studies may be responsible for the variance observed in the willingness to donate placenta. Another important factor which may be responsible for the disparity in willingness to donate placenta amongst the recruited subjects may be due to the disparity between the level of awareness about the use of the placenta for biomedical purposes amongst the two (2) categories of subjects involved in both studies i.e 8.5% versus 86.7%.¹⁰

Source of information about the biomedical use of placenta among the study participants that has some knowledge of the placenta use was mainly from the parents, health workers and family members. The social media and other means of disseminating information was less effective among the study participants.

Majority (89.5%) of the pregnant women in this study prefer to bury the placenta of their babies, due to the belief that the placenta has important implications as it

could affect their belief culturally, socially, and religiously which thus necessitates the need to bury it themselves. This was in contrast with findings from a similar study which reported that only 35.6% of the respondents were willing to take their placenta home with them.¹⁰ It is however, imperative to explain to patients that whether or not they allow the placenta to be used for biomedical research, a proper examination of the placenta is recommended as this may help discover any hidden complications during the pregnancy which may give an insight to the pathogenesis of neurologic and other developmental abnormalities.^{12,13}

Only 1.5% of the studied population had previously donated the placenta tissue for biomedical uses. This also explains the need for more advocacy and awareness among the populace by the health care workers in order to improve patients' involvement and participation in Antenatal clinic attendance, with the aim of making the scientific benefits of placenta donation and processing more accessible by individuals in the developing parts of the world. A major pitfall observed from the existing study shows that even those that donated placenta for biomedical uses had little or no information on the events which followed placenta donation. The above observation was noted in a similar study in Brazil where women were willing to donate placenta for biomedical research on the condition that they would be carried along in the entire process.¹³

It is obvious from this study that despite the very important uses of the human placenta tissue for research purposes and in other biomedical uses such as in wound healing, treatment of burns, reconstruction of the oral cavity and management of ocular surface diseases,⁷ majority of our pregnant women still prefer to bury rather than donate the placenta tissue of their babies.^{10,11}

In view of the foregoing, there is need to put in place comprehensive health education programmes targeted at improving the knowledge of women about the very important biomedical uses of placental tissue so that the population can benefit from these uses.

These benefits could be enormous because the placental cells are regarded as mesenchymal stem cells with characteristics like plasticity and ability to proliferate faster than adult mesenchymal cells.¹⁵ The training and retraining of health care workers especially those involved in care giving during antenatal periods on the benefits associated with the donation of the placenta for biomedical purposes is desirable. Health education should also be carried out to sensitize opinion leaders like traditional and religious leaders in the community because of the strong cultural and religious beliefs often attached by the population to the human placenta tissue. The need for male education and involvement especially during the antenatal period will help the women in decision making due to the patriarchal nature of our society.

There may be need to carry out similar studies in different localities in Nigeria so as to identify the barriers to human placenta tissue donation for biomedical uses.

References

1. Oyelese Y. Placenta, umbilical cord and amniotic fluid: The not-less-important accessories. *ClinObstetGynecol* 2012;55:307-23.
2. Machin GA, Ackerman J, Gilbert-Barness E. Abnormal umbilical cord coiling is associated with adverse perinatal outcomes. *PediatrDevPathol* 2000;3:462-71.
3. Valsamakis G, Kanaka-Gantenbein C, Malamitsi-Puchner A, Mastorakos G. Causes of intrauterine growth restriction and the postnatal development of the metabolic syndrome. *Ann N Y AcadSci* 2006;1092:138-47.
4. Carter AM. Placental gas exchange and the oxygen supply to the fetus. *ComprPhysiol* 2015;5:1381-403.
5. Griffiths SK, Campbell JP. Placenta structure, function and drug transfer. *ContinEducAnaesthCrit Care Pain* 2015;15:84-9.
6. Petraglia F. Endocrine role of the placenta and related membranes. *Eur J Endocrinol* 1996;135:166-7.
7. Silini AR, Cargnoni A, Magatti M, Pianta S, Parolini O. The long path of human placenta, and its derivatives, in regenerative medicine, *Front. Bioeng. Biotechnol.*, 19 October 2015.
8. Walkden A. Amniotic Membrane Transplantation in Ophthalmology: An Updated Perspective. *ClinOphthalmol.* 2020;14:2057-2072. Published 2020 Jul 22. doi:10.2147/OPTH.S208008
9. Yoshizawa RS. Review: Public perspectives on the utilization of human placentas in scientific research and medicine. *Placenta*.2013; 34(1):9-13.
10. Abudu EK, Inyang-Etoh EC, Eziagu UB, Pregnant women perception of placenta donation for biomedical research- experience at a Nigerian Tertiary Health Care Institution. *Savannah Journal of Medical Research and Practice* 2015;4(1):08-14
11. Bazuaye GN, Enabudoso EJ. Willingness of Pregnant Women in Benin City Nigeria to Donate Placenta Cord Blood for Stem Cell Transplantation. *Annals of Biomedical Sciences* Vol. 10 No. 1 (2011) 10.4314/abs.v10i1.69202
12. Staribratova D, Milchev N. Placental parameters and fetal outcome. *AkushGinekol(Sofia)* 2009;48:37-40
13. Adesina KT, Ogunlaja OO, Aboyeji, AP, Akande HJ, Adeniran AS, Olarinoye A, Fawole AA. Relationship between gross placental characteristics characteristics and perinatal outcome of low risk singleton deliveries. *Niger Postgrad Med J* 2016;23:191-5.
14. Yoshizawa RS, Osis MJ, Nascimento SL, Bento SF, Godoy AC, Coelho S, Cecatti JG. Postpartum Women's Perspectives on the Donation of Placentas for Scientific Research in Campinas, Brazil. *J Empir Res Hum Res Ethics.* 2015 Feb;10(1):76-87. doi: 10.1177/1556264614559889. Epub 2014 Nov 26. PMID: 25742669.
15. Malek A, Bersinger NA. Human placental stem cells: biomedical potential and clinical relevance. *J Stem Cells.* 2011;6(2):75-92. PMID: 22997848.

Assessment of Serum Levels of Ionized Calcium, Magnesium, Phosphate, Vitamin D and Parathyroid Hormone in Chronic Kidney Disease Patients in ABUTH, Zaria.

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Abstract

A recent evidence indicates that chronic Kidney Disease (CKD) is emerging as a worldwide public health problem, being associated with increased cardiovascular mortality and disability. It has been shown that diseases of the genitourinary system were responsible for 928,000 deaths and 14,754,000 disability-adjusted life years in 2004, therefore the need for increased attention. This study determined how certain biochemical parameters change during the course of the disease with the hope that it will guide the management of CKD patients.

Serum levels of ionized calcium, magnesium, phosphate, vitamin D and parathyroid hormone were measured in 125 adult CKD patients and equal number of age and sex matched controls. They were among those who presented at the nephrology clinic of ABUTH, Shika, Zaria.

The mean age of patients was 48 ± 15.48 years consisting of 67 (53.6%) males, and 58 (46.4%) females. There was no statistical significant difference when mean age of patients was compared with that of controls. The mean values of serum creatinine were significantly higher in the patients when compared with controls ($p=0.000$). There was no significant difference between the mean value of magnesium of the patients when compared with that of controls ($p=0.37$). The patients had significantly higher mean values for systolic and diastolic blood pressure, phosphate and parathyroid hormone than the control group and the differences were statistically significant ($p=0.000$). However, the patients had a significantly lower serum levels of ionized calcium, Vitamin D₃ and eCrCl compared to that of healthy controls ($p=0.000$).

Conclusively, majority of the CKD patients in this study had progressive hypocalcaemia, hyperphosphataemia, hypovitaminosis D, and secondary hyperparathyroidism.

Keywords: Chronic kidney disease, calcium, phosphate, Vitamin D, Magnesium, parathyroid hormone.

Introduction

The Kidney Diseases Outcome Quality Initiative (K/DOQI) defines chronic kidney disease (CKD) as either damage or a decreased Glomerular Filtration Rate (GFR) of less than $60 \text{ ml/min/1.73m}^2$ for 3 or more months. Whatever the underlying aetiology, the destruction of renal mass with irreversible sclerosis and loss of nephron leads to a progressive decline in GFR. The different stages of kidney disease form a continuum in time.^{1,2}

The magnitude of the problem of chronic renal disease is enormous, as the prevalence of kidney failure is rising. Indeed a recent evidence indicate that chronic kidney disease (CKD) is emerging as a worldwide public health problem, being associated with increased cardiovascular mortality and a loss of disability-adjusted life years.³ Globally, CKD represents the 12th cause of death and 17th cause of disability.^{3,4}

One of the consequences of CKD is progressive impairment of mineral and bone homeostasis. Bone homeostasis is determined by a balance between bone resorption and formation. This balance is perturbed such that CKD patients lose ability to excrete phosphate leading to hyperphosphataemia and develop deficient production of calcitriol, the active form of vitamin D, synthesized from its precursor molecule calciferol by a series of conversions. The main function of calcitriol is regulating the levels of calcium and phosphorus and the mineralization of bone. Calcitriol enhances the absorption of calcium and phosphorus in the small intestine and the rate of bone calcification. Along with parathyroid hormone (PTH), it stimulates the breakdown of bones and the release of calcium to the blood. During reduced blood calcium levels, calcitriol and PTH stimulate renal reabsorption of calcium.⁵ Disorders of mineral metabolism, secondary hyperparathyroidism, hyperphosphataemia, hypocalcaemia and deficiencies of vitamin D are common complications of CKD. Recent evidence has linked these factors to cardiovascular disease, including non-atherosclerotic vascular complication, hypertension, left ventricular hypertrophy and death.⁶ Therefore, it seems reasonable to assume that early

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detection of biochemical derangement will, hopefully, facilitate appropriate interventions which will impact on progression of CKD. Despite the seeming benefit of early detection of the biochemical complications of CKD, there is paucity of data in patients with CKD in Nigeria. To cover this gap, a study to determine serum parathyroid hormone, magnesium, vitamin D and other biochemical markers such as serum calcium and phosphate in chronic renal disease patients may provide helpful hints which will support management of CKD in Nigerian population.

Subjects and Methods

This study was conducted at the departments of Chemical Pathology and Medicine of Ahmadu Bello University Teaching Hospital, Shika – Zaria within fifteen months (January 2018 to March 2019). One hundred and twenty-five (125) consecutive adult patients 18yrs and above in various stages of CKD who presented at the nephrology clinic of ABUTH Shika Zaria were enrolled into the study. Equal number of apparently healthy subjects matched for sex and age were also recruited as controls. However, Patients having acute renal failure, primary hyperparathyroidism and those who were pregnant excluded. Approval was obtained from Ethical and Scientific committee of ABUTH Zaria before embarking on the study.

Five milliliters (5 mL) blood specimen was collected from a prominent peripheral vein. The antecubital fossa was cleaned with 70% methylated spirit and allowed to dry. Blood was taken using a sterilized 5 mL syringe and 21 G needle. Five (5) ml of the blood sample was transferred into a plain sample bottle and allowed to stand for 30 minutes to clot and thereafter was centrifuged at 4000rpm for 10 min. The serum was separated immediately and transferred into a serum bottle. Analysis of serum calcium was carried

out immediately and the remaining serum was stored frozen at -80°C until time for analysis.

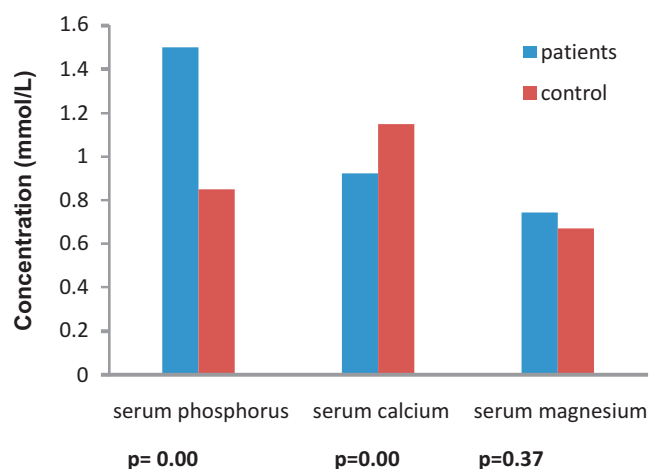
The data obtained were cleaned and entered into Statistical Package for the Social Sciences 17.0 (SPSS 20.0) for windows (SPSS inc. IBM Chicago, 2011). Results were expressed as absolute numbers means and standard deviations and ranges as appropriate. Serum calcium, phosphate, magnesium, vitamin D, parathyroid and creatinine obtained from the patients were compared with those of the controls using the two tailed student's t-test. p-value of equal to or less than 0.05 ($p \leq 0.05$) was considered statistically significant. Categorical data were presented as frequencies and percentages while continuous data were summarized as mean $\pm$ standard deviation. Students-t-test was used to analyze continues normally distributed variables

The chemicals and kits used for the measurement of serum calcium, phosphate, magnesium, creatinine, were procured from LABKIT Barcelona while that for parathyroid hormone and vitamin D were procured from WKEA medical supplies (China). All chemicals and kits were of analytical grade.

Adequate quality control was observed when carrying out the analysis of the samples to ensure that the results obtained are reliable. This was done by analyzing the samples in batches together with quality control sera from LABKIT for specific analytes using multi control. Pooled sera were used for parathyroid hormone and vitamin D.

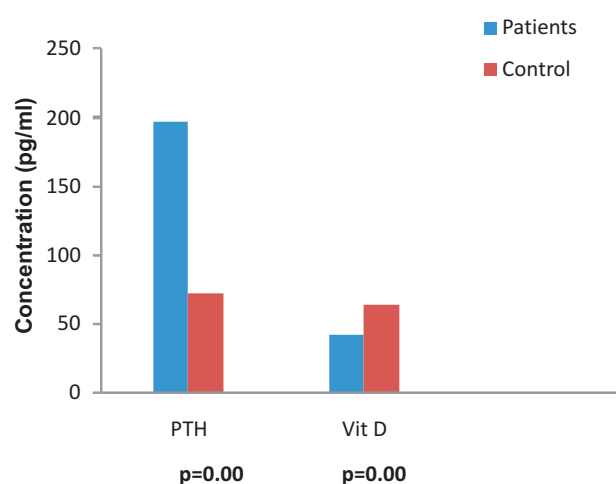
Results

One hundred and twenty-five CKD patients with age range of 18 to 85 years were enrolled for the study with a mean age of 48 ± 15.48 years. They were made up of 67 (53.6%) males, and 58(46.4%) females. The systolic blood pressure of the controls was



p value = statistical significant if < 0.05

Figure 1 Mean serum levelsof ionized calcium, phosphorus and magnesium in patients and controls



p value = statistical significant if < 0.05

Figure 2 Mean serum levels of vitamin D3 and parathyroid hormone in patients and controls.

Table 1 Clinical and Laboratory characteristic of patients with CKD and healthy controls.

Characteristics	Patients(n=125) Mean(SD)	Controls (n=125) Mean (SD)	p values
Age (years)(range)	48.8(18-85)	48.5(18-85)	0.998
Systolic BP (mmHg)	147.45(28.21)	126.12(18.71)	0.00
Diastolic BP (mmHg)	92.61(18.12)	78.64(10.63)	0.00
BMI (kg/m ²)	26.39(6.49)	24.81(6.09)	0.48
Serum Creatinine (μmol/l)	623.88(681.54)	81.47(27.43)	0.00
Serum Creatinine (μmol/l)	623.88(681.54)	81.47(27.43)	0.00
eCrCl(ml/min/1.73m ²)	36.28(35.44)	93.93(42.43)	0.00
Serum PTH (pg/ml)	197.5(89.6)	72.9(10.88)	0.00
Serum vit D (pg/ml)	42.25(8.71)	64.18(12.8)	0.00
Serum phosphorus (mmol/l)	1.50(0.76)	0.85(0.57)	0.00
Serum calcium (mmol/l)	0.92(0.16)	1.15(0.08)	0.00
Serum magnesium (mmol/l)	0.74(0.408)	0.67(0.29)	0.37

n = frequency, Vit D = vitamin D, eCrCl = estimated creatinine clearance, SD = standard deviation.

Table 2 Abnormalities of the studied analytes seen in patients with CKD

Abnormalities	n	%
Hypocalcaemia	72	57.6
Hypercalcaemia	0	0.0
Hyperphosphataemia	66	52.8
Hypophosphataemia	0	0.0
Hypermagnesaemia	8	6.4
Hypomagnesaemia	6	4.8
Hyperparathyroidism	86	68.8
Hypoparathyroidism	0	0.0
Hypervitamin D	0	0
Hypovitamin D	57	45.6

126.12±18.71mmHg while that of patients was 147.45±28.21mmHg with a p value of 0.000. The diastolic blood pressure for the controls was 78.64±10.63mmHg while that of patients was 92.61±18.12mmHg with a statistical significant difference when compared (p value = 0.000). The body mass index for controls was 24.81±6.09kg/m² while that of patients was 26.39±6.49kg/m² with no statistical significant difference when compared p = 0.48. The serum creatinine for controls was 81.47±27.43μmol/l while that of patients was 623.88±681.54μmol/l with a statistical significant difference when compared (p = 0.00). The eCrCl of controls was 93.93±42.43ml/min/1.73m² while that of patient was 36.28±35.44ml/min/1.73m² with a statistically

significant difference when compared (p = 0.00). The serum parathyroid hormone of controls was 72.9±10.88pg/ml, while that of patients was 197.5±89.6pg/ml with a statistical significant difference when compared (p = 0.00). The serum vitamin D for controls was 64.18±12.8pg/ml while that of patient was 42.25±8.71pg/ml with a statistically significant difference when compare (p = 0.00). The serum phosphate for controls was 0.85±0.57mmol/l while that of patients was 1.50±0.76mmol/l, with a statistically significant difference when compared (p = 0.00). The serum ionized calcium of controls was 1.15±0.08mmol/l while that of patients was 0.92±0.16mmol/l with a statistically significant difference when compared (p = 0.00). The serum

magnesium, of controls was $0.67 \pm 0.29 \text{ mmol/l}$ while that of patients was $0.74 \pm 0.408 \text{ mmol/l}$ and the difference was not statistically significant when compared ($p = 0.37$) as shown in Table 1.

The patients had a significantly higher mean value for phosphorus and parathyroid than the control group ($p = 0.000$), while the controls had higher values of serum calcium, vitamin D and eCrCl than the patients ($p = 0.000$). figures 1 and 2.

About 57.6% of CKD patients had hypocalcaemia, none had hypercalcaemia, 40% had Hyperphosphatasemia, 45.6% had low serum 1-25 vitamin D, 68.8% had secondary hyperparathyroidism and 6.4% had hypermagnesaemia while 4.8% had hypomagnesaemia as seen in Table 2.

Discussion

Chronic kidney disease is a major contributor to the global burden of non-communicable diseases and is associated with many metabolic complications.⁶ This study found a predominance of male (53.6%) with CKD over female patients (46.4%). This is similar to the finding of Alebiosu et al, in 2006 at Sagamu who found 90 males and 63 females (1.42:1) which was also predominance of males over females.⁷ This finding may not be surprising as observations in animal models and several studies in human populations have found that males generally predominate in CKD.^{3,7} Health seeking behavior due to economic factors which favors males in our communities could also be responsible. The mean age of the study population was found to be 48 years which is similar to the work of Chinwuba et al,⁸ in Enugu who reported mean age of 45 years in a study on patients with kidney disease in 2010 and that of Suega et al, 2005⁹ in Indonesia who found the mean age to be 47 years.^{8,9} However, it is in contrast to the work of Alebiosu in Sagamu which showed a lower mean age of 39 years.⁷

The mean values of both systolic and diastolic blood pressures were higher in the study patients as compared to that of the controls. The same trend was earlier documented in the work of Chijioke et al, 2011¹⁰ in Ilorin involving 120 CKD patients with similar age-matched controls.

It is found in this study that the mean ionized calcium and 1-25 vitamin D were lower in CKD patients than in controls. By comparison serum levels of phosphate and parathyroid hormone were higher in CKD patients than in controls. The differences were statistically significant when compared to controls. This has confirmed that hypocalcaemia, low levels of vitamin D, hyperphosphataemia and secondary hyperparathyroidism are prominent biochemical features of CKD. This is in conformity with the work of Malawadi et al in India, in 2014¹¹ who also noticed an increase in the serum levels of phosphate, parathyroid, and creatinine. He also found a decrease in the serum

levels of calcium and eCrCl when compared to the controls which is consistent with this index study. He did not study vitamin D.

The mean serum magnesium levels in patients and controls were similar and no statistical significant difference was observed between the various stages of CKD neither was there any correlation with other analytes. This is similar to the work of Ortega et al in 2013 in Spain who found all the CKD patients in stages 4 and 5 (study population) had normal baseline serum magnesium and there was no correlation with serum calcium, phosphorus and parathyroid.¹² The regulation and elimination of magnesium in patients with renal disease is somewhat understudied. However, in moderate CKD, the increase in the fractional excretion of magnesium compensates for the loss of renal function, such that serum levels are maintained within the normal range. The regulation of intact PTH (iPTH) by extracellular calcium has been studied extensively, but the mechanism whereby serum magnesium affects PTH has still not been fully elucidated. While complications of both hypo- and hypermagnesaemia exist, as seen in this study with 6.4% having hypermagnesaemia and 4.8% had hypomagnesaemia their relative infrequency among persons with kidney disease has reinforced a very limited practice of monitoring magnesium levels. This may also explain sparse data on serum magnesium in CKD.¹³

Fifty-eight (58%) of CKD patient were hypocalcaemic, 52.8% were hyperphosphataemic, and 6.4% had hypermagnesaemia, 4.8% had hypomagnesaemia, 68.8% had secondary hyperparathyroidism, and 45.6% had low levels of 1-25 vitamin D.

It can be concluded from this study that majority of the CKD patients are within 36 – 65 years with a mean age of 48 years with and associated male predominance. It also confirmed that biochemical derangement of minerals of bone metabolism exists in CKD patients. Majority of the CKD patients in this study had hypocalcaemia, hyperphosphataemia, hypovitaminosis D, and secondary hyperparathyroidism.

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Reference

1. Afolabi MO, Abioye-Kuteyi EA, Arogundade FA, Bello IS. Prevalence of chronic kidney disease in a Nigerian family practice population. *South African Family Practice*. 2009 Mar 1;51(2):132-7.
2. Hogg RJ, Furth S, Lemley KV, Portman R, Schwartz GJ, Coresh J, Balk E, Lau J, Levin A, Kausz

- AT, Eknayan G. National Kidney Foundation's Kidney Disease Outcomes Quality Initiative clinical practice guidelines for chronic kidney disease in children and adolescents: evaluation, classification, and stratification. *Pediatrics*. 2003 Jun 1;111(6):1416-21.
3. Ulasi II, Ijoma CK. The enormity of chronic kidney disease in Nigeria: the situation in a teaching hospital in South-East Nigeria. *Journal of tropical medicine*. 2010 Jun 2;2010.
4. Havelaar AH, Kirk MD, Torgerson PR, Gibb HJ, Hald T, Lake RJ, Praet N, Bellinger DC, De Silva NR, Gargouri N, Speybroeck N. World Health Organization global estimates and regional comparisons of the burden of foodborne disease in 2010. *PLoS medicine*. 2015 Dec 3;12(12):e1001923.
5. Mugera AN. *Patterns and prevalence of hyperpara thyroidism and mineral bone disease in patients with chronic kidney disease at the Kenyatta National Hospital* (Doctoral dissertation, University of Nairobi).
6. Couser WG, Remuzzi G, Mendis S, Tonelli M. The contribution of chronic kidney disease to the global burden of major non-communicable diseases. *Kidney international*. 2011 Dec 2;80(12):1258-70.
7. Alebiosu CO, Ayodele OO, Abbas A, Olutoyin AI. Chronic renal failure at the Olabisi Onabanjo university teaching hospital, Sagamu, Nigeria. *African health sciences*. 2006 Nov 21;6(3):132-8.
8. Ijoma C, Ulasi I, Ijoma U, Ifebunandu N. High prevalence of anemia in predialysis patients in Enugu, Nigeria. *Nephrology Research & Reviews*. 2010;2(1):61-5.
9. Suega, K., Bakta, M., Dharmayudha, T.G., Lukman, J.S. and Suwitra, K., 2005. Profile of anemia in chronic renal failure patients: comparison between predialyzed and dialyzed patients at the Division of Nephrology, Department of Internal Medicine, Sanglah Hospital, Denpasar, Bali, Indonesia. *inflammation, 1*, pp.6-9.
10. Chijioke A, Aderibigbe A, Olarenwaju TO, Makusidi AM, Oguntoyinbo AE. Prevalence and pattern of cystic kidney diseases in Ilorin, Nigeria. *Saudi Journal of Kidney Diseases and Transplantation*. 2010 Nov 1;21(6):1172.
11. Malawadi BN, Suma MN, Prashant V, Akila P, Anjalidevi BS, Manjunath S. Secondary hyperparathyroidism in all the stages of chronic kidney disease in southern indian population. *IJPPS* 2014; 4. 2014;6.
12. Ortega O, Rodriguez I, Cobo G, Hinostroza J, Gallar P, Mon C, Ortiz M, Herrero JC, Di Gioia C, Olié A, Vigil A. Lack of influence of serum magnesium levels on overall mortality and cardiovascular outcomes in patients with advanced chronic kidney disease. *International Scholarly Research Notices*. 2013;2013
13. Malawadi BN, Suma MN, Prashant V, Akila P, Anjalidevi BS, Manjunath S. Secondary hyperparathyroidism in all the stages of chronic kidney disease in southern indian population. *IJPPS* 2014; 4. 2014;6.

Determinants of Outcome among Intensive Care Unit Patients in a Nigerian Tertiary Hospital.

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Abstract

Communities in sub-saharan Africa with limited access to health care often have a disproportionately high prevalence of critically ill patients. The challenges faced by many countries in Africa make it important to develop innovative and cost effective ways to provide critical care services and maximize the use of limited ICU bed spaces. Understanding the determinants of outcome in ICU patients should lead to better decision making when allocating limited ICU bed spaces.

This was a retrospective study from January to December 2019. With the aid of a proforma, relevant information concerning patients' biodata, associated medical condition, indication for ICU admission, critical care interventions provided and outcome of care were retrieved from the records.

One hundred and three ICU patients were included in the study. Sixty-two (59.6%) were males while 41 (39.4%) were female. The mean age of the patients was 38.31yr. Fifty patients did not survive to ICU discharge giving a mortality rate of 48.5%. Gender (χ^2 1.556, p 0.212258), age (U = 1319.5, z = 0.03299, p 0.97606), associated medical disease (χ^2 0.01435, p 0.704814) and ICU length of stay (U = 1175, z = 0.98649, p = 0.32218) did not have a statistically significant impact on ICU outcome. Patients who had mechanical ventilation (χ^2 18.8976, p 0.000014) and inotropic support (Fishers exact p 0.0012) had a poorer outcome than those who did not (Table I).

We conclude that patients who require mechanical ventilation and inotropic support are more likely to have a poorer ICU outcome than those who do not.

Key words: Intensive care, mechanical ventilation, mortality

Introduction

The Intensive Care Unit (ICU) is an essential component of modern healthcare delivery. The unit caters for a subset of patients whose illnesses, injuries and complications are of such severity that they require additional care beyond what can be provided in a regular hospital ward.

The management of these patients usually require additional physician and nursing staff availability of certain equipment for respiratory support, invasive monitoring and the ability to provide continuous infusion of pharmacologic agents.

Intensive care began in the 1950s during the polio epidemic.¹ Since then, ICUs have been established in several communities in Europe and North America. Establishment of ICUs in Africa has lagged behind and the first ICU in Nigeria was established in the University of Nigeria Teaching Hospital (UNTH) Enugu, in 1973.² The ICU in the University of Ilorin Teaching Hospital was established in 1991.

Often, communities in sub-saharan Africa with limited access to clean water and food and primary health care, have a disproportionately high prevalence of critically ill patients.³

South African and Uganda have 75 and 1 ICU bed per million population respectively while many countries in sub-saharan African have fewer than 20 beds for their entire population.⁴ In contrast, USA has 336 ICU beds per million population.⁵ The challenges faced by many countries in Africa make it important to develop innovative and cost effective ways to provide critical care services and maximize the use of limited ICU bed spaces.⁶

Understanding the determinants of outcome in ICU patients should lead to better decision making when allocating limited ICU bed spaces.

Patients and Methods

Study Setting

The study was conducted at the University of Ilorin Teaching Hospital, Ilorin, Nigeria. This hospital is a referral centre for patients from Kwara State and neighbouring states of Kogi, Niger, Ekiti and Oyo. The ICU is a four bedded unit equipped with mechanical ventilators, mobile X-ray machine, blood-gas analyzer, syringe and infusion pumps.

Study population

The records of all patients admitted into the ICU during the study period were retrieved and

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analysed.

Study design

This was a retrospective study of all patients admitted into the ICU between 1st January and 31st December, 2017. Study participants were identified from Institutional record books and clinical records (casenotes). The case notes were retrieved from the records department. With the aid of a proforma, relevant information concerning patients' biodata, associated medical condition, indication for ICU admission, critical care interventions provided and outcome of care were retrieved from the records. All patients admitted into the ICU from January to December 2017 were included. The patients were either transferred or admitted into the ICU from various locations in the hospital during the study period. There were no exclusion criteria.

Ethical permission was obtained from the Ethical Review Board of the University of Ilorin Teaching Hospital.

Data Analysis

Results generated from this study were expressed as frequencies or proportions of total, means and standard deviations. Quantitative data with normal distribution were analyzed with the student t-test while the Mann-Whitney test was used for skewed data. Chi-

square test or Fisher's exact test were applied to categorical variables using the software package SPSS version 16.0. A p-value of less than 0.05 was considered statistically significant.

Results

One hundred and three ICU patients were included in the study. Sixty-two (59.6%) were males while 41 (39.4%) were female. The mean age of the patients was 38.31yr.

Source of ICU admission

Patients were admitted from several locations in the hospital but the operating theater and the Accident and Emergency ward accounted for most admissions with 40 (38.84%) and 39 (37.86%) patients respectively. The paediatric wards accounted for 12 (11.65%) ICU admissions while the surgical, medical and obstetrics and gynaecology wards accounted for 7 (6.80%), 4 (3.88%) and 1 (0.97%) admission respectively. Of the 40 post-operative admissions, 16 (40%) had emergency procedures while 24 (60%) had elective surgeries.

Indication for ICU admission

Sixty (58.25%) patients were admitted for ventilatory support. Other indications for admission were monitoring, airway management, delayed

Table I: Determinants Of ICU Outcome

	Total	Discharge	Death	Statistical test	p
Gender					
Male	62	35	27	X ² 1.556	0.212258
Female	41	18	23		
Assoc Med. Disease					
Present	39	21	18	X ² 0.01435	0.704814
Absent	64	32	32		
Surgery					
Yes	40	26	14	X ² 4.8024	0.02842
No	63	27	36		
Urgency of surgery					
Emergency	16	7	9	X ² 5.293	0.021411
Elective	24	19	5		
Mechanical Ventilation					
Yes	60	20	40	X ² 18.8976	0.000014
No	43	33	10		
Inotropic support					
Yes	21	4	17		Fishers exact 0.0012
No	82	49	33		
Days to ICU admission		4.34(33.96)	1.82(7.7)	U is 1205 z-score 3.02875	0.00244
ICU length of stay		3.7 (33.52)	2.51 (4.49)	U = 1175 Z =-0.98649	0.32218
Mean Age (years)		38.6 (27.24)	37.995 (23.26)	t 0.2634 (CI-11.372, 8.7112)	0.7928

recovery from anaesthesia, cardiovascular support and severe sepsis with 37 (35.92%), 18 (17.48%), 11 (10.68%), 8 (7.77%) and 5 (4.85%) respectively.

Associated Medical conditions

Thirty-nine (37.86%) patients had at least one medical condition with cardiovascular disease occurring in 29 of them. This is the most frequent associated medical condition (74.36%). Other medical conditions were sickle cell disease 2 (5.13%), obesity 1 (2.56%), Tuberculosis 2 (5.13%), Pregnancy 1 (2.56%), Peptic ulcer disease 1 (2.56%), Non-Hodgkin's Lymphoma 1 (2.56%), renal failure 2 (5.13%). One patient with hypertension also had diabetes mellitus.

Mechanical ventilation

Sixty patients (57.7%) were admitted for ventilatory support. The mode of support was Synchronized Intermittent Mandatory Ventilation (SIMV) in 56 patients. Intermittent Positive Pressure Ventilation (IPPV) and Continuous Positive Airway Pressure (CPAP) were only used in 2 patients each.

ICU outcome

Fifty patients did not survive to ICU discharge giving a mortality rate of 48.5%. Gender ($\chi^2 1.556$, $p = 0.212258$), age ($U = 1319.5$, $z = 0.03299$, $p = 0.97606$), associated medical disease ($\chi^2 0.01435$, $p = 0.704814$) and ICU length of stay ($U = 1175$, $z = 0.98649$, $p = 0.32218$) did not have a statistically significant impact on ICU outcome. Post-operative patients had a better ICU outcome than non-operated ICU patients ($\chi^2 4.8024$, $p = 0.02842$). Among post-operative patients, those who had emergency surgeries also had better ICU outcome ($\chi^2 5.293$, $p = 0.021411$). Patients who had mechanical ventilation ($\chi^2 18.8976$, $p = 0.000014$) and inotropic support (Fishers exact $p = 0.0012$) had a poorer outcome than those who did not (Table I). Also, patients who died were those who were transferred to ICU after a mean of 1.82 (7.7) days admission in the wards while those who survived had a longer duration of admission before ICU transfer with a mean of 4.34 (33.96) ($U = 1205$, $z = 3.02875$, $p = 0.00244$).

Discussion

This study found that ICU mortality rate was 48.5%. This is unusually high compared to the worldwide rate of 16.2% found in a large study that looked at patients from several continents.⁷ This rather high rate may be due to the severity of disease in the patients that were transferred to ICU. Many patients were referred for ICU care late due to the limited coverage of health insurance which means that relatives of ICU patients have to pay for care out of pocket. Cost considerations therefore mean that

consent for transfer to ICU is usually withheld until all other means are exhausted. The use of an ICU score for severity of illness like APACHE is better at determining the significance of mortality rates. Unfortunately, these tests were not in routine use when the study was conducted.

Patient's age did not have a statistically significant impact on ICU outcome. This is probably because the average age of study participants was 38.31 years. The mean age of patients in an European study was 60.6 ± 17.4 years in 2002 and 62.5 ± 17.0 years in 2012.⁸ While in mainland China the mean age was 58.5 ± 19.2 yrs.⁹ In an older subset of patients, the impact of age on outcome may have been more telling. Age was an independent risk factor for poor outcome in trauma patients treated in ICU.¹⁰ In a review article, mortality rates were found to be higher in elderly ICU patients than in younger patients.¹¹ The poorer prognosis was due to associated factors with ageing such as severity of illness and premorbid functional status.

In our study, the patients' gender did not contribute to poor outcome. The impact of gender on ICU outcome has not been clearly established. While one study found that male gender contributed to poor outcome in postoperative ICU patients¹² another could only confirm better prognosis in female ICU patients less than 50 years of age while those above 50 years did not have a significant difference compared to men.¹³

The presence of associated medical conditions did not have a statistically significant impact on ICU outcome. This may be because a large proportion of our patients had cardiovascular disease (especially systemic hypertension) which was usually controlled and did not significantly impact outcome. Intensive Care Unit length of stay also did not have a statistically significant impact on mortality. This is in agreement with a study by Williams *et al* which showed that most deaths occurred in ICU within the first few days of ICU admission and increasing length of ICU stay was not associated with increased risk of in-hospital mortality.¹⁴ In this study, postoperative patients had a better outcome than non-operated patients. This was surprising as the stress of surgery could have been expected to have an adverse effect on the outcome of ICU care. However, adequate and effective utilization of the intensive care unit has been found to improve outcome in high-risk surgical patients. The patients that had a poor outcome were those that were initially managed in the wards after their operations before transfer to ICU.¹⁵

Patients who had mechanical ventilation and inotropic support had a poorer outcome than those who did not. This may simply reflect the fact that these modalities of treatment are generally used for more severe cases in the ICU. However, it may also be a reflection of the adverse effects of these therapeutic

regimens on critically ill patients.

Mechanical ventilation, though life-saving, is associated with several adverse effects. These include intubation-related complications like laryngospasm, bronchospasm, tube dislodgement, local trauma to the oral cavity, dentition, pharynx, larynx, and trachea; hematoma formation; tracheal stenosis or necrosis.¹⁶

Others are ventilator associated pneumonia,¹⁷ ventilator-induced diaphragmatic dysfunction,¹⁸ ventilator-induced lung injury.¹⁹ While inotropic therapy are valuable in maintaining patient haemodynamics of the short term, they have been associated with an increased risk of bacteremia and arrhythmias. The complications from mechanical ventilation and inotropic support can adversely affect the prognosis of patients and may be responsible for the poor outcome with these modes of treatment that was found in our study.

Conclusion

The requirement for mechanical ventilation and inotropic support were predictors of poor outcome among ICU patients. More studies are needed on the use of lung protective strategies which may reduce morbidity and mortality associated with mechanical ventilation.

References

1. Kelly FE, Fong K, Hirsch N, Nolan JP. Intensive care medicine is 60 years old: the history and the future of the intensive care unit. *Clin Med (Lond)*. 2014;14(4):376-9.
2. Okafor UV. Challenges in critical care services in Sub-Saharan Africa: Perspectives from Nigeria. *Indian J Crit Care Med*. 2009;13(1):25-27.
3. Dunser M, Baelani I, Ganbold L. A review and analysis of intensive care medicine in the least developed countries. *Critical care medicine*. 2006;34:1234-1242.
4. Murthy S, Leligdowicz A, Adhikari NK. Intensive care unit capacity in low income countries: a systematic review. *PLoS ONE*. 2015;10(1):ed0116949.
5. Wallace DJ, Angus DC, Seymour CW, Barnato AE, Kahn JM. Critical care bed growth in the United States. A comparison of regional and national trends. *Am J Respir Crit Care Med*. 2015;191(4):410-416.
6. Riviello E, Letchford S, Achieng L, Newton M. critical care in resource poor settings: lessons learnt and future directions. *Critical care medicine*. 2011;39:860-867.
7. Vincent JL, Marshall JC, Namendys-Silva SA, François B, Martin-Loeches I, Lipman J, *et al*. Assessment of the worldwide burden of critical illness: the intensive care over nations (ICON) audit. *Lancet Respir Med*. 2014 May;2(5):380-6. doi: 10.1016/S2213-2600(14)70061-X. Epub 2014 Apr 14. PMID: 24740011.
8. Vincent JL, Lefrant JY, Kotfis K, Nanchal R, Martin-Loeches I, Wittebole X *et al*. Comparison of European ICU patients in 2012 (ICON) versus 2002 (SOAP). *Intensive Care Med*. 2018;44(3):337-344.
9. Bin D, Youzhong A, Yan K, Xiangyou Y, Mingyan Z, Xiaochun M. Characteristics of critically ill patients in ICUs in Mainland China. *Crit Care Med*. 2013;41(1):84-92.
10. Brattström O, Granath F, Rossi P, Oldner A. Early predictors of morbidity and mortality in trauma patients treated in the intensive care unit. *Acta Anaesthesiol Scand*. 2010;54(8):1007-17. doi: 10.1111/j.1399-6576.2010.02266.x. Epub 2010 Jul 12. PMID: 20626360.
11. de Rooij SE, Abu-Hanna A, Levi M, de Jonge E. Factors that predict outcome of intensive care treatment in very elderly patients: a review. *Crit Care*. 2005;9(4):R307-14.
12. Reinikainen M, Niskanen M, Uusaro A, Ruokonen E. Impact of gender on treatment and outcome of ICU patients. *Acta Anaesthesiol Scand*. 2005;49(7):984-90. doi: 10.1111/j.1399-6576.2005.00759.x. PMID: 16045660.
13. Mahmood K, Eldeirawi K, Wahidi MM. Association of gender with outcomes in critically ill patients. *Crit Care*. 2012;16(3):R92. doi: 10.1186/cc11355. PMID: 22617003; PMCID: PMC3580638.
14. Williams TA, Ho KM, Dobb GJ, Finn JC, Knuiman M. Effect of length of stay in intensive care unit on hospital and long-term mortality of critically ill adult patients. *BJA*. 2010;104(4):459-464.
15. Jhanji S, Thomas B, Ely A, Watson D, Hinds CJ, Pearse RM. Mortality and utilization of critical care resources amongst high-risk surgical patients in a large NHS trust. *Anaesthesia*. 2008;63(7):695-700.
16. Griesdale DE, Bosma TL, Kurth T, Isac G, Chittock DR. Complications of endotracheal intubation in the critically ill. *Intensive Care Med*. 2008 Oct;34(10):1835-42. Kalanuria AA, Ziai W, Mirski M. Ventilator-associated pneumonia in the ICU. *Crit Care*. 2014;18(2):208.
17. Petrof BJ, Jaber S, Matecki S. Ventilator-induced diaphragmatic dysfunction. *Curr Opin. Crit Care*. 2010;(1):19-25.
18. Slutsky AS, Ranieri VM. Ventilator-induced lung injury. *N Engl J Med*. 2013 Nov 28;369(22):2126-36

Awareness of Sexually Transmitted Infections and Prevalence of Risky Sexual Behaviors among Undergraduates of a Private University in Ekiti State, South West Nigeria

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Abstract

Sexually Transmitted Infections (STIs) are serious health problems among the youths, and risky sexual behaviour (RSB) is a factor fuelling its transmission. This study assessed the level of awareness of STIs and the prevalence of RSB among undergraduates of a private university in Ekiti State, Nigeria.

A survey was conducted among 383 students who were selected using multi-stage sampling technique. Data collection was done with pre-tested semi-structured self-administered questionnaires and analyzed using the IBM SPSS version 24.0.

The mean age of the respondents was 19.01 ± 2.15 years. The overall level of awareness of STIs was 66.1% and the prevalence of RSB was 32.4%. Significant predictors of awareness of STIs were female gender (OR = 0.453, 95% CI [0.289-0.710]), openly discussing sexual and reproductive health issues with parents (OR = 1.653, 95% CI [1.004-2.723]) and having knowledge of HIV prevention (OR = 3.046, 95% CI [1.605-5.781]) while significant predictors of RSB were age ≥ 20 years (OR = 0.414, 95% CI [0.200-0.857]), male gender (OR = 2.907, 95% CI [1.652-5.115]), having friends that engaged in RSB (OR = 2.129, 95% CI [1.166-3.887]) and alcohol use (OR = 3.255, 95% CI [1.907-5.556]).

The study identified factors that increase the likelihood of awareness of STIs and the odds of engaging in RSB. We recommend that stakeholders should direct concerted efforts towards modifying these factors to increase STIs' awareness and reduce the prevalence of RSB among this population.

Key words: STIs, Risky sexual behaviours, Nigeria

Introduction

Sexually transmitted Infections (STIs) are infections that are gotten predominantly through unprotected sexual intercourse and sex-related activities. They include diseases such as gonorrhoea, syphilis, chlamydia, Human Immunodeficiency Virus (HIV) and Human Papilloma Virus (HPV) among others.¹ Although STIs are transmitted mainly through unprotected sexual intercourse, they could also be acquired via other means such as blood transfusion, mother-to-child transmission and infected sharps.² Risky sexual behaviours (RSB) are activities that would increase the chances of getting STIs. Some of these behaviours include but are not limited to unprotected intercourse, oral and anal sex, multiple sexual partners (MSP), early sexual debut and engaging in sex work.³

Globally, adolescents and youths have the highest rates of curable STIs and up to 1 in 20 adolescents develop a new STI each year.⁴ The sequelae of STIs include pelvic inflammatory disease, ectopic pregnancy, cervical cancer and infertility.⁵ Apart from the physical morbidity, STIs are associated with social and psychological burden for the affected individuals.⁶ Individuals who have been diagnosed with STIs report experiencing shame, anxiety, embarrassment, isolation, fear of rejection and not being sexually desirable.⁷⁻⁹

A study in Europe revealed that awareness of STIs was high for HIV/AIDS (above 90%) but low for HPV (range 5.4%-66%).¹⁰ In Malaysia, 86.6% of university students had heard about STIs, and 50.4% knew STIs could present without symptoms. Among the sexually active students, 66.7% and 18% had sexual intercourse with MSP and commercial sex workers, while 17.4% and 9.4% took alcohol and drugs before having sex respectively.¹¹ In Ethiopia, the prevalence of RSB was 42.8% and factors found to be associated included male gender, substance abuse, peer pressure and viewing pornographic materials.¹² Students who were under peer pressure, who read or saw pornography and who used alcohol were found to be 4.4, 1.6 and 2 times more likely to engage in RSB respectively.¹³ Also, students who had poor knowledge of HIV/AIDS were four times more likely to engage in RSB.¹⁴ In Tanzania, majority (98%) of the students have heard about STIs, and most of them mentioned

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television and radio as their sources of information.¹⁵ In Ghana, female university students have a good knowledge of HIV, but are limited in knowledge about other STIs.¹⁶

Similarly, in Nigeria, high awareness of HIV/AIDS (93.6%), gonorrhea (76.3%) and syphilis (69.1%) were found among university students. The common sources of information were through the school (80.6%), television (80.1%) and radio (73.1%).¹⁷ The RSB noted included: having unprotected sex (57.0%) and having MSP (42.1%).¹⁸ Those with low parental income were more sexually active than those who reported high or medium parental income.¹⁹ In Ekiti state, Nigeria, factors such as male gender, having sexually active friends, and alcohol use were risk factors for early sexual exposure among students.²⁰ Another study in the state revealed that RSB among students was associated with parental ejection, peer group, exposure to pornography, depression and low self-esteem.²¹

The risk of STIs is higher among the youths than other age groups.²² Youths as defined by the World Health Organization (WHO), are people between the ages of 15 to 24 years and they account for nearly half of the world's population²³ as well as about 32.0% of Nigeria's population.³ This is the age bracket of most students in the university. The university plays an important role in national development through the production of skilled labour; thus, the health of university students is of utmost importance. Unfortunately, little attention is paid to the health of the students, and access to reproductive health services is limited. The consequence of this could be an increase in STIs and other reproductive pathologies. Therefore, this study assessed the level of awareness of STIs, and the prevalence of RSBs among undergraduates in a private university in Ekiti State, Nigeria. Information obtained from this study will help to provide evidence-based information on the reproductive health of undergraduates in Nigeria.

Materials and Methods

This is a cross-sectional study conducted with a study population of undergraduates in an Ekiti state private university. Students of the college of medicine and health sciences and those incapable of participating in the research due to illness were excluded.

The sample size was calculated using the Fischer's formula.²⁴ A prevalence of RSB of 66.1%,²⁵ confidence interval of 95%, degree of accuracy of 5% and an upward adjustment of 10% to account for non-response, gave a sample size of 383. A multi-stage sampling technique (3 stages) was used to select eligible participants. Respondents were informed about their participation in the study, and the procedure for filling the questionnaires. A semi-structured, self-administered questionnaire was

designed and used to collect data on socio-demographic information, awareness of STIs, and risky sexual practices. The questionnaire was pretested at Ekiti State University, Ado-Ekiti.

Statistical analysis was done with IBM SPSS (Statistical package for the social sciences) version 24.0 and the data were presented using frequency tables. Descriptive statistics such as mean and proportions were used to summarize continuous and categorical data respectively. Chi square test and binary logistic regression was used to determine the statistical significance at bivariate and multivariate level of analysis respectively. The level of significance was set at p value < 0.05 .

Ethical approval was obtained from the Research and Ethics review committee of the Federal Teaching Hospital, Ido-Ekiti, Ekiti State.

Results

The mean age of the respondents was 19.01 $\pm$ 2.15 years with about 60% within the age group of 15-19 years. More than half 201 (52.5%) were males and 4 (1%) were married. Majority 338 (88.3%) practice Christianity, had fathers 333 (86.9%) as well as mothers 341 (89.0%) with tertiary level of education. [Table 1]

The overall level of STI awareness was 66.1%. Most of the respondents were aware of HIV (98.4%), Gonorrhoea (98.2%), and syphilis (95.8%) while only 56.7% were aware of HPV. Also, 52.7% of the respondents were aware that abnormal vaginal discharge is a symptom of STIs while less than this proportion recognized other symptoms. [Table 2]

Table 1: Socio- demographic characteristics of the respondents

Variable	Frequency N=383	Percent (%)
Age Group (years)		
15 – 19	233	60.8
≥ 20	150	39.2
Mean $\pm$ SD	19.01 $\pm$ 2.15	
Range	15 – 27	
Gender		
Male	201	52.5
Female	182	47.5
Marital Status		
Single	379	99.0
Married	4	1.0
Religion		
Christian	338	88.3
Muslim	39	10.2
Others	6	1.5
Father's Education		
$\leq$ Secondary	50	13.1
Tertiary	333	86.9
Mother's Education		
$\leq$ Secondary	42	11.0
Tertiary	341	89.0
Tribe		
Yoruba	127	33.2
Igbo	117	30.5
Others	139	36.3

Table 2: Awareness of STI

Variable	Frequency N=383	
	Yes n (%)	No n (%)
Awareness of STI		
HIV	377 (98.4)	6 (1.6)
Gonorrhoea	376 (98.2)	7 (1.8)
Syphilis	367 (95.8)	16 (4.2)
Human papilloma virus	217 (56.7)	166 (43.3)
Genital warts	280 (73.1)	103 (26.9)
Awareness of symptoms of STI		
Genital ulcer	81 (21.1)	302 (78.9)
Urethral discharge	178 (46.5)	205 (53.5)
Groin swelling	117 (30.5)	266 (69.5)
Scrotal swelling	107 (27.9)	276 (72.1)
Female lower abdominal pain	123 (32.1)	260 (67.9)
Abnormal vaginal discharge	202 (52.7)	181 (47.3)
Overall level of Awareness of STI	253(66.1)	130 (33.9)

Table 3: Prevalence of RSB among the students

N=383 Sexual practices	Frequency	
	Yes n (%)	No n (%)
Overall prevalence of RSB	124(32.4)	259(67.6)
Ever had sexual intercourse	139 (36.3)	244 (63.7)
n=139		
Sexual debut before 14years	12 (8.6)	127 (91.4)
Unprotected sex	29 (20.9)	110 (79.1)
Multiple sexual partners	35 (25.2)	104 (74.8)
Have you practiced oral sex	104 (74.8)	35 (25.2)
Have you practiced anal sex	32 (23.0)	107 (77.0)
Have you had sex with a commercial sex worker	29 (20.9)	110 (79.1)
Have you ever engaged in sex under influence of an illicit substance	35 (25.2)	104 (74.8)

The overall prevalence of RSB was 32.4%. One hundred and thirty-nine (36.3%) respondents have had sexual intercourse and 20.9% of them had unprotected sex. Three-quarter (74.8%) of them had practiced oral sex while about one-quarter (23.0%) had practiced anal sex. About one in every four engaged in sex under the influence of an illicit substance (25.2%) or had MSP (25.2%). Only 8.6% had sex before the age 14 while about 20% have had sex with a commercial sex worker.[Table 3]

Awareness of STIs was significantly higher among female gender($p=0.001$), those who openly discussing sexual and reproductive health issues with parents ($p=0.048$) and those with knowledge of HIV prevention ($p=0.001$). At multivariate level, male respondents were 55% less likely to be aware of STIs than females (OR = 0.453, 95% CI [0.289-0.710]).

Respondents who openly discussed sexual and reproductive health issues with parents(OR = 1.653, 95% CI [1.004-2.723])and those withknowledge of HIV prevention (OR = 3.046, 95% CI [1.605-5.781])were 1.6 and 3 times more likely to be aware of STIs respectively.[Table 4]

Also, RSB was significantly higher among individuals who were ≥ 20 years($p<0.001$), male gender($p<0.001$), non-Christian and non-Muslim($p=0.040$), having friends with RSB($p<0.001$), being encouraged to engage in RSB ($p<0.001$) and using alcohol($p<0.001$). Respondents below the age of 20 years were 59% less likely to engage in RSB than those ≥ 20 years (OR = 0.414, 95% CI [0.200-0.857]). Male respondents were about 3 times more likely to engage in RSB than females (OR = 2.907, 95% CI [1.652-5.115]). Respondents who had friends that

Table 4: Predictors of awareness of STI

Variable	Awareness of STI		Bivariate analysis		Binary Logistic regression			
	Yes n (%)	No n (%)	X ²	p-value	OR	95% CI		p-value
Age (years)			1.180	0.277				
15 – 19	149(63.9)	84(36.1)						
≥ 20	104(69.3)	46(30.7)						
Gender			10.194	0.001*				
Male	118(58.7)	83(41.3)			0.453	0.289	0.710	0.001*
Female	135(74.2)	47(25.8)			1.000			
Marital Status			0.023	0.879				
Single	251(66.2)	128(33.8)						
Married	2(50.0)	2(50.0)						
Religion			0.168	0.919				
Christian	224(66.3)	114(33.7)						
Muslim	26(66.7)	13(33.3)						
Others	3(50.0)	3(50.0)						
Father's Education			<0.001	0.993				
≤ Secondary	33(66.0)	17(34.0)						
Tertiary	220(66.1)	113(33.9)						
Mother's Education			0.066	0.797				
≤ Secondary	27(64.3)	15(35.7)						
Tertiary	226(66.3)	115(33.7)						
Tribe			1.793	0.408				
Yoruba	81(63.8)	46(36.2)						
Igbo	83(70.9)	34(29.1)						
Others	89(64.0)	50(36.0)						
Friends with RSB			0.162	0.687				
Yes	121(65.1)	65(34.9)						
No	132(67.0)	65(33.0)						
Ever encouraged in RSB			0.012	0.913				
Yes	61(65.6)	32(34.4)						
No	192(66.2)	98(33.8)						
Alcohol Use			0.918	0.338				
Yes	100(63.3)	58(36.7)						
No	153(68.0)	72(32.0)						
Discuss SRH with parents			3.908	0.048*				
Yes	83(73.5)	30(26.5)			1.653	1.004	2.723	0.048*
No	170(63.0)	100(37.0)			1.000			
HIV prevention knowledge			10.919	0.001*				
Yes	232(69.0)	104(31.0)			3.046	1.605	5.781	0.001*
No	21(44.7)	26(55.3)			1.000			

X²: Chi square test; *: p value <0.05; RSB=Risky Sexual Behaviour; SRH=Sexual & Reproductive Health

OR: Odds ratio; 95% CI: 95% Confidence Interval Predictive value: 67.9%; R²: 0.092

engaged in RSB(OR = 2.129, 95% CI [1.166-3.887]) and those that use alcohol(OR = 3.255, 95% CI [1.907-5.556])were 2 and 3 times more likely to engage in RSB respectively.[Table 5]

Discussion

The mean age of respondents from this study was 19.01 ±2.15 years, which fits into the WHO

definition of youths.²³The level of awareness of STIs was 66.1% among the students. This is lower than what was observed from studies in Malaysia (86.6%) and Tanzania (98%).^{11,15} However, findings on awareness of specific infections revealed a high level of awareness among the students with the exception of HPV. This pattern is consistent with findings from studies in Nigeria¹⁷ and Europe.¹⁰ The reason for this may be

Table 5: Predictors of Risky Sexual Behaviour

Variable	Risky Sexual Behaviour		Bivariate analysis		Binary Logistic regression			
	Yes n (%)	No n (%)	X ²	p-value	OR	95% CI		p-value
						Lower	Upper	
Age (years)			32.384	<0.001*				
15 – 19	50(21.5)	183(78.5)			0.414	0.200	0.857	0.018*
≥ 20	74(49.3)	76(50.7)			1.000			
Gender			25.130	<0.001*				
Male	88(43.8)	113(56.2)			2.907	1.652	5.115	<0.001*
Female	36(19.8)	146(80.2)			1.000			
Religion			6.421	0.040*				
Christian	103(30.5)	235(69.5)			1.000			
Muslim	16(41.0)	23(59.0)			2.008	0.878	4.591	0.099
Others	5(83.3)	1(16.7)			8.821	0.770	11.102	0.080
Father's Education			0.004	0.951				
≤ Secondary	16(32.0)	34(68.0)						
Tertiary	108(32.4)	225(67.6)						
Mother's Education			0.044	0.834				
≤ Secondary	13(31.0)	29(69.0)						
Tertiary	111(32.6)	230(67.4)						
Tribe			2.154	0.341				
Yoruba	36(28.3)	91(71.7)						
Igbo	37(31.6)	80(68.4)						
Others	51(36.7)	88(63.3)						
Friends with RSB			29.317	<0.001*				
Yes	85(45.7)	101(54.3)			2.129	1.166	3.887	0.014*
No	39(19.8)	158(80.2)			1.000			
Ever encouraged in RSB			20.760	<0.001*				
Yes	48(51.6)	45(48.4)			1.263	0.657	2.431	0.484
No	76(26.2)	214(73.8)			1.000			
Alcohol Use			43.834	<0.001*				
Yes	81(51.3)	77(48.7)			3.255	1.907	5.556	<0.001*
No	43(19.1)	182(80.9)			1.000			
Discuss SRH with parents			0.144	0.704				
Yes	35(31.0)	78(69.0)						
No	89(33.0)	181(67.0)						
HIV prevention knowledge			0.005	0.943				
Yes	109(32.4)	227(67.6)						
No	15(31.9)	32(68.1)						
Awareness of STI			1.283	0.257				
Yes	77(30.4)	176(69.6)						
No	47(36.2)	83(63.8)						

X²: Chi square test; *: p value <0.05; RSB=Risky Sexual Behaviour; SRH=Sexual & Reproductive Health

OR: Odds ratio; 95% CI: 95% Confidence Interval Predictive value: 67.9%; R²: 0.092

because of the massive and continuous public enlightenment at every level, and also multiple sources of information on HIV compared with the relatively lower public education on HPV. This study also showed that the level of awareness of STIs' symptoms was relatively low. This finding is consistent with the study of Blay.¹⁶ This may be because, HIV which had the highest level of awareness among the various STIs does not classically present with the symptoms asked from the respondents. Another reason may be that STIs are sometimes asymptomatic.

The prevalence of RSB among the respondents in this study was 32.4% which is lower than what was obtained by Achenef et al in Ethiopia.¹² The practice of oral sex was the most common RSB among the students. The reason for this high prevalence of oral sex may be due to sexual experimentation associated with the age group. The prevalence of sexual debut before 14 years of age among those that are sexually active was 8.6%. The low prevalence of sexual debut before 14 years of age is probably attributable to parental, religious and community restrictions at that age. This study also reveal that about one-fourth of the sexually active students have had unprotected sex, sex with commercial sex workers, sex with MSP and sex under the influence of an illicit substance. This value is lower than the values obtained in a public university in River state Nigeria.¹⁸ The private university is a strict environment where all students are accommodated, monitored and guided with less freedom which may account for the lower prevalence of RSB in this study.

There was a significantly higher proportion of female students who were aware of STIs. This may be due to the increase health awareness campaigns directed at girls with the aim of preventing unwanted pregnancies, cervical cancer and other reproductive health issues of the female tract. There was also a significantly higher level of awareness among students who openly discussed sexual and reproductive health issues with parents; they were 1.6 times more likely to be aware of STIs. This may be because of the higher level of education of the parents, as majority of the students who were aware of STIs had parents with a tertiary education. A study in Ethiopia showed that the highest STIs' knowledge score was reported among students whose parents have, at least, a university education while the lowest score was seen in students whose parents were illiterate.¹³ Students with knowledge of ways to prevent HIV were 3 times more likely to be aware of STIs. This result is similar to that of a study conducted in Bangladesh.²⁶ This may be due to the fact that HIV's preventive measures are similar to and also protective against STIs.

Another finding in this study is the identification of factors predicting RSB among the students. Age older than 20years, male gender, not being a Christian nor a Muslim, keeping a friend that engages in RSB, being

encouraged to engage in RSB and alcohol use were factors identified to increase the odds of RSB. This is comparable with findings from previous studies in Ethiopia^{12,13,14} and Nigeria.^{20,21} The explanations for these findings could be that the older students have relatively longer exposure and experience about sexual practices as compared to the younger counterparts. For gender, the culture does not permit females to explore their sexuality especially because of fear of losing their virginity. Also, boys are thought to be more adventurous than females which may explain their increased involvement in RSB. The Christians and Muslims engage less in RSB because the religions preach against premarital sex and other forms of sexual immorality. On the other hand, alcohol makes it easier to make spontaneous decisions. It is usually taken in groups and parties, further enhancing the chances of engaging in RSB.

The limitation of this study is that it is based on self-report and it was not possible to confirm the claims made by respondents in the course of questionnaire administration.

Conclusion

The study found an overall level of awareness of 66.1% with awareness of HIV being the highest and that of HPV being the lowest. The prevalence of RSB was 32.4% with the most common RSB being oral sex. The study identified factors that increase the likelihood of awareness of STIs and the odds of engaging in RSB.

It is therefore important to encourage parents to improve their interaction and discuss issues pertaining to sex and STIs with their wards. Also, school management should encourage and support religious activities among the students. Policy on substance and alcohol use within the school must be instituted and enforced. STIs' awareness and prevention campaign should be included within the HIV control program as this will go a long way in educating the youths on STIs/HIV. Lastly, adequate health education on HPV, its risk factors and complications especially cervical cancer should be embarked upon on a large scale to improve the low level of its awareness.

References

1. Amu EO, Adegun PT. Awareness and Knowledge of Sexually Transmitted Infections among Secondary School Adolescents in Ado Ekiti, South Western Nigeria. *Journal of Sexually Transmitted Diseases*. 2015; 2015:260126. doi:10.1155/2015/260126
2. World Health Organization Fact sheets. Sexually Transmitted Infections. Available at [www.who.int/news-room/fact-sheets/details/sexually-transmitted-infections-\(stis\)](http://www.who.int/news-room/fact-sheets/details/sexually-transmitted-infections-(stis)) (Last accessed at February 9, 2019)
3. John AI, Opirite BP, Eme OA, Pattern of risky sexual

- behaviour and associated factors among undergraduate students of the university of Port Harcourt, Rivers State, Nigeria. *Pan African Medical Journal* 2012; 12:97
4. Sexually Transmitted Infections in Developing Countries; Current concepts and strategies on improving STI prevention, treatment and control". Available at <http://siteresources.worldbank.org/INTPRH/Resources/STINoteFINAL26Feb08.pdf>. (Last Accessed at 06/02/2019)
5. Deal C, Cates W, Peeling R, Wald A. Long-term clinical sequelae of sexually transmitted infections in women. *Emerging Infectious Diseases journal*. 2004; 10(11): e2.
6. Nack A. Damaged goods: Women managing the stigma of STDs. *Deviant Behaviour*. 2000; 21:95–121.
7. Darroch J, Myers L, Cassell J. Sex differences in the experience of testing positive for genital chlamydia infection: A qualitative study with implications for public health and for a national screening programme. *Sexually Transmitted Infections*. 2003; 79:372–376.
8. Duncan B, Hart G, Scoular A, Bigrigg A. Qualitative analysis of psychosocial impact of diagnosis of chlamydia trachomatis: Implications for screening. *British Medical Journal*. 2001; 27:195–199.
9. Lindberg C, Lewis-Spruill C, Crownover R. Barriers to sexual and reproductive health care: Urban male adolescents speak out. *Issues in Comprehensive Pédiatric Nursing*. 2006; 29:73–88.
10. Samkange-Zeeb FN, Spallek L and Zeeb H. Awareness and knowledge of sexually transmitted diseases (STDs) among school-going adolescents in Europe: a systematic review of published literature. *BMC Public Health*. 2011; 11-12
11. Adigun TF, Afolayan JO, Suhailah S, Siti Nor SS, Malina O, and Rukman AH. Assessing the knowledge level, attitudes, risky behaviours and preventive practices on sexually transmitted diseases among university students as future healthcare providers in the central zone of Malaysia; A cross-sectional study. *Int J Environ Res Public Health*. 2017; 14(2): 159.
12. Achenef AM, Getachew MK, Abadi KB, and Gedefaw AF. Prevalence and determinants of risky sexual practice in Ethiopia: Systematic review and Meta-analysis *Reprod Health*. 2017; 14: 113.
13. Solomon MW, Nega A, Solomon T and Hiwot Z. Substance use and Factors Associated with Risky Sexual Practice in School Youth in Asella Town, Ethiopia. *Academic Journals*; 2017; 10: 6-15.
14. Getachew MK, Genet D, Meseret Y, Worku M, Mikiyas M, Tiguated D, Meless M, Melat A. Risky Sexual Behaviors and Associated Factors among Jiga High School, Amhara Region, Ethiopia. *International Scholarly Research Notices*; 2016.
15. Obiechina NJ, Diwe K and Ikpeze OC. Knowledge, awareness and perception of sexually transmitted diseases (STDs) among Nigerian adolescent girls. *J Obstetric Gynaecol*. 2002; 22(3):302-5
16. Blay GA. Awareness and knowledge of sexually transmitted infections among female porters in Mandina. School of Public Health, College of Health Science, University of Ghana, Legon. 2013: 45-46
17. Mwambete KD and Mtaturu Z. Knowledge of sexually transmitted diseases among secondary school students in Dar es Salaam, Tanzania. *African Health Sci*. 2006; 6(3):165-9.
18. Imaledo JA, Peter-Kio OB, and Asuquo EO. Pattern of risky sexual behaviour and associated factors among undergraduate students of the University of Port Harcourt, Rivers State, Nigeria. *The Pan African Medical Journal*. 2012; 12:97.
19. Ali J, Ali MO, Ifeadike CO, Emelumadu OF, Ubajaka C, Nwabueze SA, Ebenebe UE and Azuike EC. Adolescent Sexual Behaviour and Practices in Nigeria: A Twelve Year Review. *AfriMedic Journal*; 2011; 4(1): 10-16.
20. Durowade KA, Babatunde OA, Omokanye LO, Elegbede OE, Ayodele LM, Adewoye KR, Adetokunbo S, Olomofe CO, Fawole AA, Adebola OE, Olaniyan TO . Early sexual debut: Prevalence and Risk factors among secondary school students in Ido-Ekiti, Ekiti State, Southwest Nigeria. *Africa Health Sciences*. 2017; 17(3): 614-622.
21. Ojo. LA. Parental factor as a determinant of risky sexual among undergraduate students in university of Ekiti state, Nigeria. *Journal of Education and Practice*. 2014; 5: 38
22. Francis SC, Mthiyane TN, Baisley K, Mchunu SL, Ferguson JB, Smit T, et al. Prevalence of sexually transmitted infections among young people in South Africa: A nested survey in a health and demographic surveillance site. *PLoS Med* 2018; 15(2): e1002512. Doi:10.1371/journal.pmed.1002512
23. Ikeako LC, Ekwueme OC, Ezegwui HU, Okeke TOC, Vulnerability and Knowledge of Sexually Transmitted Infections among Female Traders of Reproductive Age in Enugu, Nigeria. *Annals of Medical and Health Sciences Research* 2014; 4 (1): 118-122
24. Araoye, M.O. (2004) *Research Methodology with Statistics for Health and Social Sciences*. Nathadex Publishers, Ilorin.
25. Lichtenstein B. Stigma as a barrier to treatment of sexually transmitted infection in the American Deep South: Issues of race, gender, and poverty. *Social Science & Medicine*. 2003; 57:2435–2445.
26. Ashiqul H, Sha NH, Muhammad ABC, Jamal U. Factors associated with knowledge and awareness of HIV/AIDS among married women in Bangladesh: evidence from a nationally representative survey. *SAHARA-J. Journal of social aspects of HIV/AIDS* 2018; 15(1):121127

Biofilm Forming Staphylococci and Antimicrobial Resistance Pattern at the University of Ilorin Teaching Hospital, North Central Nigeria.

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Abstract

Microorganisms that grow within the biofilm state possess several mechanisms that increase resistance to external antimicrobial treatments. This study was designed to investigate the relationship between antimicrobial resistance and biofilm production with a view to providing solution to the increasing trend in antimicrobial resistance.

One hundred and sixty eight staphylococcal isolates from different clinical specimens were collected into 20% glycerol-brain heart infusion broth in vials and stored at -20°C for further processing. They were re-characterized using standard microbiological techniques. Biofilm detection and quantification was carried out using modified Christensen's Microtitre plate method and the optical density determined at 450nm. *Staphylococcus aureus* isolates were categorised into non-multidrug resistant and multidrug resistant and related to microfilm production and non-production. The prevalence of methicillin resistance of the Staphylococcal isolates was determined using Cefoxitin (30µg). Data collected were analysed using SPSS 23.0.

Staphylococcal isolates showed moderate resistance to almost all the antibiotics with Tetracycline (51.8%), Ciprofloxacin (42.3%), Gentamycin (35.7%) displaying the highest resistance. Biofilm producers and non-biofilm producers exhibited 100% sensitivity to Linezolid. The prevalence of methicillin resistance among staphylococcal isolates was 44.6%. The prevalence of biofilm production at UITH is relatively high and of grave concern considering the devastating effect of antimicrobial resistance. Linezolid still remain a drug of choice in managing Staphylococcal infections and also infections caused by methicillin resistant staphylococci. We therefore recommend biofilm detection protocol in the routine microbiological examination with an objective to curbing antimicrobial resistance.

Key Words: Biofilm, Staphylococci, Antimicrobial Resistance, North-central Nigeria.

Introduction

Biofilm which is a structural community of bacterial cells enclosed in a self-producing polymeric matrix and adherent to inert or living surfaces¹ have its formation been regulated by different genetic and environmental factors.²

Genetic studies have shown that bacterial mobility, cell membrane proteins, extracellular polysaccharides and signalling molecules play significant roles in biofilm formation³. Basic structural units of a biofilm are micro colonies, separate communities of bacterial cells embedded into extracellular polymeric substances (EPS) matrix.

The development of a mature biofilm may take several hours to several weeks depending on the system⁴ and both gram positive and gram negative bacteria form biofilm.

The innate and adaptive arms of the immune system more effectively eliminate planktonic cells than microorganisms in biofilms. Microorganisms that grow within the biofilm state are thought to possess several mechanisms that increase resistance to external antimicrobial treatments when compared with bacteria in the planktonic state. The EPS matrix of the biofilm slows the penetration of antimicrobial agents into the biofilm community. The matrix barrier also acts as a defence mechanism against other external stimuli such as UV light and dehydration. It has been reported that mature biofilms (≥ 7 days old) require 500-5000 times the concentration of bactericidal agents necessary to kill planktonic cells of the organism.⁵

Bacteria involved in biofilm formation are highly refractory to antimicrobial treatment, resulting in serious consequences for the therapy of associated infections. The biofilm lifestyle affords bacteria a 10-1000 fold increase in antimicrobial resistance compared to their planktonic counterparts, and many of these genetic changes render the constituent bacteria resistant to antimicrobials^{6,7,8,9}.

Staphylococcus epidermidis in biofilm resists deposition of the antimicrobial complement component (C3b) and immunoglobulin G (IgG) on cell surfaces thereby reducing the opsonization required for phagocyte mediated killing.¹⁰ Also, *Staphylococcus aureus* cells in biofilms resist macrophage phagocytosis by circumventing bacterial recognition

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pathways mediated by toll - like receptors TLR2 and TLR9.

The ability of Staphylococci to form biofilm is an important problem in the management of infections in hospitalized, immunosuppressed and immunocompromised patients worldwide due to their recalcitrant nature to treatment with antibiotics¹¹.

The EPS of Staphylococci biofilm consists of matrix of polysaccharide, teichoic acid, extracellular DNA, staphylococcal proteins. Polysaccharide intercellular Adhesin (PIA) is a specific polysaccharide in the EPS that is composed of β -1, 6- linked N-acetylglucosamine residues and non N- acetylated D-glucosaminyl residues that are an anionic fraction together with phosphate and ester-linked succinate¹².

Contemporary resistance by planktonic forms of bacteria involves inactivation of antimicrobial, modification of target sites and extrusion or efflux pump. These resistance mechanisms are affected by specific gene factors inherent or acquired from an external source by the bacteria. The structural and architectural arrangements of biofilms manifest resistance against antimicrobials and therefore lead to a protected environment against adverse or harsh conditions⁸. Medical devices or other devices used in the healthcare environment have been shown to harbor biofilms, resulting in measurable rates of device-associated infections¹³.

Justification

The prevalence of resistance in *S. aureus* is increasing globally. Biofilm formation has been described as a possible attribute to the resistance of pathogenic microorganism and a major contributor to the establishment of nosocomial infections^{14,15}.

The ability of microorganisms to be organized in a biofilm community confers increased antimicrobial resistance thereby depleting the pool of available antimicrobials.

Plasmid exchange occurs at higher rate in biofilms, increasing the chances of developing naturally occurring and antimicrobial-induced resistance⁵. This coupled with the fact that exchange between species is possible increases antimicrobial resistance.

The prevalence of resistant *Staphylococcus* spp (Methicillin resistant *S. aureus* and CoNS) is on the increase in Nigeria especially in teaching hospitals¹⁶. The increase in antimicrobial resistance exchange mechanism as a result of biofilms formation underscores the importance of this study aiming to primarily determine the antimicrobial resistance and susceptibility patterns of biofilm producing staphylococcal isolates in North Central Nigeria.

Materials and Methods

This study was carried out at the Medical Microbiology Laboratory of the University of Ilorin Teaching Hospital (UITH). The study populations were patients from whom staphylococcal isolates had been recovered from different clinical specimens (pus, sputum, urine, blood, HVS, rectal swab, eye discharge, wound swab, aspirate, endocervical swab) at the Microbiology Laboratory of UITH. The study employed a descriptive cross-sectional design, all patients from whom staphylococcal isolates were recovered were studied. Purposive, non-probability sampling technique was adopted in collecting these samples. The sample size was determined using Fisher's and an overall sample of 168 were studied.¹⁷ Ethical approval/clearance was obtained from the Ethical Review Committee (ERC) of the University of Ilorin Teaching Hospital.

Sample Collection, Storage and Reactivation

Staphylococcal isolates were collected into sterile glycerol broth in vials. Five (5ml) of glycerol broth was dispensed into each vial. The vials were autoclaved and allowed to cool at room temperature. Aliquots of each isolate were inoculated into each vial. The isolates were then maintained as a stock kept at - 20°C before the commencement of the research work.

The vials with the isolates were removed from the cold storage and allowed to thaw at room temperature. Aliquot from each vial was then inoculated on 5% sheep blood agar (Oxoid, UK) and a selective medium, Mannitol salt agar (HiMedia-MSA). They were incubated aerobically at 37°C for 24 hours. The plates were examined after 24 hours of growth.

These staphylococcal isolates were identified using an identification work flow and Gram staining was carried out to differentiate between the morphology of gram positive and gram negative organisms according to Chessbough¹⁸.

Catalase test was used to differentiate catalase producing staphylococci from non-catalase producing streptococci while Coagulase test was used to differentiate between *S. aureus* and the CoNS (*S. epidermidis*, *S. saprophyticus*).

Identification test for CoNS was used to speciate the CoNS and also to differentiate CoNS from *Micrococcus* spp. using Modified Kirby Bauer disc diffusion method of antimicrobial susceptibility testing with Novobiocin and Bacitracin.

Biofilm detection and quantification assay which employed a microtiter plate biofilm assay in its typically used form is derived from the usual standard protocol.

The antimicrobial susceptibility pattern of each isolate was carried out using modified Kirby Bauer disc diffusion method based on the clinical laboratory standard institute guidelines.

Gentamicin, Erythromycin, Tetracycline, Ciprofloxacin, Amoxicillin-Clavulanic acid, Cefuroxime, Ceftriaxone and Linezolid (Oxoid, UK) were the antimicrobial discs used to detect the antimicrobial susceptible pattern of the isolates. Biofilm producers and non-producer were then differentiated using the same standard techniques and related to the antimicrobial resistance.

Meticillin resistance test was carried out using the modified Kirby Bauer disc diffusion method. Cefoxitin (Oxoid, UK-30µg) disc was then used to test for meticillin resistance among both coagulase positive and coagulase negative Staphylococci (CoNS). Data generated were analyzed using statistical package for social sciences (SPSS) version 23.0, results presented

in tables and the statistical difference was determined at $P < 0.05$.

Results

A total of one hundred and sixty-eight Staphylococcal isolates from different clinical specimens submitted to the Microbiology Biology Laboratory of the University of Ilorin Teaching Hospital was obtained for this study. The clinical specimens that yielded the staphylococcal isolates are blood (50, 29.8%), urine (27, 16.1%), sputum (9, 5.4%), eye swab (9, 5.4%), Wound swab (51, 30.4%), throat swab (2, 1.2%), STI swab (10, 6.0%), aspirate (9, 5.4%), and ear swab (1, 0.6%).

Both *S. aureus* and CoNS isolates were used in

Table 1: Relationship between biofilm production and methicillin resistance in *S. aureus*

Biofilm Production	<i>S. aureus</i>		Total n (%)	χ^2	P-value
	MRSA n (%)	MSSA n (%)			
Biofilm Producer	45(77.6)	31 (36)	76(52.8)	6.141	P<0.001
Non Biofilm Producer	13(22.4)	55(64)	68(47.2)		
Total	58(40.3)	86(59.7)	144(100)		

Key: MRSA-Meticillin resistant *Staphylococcus aureus* MSSA -Meticillin susceptible *Staphylococcus aureus*

Table 2: Relationship between biofilm production and methicillin resistance in CoNS

Biofilm production	CoNS n (%)		Total n (%)	χ^2	P-value
	MRCoNS	MsCoNS			
Biofilm Producer	14(87.5)	5(62.5)	19(79.2)	4.200	0.2885
Non Biofilm Producer	2(13.5)	3(37.5)	5(20.8)		
Total	16(66.7)	8(33.3)	24 (100)		

Key: MRCoNS-Meticillin resistant coagulase negative staphylococci MSCoNS-Meticillin susceptible coagulase negative Staphylococci

Table 3: Distribution of MDR among MRSA/MSSA isolates in relation to biofilm production

BIOFILM PRODUCTION	DRUG RESISTANCE						χ^2	PValue
	MRSA n (%)	MDR MSSA n (%)	TOTAL n (%)	MRSA n (%)	NMDR MSSA n (%)	TOTAL n (%)		
POSITIVE	45(77.6)	15(75)	60(76.9)	-	16(24.2)	16(24.2)	39.809	P<0.001
NEGATIVE	13(22.4)	5(25)	18(23.1)	-	50(75.8)	50(75.8)		
TOTAL	58(74.4)	20(25.6)	78(54.2)	-	66(100)	66(45.8)	82.175	P<0.001

Key: NMDR: Non multidrug resistant MDR: Multidrug resistant MRSA methicillin resistant *Staphylococcus aureus* MSSA-Meticillin susceptible *Staphylococcus aureus* EUCAST-European Committee on Antimicrobial Susceptibility Testing FDA-US Food and Drug Administration CLSI-Clinical Laboratory Standards Institute.

Table 4: Antimicrobial Resistance and susceptibility patterns in relation to biofilm potentials of isolates

Antibiotic		Meticilin resistance n (%)		Meticilin susceptible n (%)		X ²	P value
		Biofilm Producer n=59	Non Biofilm producer n=16	Biofilm Producer n=36	Non Biofilm Producer n=57		
CXM	S	28(47.5)	10(62.5)	21(58.3)	48(84.2)	15.993	<0.001
	R	26(44.1)	2(12.5)	9(25)	6(10.5)		
	I	5(8.5)	4(25)	6(16.7)	3(5.3)		
CRO	S	13(22)	3(18.8)	18(50)	36(63.2)	8.838	0.012
	R	26(44.1)	5(31.2)	9(25)	9(15.8)		
	I	20(33.9)	8(50)	9(25)	12(21.1)		
AMC	S	32(54.2)	12(75)	30(83.3)	49(86.0)	7.048	0.008
	R	27(45.8)	4(25)	6(16.7)	8(14.0)		
ERY	S	27(45.8)	12(75)	18(50)	46(80.7)	22.217	P<0.001
	R	26(44.1)	1(6.2)	11(30.6)	5(8.8)		
	I	6(10.2)	3(18.8)	7(19.4)	6(10.5)		
GEN	S	16(27.1)	6(37.5)	20(55.6)	48(84.2)	21.646	P<0.001
	R	31(52.5)	9(56.2)	14(38.9)	6(10.5)		
	I	12(20.3)	1(6.2)	2(5.6)	3(5.3)		
CIP	S	19(32.2)	8(50)	18(50)	48(84.2)	16.472	P<0.001
	R	36(61)	12(75)	15(41.7)	8(13.0)		
	I	2(3.4)	2(12.5)	2(5.6)	2(3.5)		
TET	S	15(25.4)	7(43.8)	20(55.6)	39(68.4)	11.324	0.001
	R	44(74.6)	9(56.2)	16(44.4)	18(31.6)		
LZD	S	59(100)	16(100)	36(100)	57(100)		
<i>CXM- Cefuroxime AMC-Amoxicillin/clavulanic acid</i>				<i>CRO- Ceftriaxone</i>	<i>ERY- Erythromycin</i>		
<i>GEN- Gentamycin CIP- Ciprofloxacin</i>				<i>TET- Tetracycline</i>	<i>LZD- Linezolid</i>		

the research and the 168 isolates, 24 isolates were identified as CoNS. Of the 24 (14.29%) CoNS, only 1 (4.2%) was resistant to Novobiocin.

Forty five of 58 (77.6%) MRSA isolates were biofilm producer compared with to 31 of 84 (36.9%) of MSSA isolates. There was a significant difference in the distribution of biofilm producers among *S. aureus* isolates ($P<0.001$), (Table 1.).

Fourteen of 16 (87.5%) MRCoNS isolates were biofilm producers compared to 5 of 8 (62.5%) of MSCoNS isolates. Analysis showed there was no significant difference in the distribution of biofilm

producer among CoNS isolates ($P=0.2885$), (Table 2).

Based on these criteria, *S. aureus* isolates were classified into MDR and NMDR. A total of 78 (54.25%) isolates were MDR and 66 (45.8%) were NMDR. Sixty (76.9%) MDR were biofilm producers while 50 (75.8%) NMDR were non-biofilm producers and 45 (77.6%) of MDR that produce biofilm were MRSA. There was a statistical difference/association ($P<0.05$) in the distribution of biofilm producers among MDR isolates and in the distribution of MDR among *S. aureus* isolates. (Table 3).

The overall antibiotic susceptibility pattern

between biofilm and non-biofilm producers by Chisquare test ($p < 0.05$) which is considered as significant was carried out. It was discovered that there was an overall significant difference in the susceptibility pattern among biofilm and non-biofilm producers (Table 4).

Discussion

In this study, 168 staphylococcal isolates were obtained and re characterized for analyses. Of the 168, 24 (14.3%) isolates were coagulase negative Staphylococci while 144 (85.7%) isolates were coagulase positive Staphylococci. The staphylococcal isolates were obtained from different clinical specimens. Statistical Analyses showed that there was no significant difference in the distribution of the organisms among the clinical specimens ($P > 0.05$).

The wound specimen had the highest number of biofilm producers (37.9%), followed by blood (24.2%) and urine (17.9%). The result did not agree with that of AbdelHasim *et al*¹⁹ where blood specimen had the highest percentage of biofilm producers (82.6%).

Forty-three (25.6%) staphylococcal isolates were resistant to Cefuroxime, 48 (28.8%) isolates were resistant to Amoxicillin-clavulanic. Forty-nine (29.2%) isolates were resistant to Ceftriaxone. Seventy-one (42.3%) isolates were resistant to Ciprofloxacin, while 87 (51.8%) isolates were resistant to Tetracycline. All the staphylococcal isolates used in the study were susceptible to Linezolid. In the study conducted by Abirami *et al*²⁰, there was similarity in the antimicrobial susceptibility pattern (Erythromycin-63.7%). Also, all staphylococcal isolates were susceptible to Linezolid in that study. Filho *et al*²¹, reported that, all isolates used in the study were susceptible to Linezolid too.

CoNS isolates showed low sensitivity to Ceftriaxone (8,33.3%), Gentamycin (9,37.5%), and Tetracycline (8,33.3%). *S. aureus* exhibited moderate sensitivity to Cefuroxime (92,63.9%), Erythromycin (88,61.1%), Gentamycin (81,56.3%), Ciprofloxacin (80,55.6%), Tetracycline (73, 50.7%). MRSA exhibited relatively low sensitivity to Ceftriaxone (14, 23.7%), Erythromycin (29,49.2%), Gentamycin (19,32.2%), Ciprofloxacin (21,35.6%), and Tetracycline (17,28.8%). The MRCoNS isolates showed a relative high resistance to Ceftriaxone (9, 56.3%), Gentamycin (9, 56.25%), Ciprofloxacin (10, 62.5%), and Tetracycline (11, 68.75%). Analysis showed that there was an increased resistance among the methicillin resistant staphylococci. The result was in agreement with Ayepola *et al*²² study where Tetracycline resistance was highest and again all CoNS isolates were susceptible to Linezolid.

A total of 78 (54.25%) *S. aureus* isolates were MDR while 66 (45.8%) were NMDR. Sixty (76.9%)

MRSA isolates that were MDR were also biofilm producers. Also, 50 (75.8%) MSSA isolates that were NMDR were in the same vein negative for biofilm production. There was a significant difference in biofilm distribution among the MDR/ NMDR isolates and among MRSA/ MSSA isolates. The MDR prevalence (54.25%) of this study was in accordance with a study by Neopane *et al*. (2017) where 60.5% MDR prevalence was obtained. The difference between the two studies was that in the study by Neopane *et al*,²³ all the non-biofilm producers were non-MDR isolates. This difference may not be unconnected with the study design where the researchers recruited *S. aureus* from only wound specimen. The result of this study also conflicts with that of Eyoh *et al*²⁴ where there was slightly lower biofilm prevalence (42.9%) among MDR isolates and there was no relationship between multidrug resistance and biofilm production.

This study showed that there was high number of biofilm producers among isolates resistant to the antimicrobials used in the study. According to Sauer *et al*,²⁵ biofilm formation is accompanied by significant changes in gene and protein expression, which confers resistance to antimicrobial agents. The relationship between antimicrobial resistance and biofilm formation was illustrated. The results showed that there was higher percentage of biofilm producers among methicillin resistant staphylococci than methicillin susceptible Staphylococci. Forty-five (77.65%) MRSA were biofilm producers compared to the 31(36.9%) MSSA. There was also a statistical difference in the distribution of biofilm production among *S. aureus* isolates. The trend was similar among coagulase negative Staphylococci where 14 (87.5%) of MRCoNS were biofilm producers as compared to 5 (62.5%) of MSCoNS but there was no significant difference in the distribution of biofilm producers among CoNS. The result of this study was similar to one conducted by Samie and Shivambu¹⁶ where 56% biofilm producers were MRSA and 48% among the MSSA isolates. There was a statistical significance in the distribution in thier study. The result of this study was closely related to the outcome of the one conducted by AbdelHalim and Mahmoud¹⁹ where 75% of MRSA and 71.4% MRCoNS were biofilm producers. Twenty-six (44.1%) methicillin resistant staphylococci which were Cefuroxime resistant were biofilm producers as compared to 9 (25%) meticillin susceptible staphylococci that were biofilm producers. Fifty-nine (78.7%) methicillin resistant Staphylococci were biofilm producers as compared to 36 (38.7%) methicillin susceptible Staphylococci that were biofilm producers. This pattern of relationship was obtained in all the antimicrobials used except for Linezolid. However, there was a difference in a study by Abdel Halim and Mahmoud¹⁹ where there were higher

number of biofilm producers among methicillin susceptible Staphylococci isolates than Methicillin resistant Staphylococci. Analysis showed that there was an overall significant difference in the susceptibility pattern among biofilm and non-biofilm producers in this study ($P < 0.05$). This result was in concordance with a study by Abirami *et al*²⁰ where there was a significant association between antimicrobial susceptibility pattern and biofilm production.

The prevalence of methicillin resistance in this study was 44.6%. Fifty-eight (40.3%) *S. aureus* isolates were methicillin resistant while 16 (66.7%) CoNS were methicillin resistant. This was similar to a study conducted by Abirami *et al*²⁰ where 44.8% MRSA was obtained. A higher prevalence (56.4%) was obtained among *S. aureus* isolates in Abakaliki in a study carried out by Chika *et al*²⁶. A lower methicillin resistance (41%) was obtained among CoNS isolates in a study by Ayepola *et al*²². The difference in these studies cannot be unconnected from the fact that Ayepola *et al*²² made use of health facilities from different study areas. The result of this study showed that there was a significant difference ($P < 0.05$) in the distribution of methicillin resistance among staphylococcal isolates. Accident and Emergency ward had the highest number of methicillin resistant staphylococci (21.33%). This was followed by GOPD and NICU which had 14 (18.67%) and 10 (13.33%) respectively. MSW, IVF and Paediatric ward had no methicillin resistance staphylococci. A/E and GOPD had the highest number of MRSA, 13 (22%) and 12 (20.3%) respectively. A/E and EPU had the highest number of MRCoNS, 3 (18.8%) each. A/E had the highest number of MRSA (13, 61.9%) in relation to the number of sample obtained from the ward ($n=21$). The ward/MRSA distribution was different in the study by Kaur and Wankhede²⁷ in India, where O/G ward had the highest prevalence (38.82%) of MRSA and paediatric ward had the least prevalence (2.35%).

Antimicrobial resistance is a global menace that has become an issue of concern in the world. Staphylococci in biofilm are known to exhibit resistance to chemotherapy in the process of treatment. Resistance to methicillin has been a top concern to health practitioners because resistance to methicillin implies resistance to other β -lactam anti microbial agents currently available²⁸. The multidrug resistant ability of MRSA has become an increasing problem in hospital and a grave concern in the management of staphylococcal infections.

Conclusions

The findings from the study also emphasized the increasing trends in the development of antimicrobial resistance using the biofilm concept. The

work showed a correlation between biofilm production and resistance to antimicrobial. There was a significant difference in the biofilm production to antimicrobial resistance. And it can actually be deduced that biofilm formation is a survival mechanism for pathogenic microorganisms against chemotherapeutic management. Oxazolidinones (Linezolid) is still a drug of choice in the treatment of staphylococcal infections and also infections by methicillin resistant staphylococci. The growing prevalence of methicillin resistance among staphylococci isolates was also obtained in this study. The distribution of MDR among *S. aureus* isolates also showed the abuse (inappropriate use) of antimicrobials at UITH in this antimicrobial resistance era.

Biofilm detection and quantification should be included in the routine microbiological investigations in tertiary Hospitals.

References

1. Costerton, J., Philip, S., Stewart, S., and Greenberg, P. Bacterial Biofilm: A common cause of persistent Infections, Science, 1999; 284: 1318-1322.
2. Kreth, J. and Herzberg, M. Molecular Principles of Adhesion and Biofilm Formation In: L.E. Cha 'vez de Paz et al. (eds.), The Root Canal Biofilm, 2015; pp23-53.
3. Maric S. and Vrane J. Characteristics and Significance of Microbial Biofilm Formation, Periodicum Biologorum, 2007; 109(2), 1-5.
4. Mittelman, M. Biological Fouling of Purified-Water Systems: Part 3, Treatment. Microcontamination, 1996; 4(1):30-40.
5. Percival, S., Suleiman, L., Vuotto, C., and Donelli, G. Healthcare-associated Infections, Medical Devices and Biofilms: Risk, Tolerance and Control, Journal of Medical Microbiology, 2015; 64, 323-334.
6. Mah, T. and O'Toole, G. Mechanisms of Biofilm Resistance to Antimicrobial Agents. Trends in Microbiology, 2001; 9:34-39.
7. Stewart, P. and Costerton, J. Antibiotic Resistance of Bacteria in Biofilms. Lancet 2001; 358, 135-138.
8. Patel, R. Biofilms and Antimicrobial Resistance. Clinical Orthopaedics and Related Research, 2005; 437: 41-47.
9. Antunes, A., Secchi, C., Reiter, K., Perez, R., de Freitas, A. and D'Azevedo, A. Feasible Identification of *Staphylococcus epidermidis* using Desferrioxamine and Fosfomycin Disks. Acta Pathologica, Microbiologica, et Immunologica Scandinavica, 2008; 116, 16-20.
10. Reiter, C., Villa, B., Paim, T., Fernandode Oliveira, C. and Alves de Azevedo P. Inhibition of Biofilm Maturation by Linezolid in Methicillin Resistant *Staphylococcus epidermidis* Clinical Isolates: Comparison with other Drugs, Journal of

- Medical Microbiology, 2013; 62,394-399.
11. Bjarnsholt, T., Moser, C., Jensen, P. and Hoiby, N. Biofilm Infections. New York Dordrecht Heidelberg London: Springer Science Business Media, LLC; 2011; 215–225.
12. Archer, N., Mazaitis, M., Costerton, W., Leid, G., Powers, M. and Shirtliff, M. *Staphylococcus aureus* Biofilms: Properties, Regulation and Roles in Human Disease. Virulence; 2011; 2(5)445–459.
13. Donlan, R. Biofilms: Microbial Life on Surfaces, Emerging Infectious Disease, 2002; 8(9): 881-890.
14. Samie, A., and Shivambu, N. Biofilm Production and Antibiotic Susceptibility Profiles of *Staphylococcus aureus* Isolated from HIV and AIDS Patients in the Limpopo Province, South Africa, African Journal of Biotechnology, 2011; 10(65),14625-14636.
15. Uneke, C., Ogbonna, A., Oyibo, G., and Onu, M. Bacterial Contamination of Stethoscopes used by Health Workers: Public Health Implications. Journal of Infection in Developing Countries, 2010; 4(7): 436-41.
16. Onemu, S., and Ophori, A. Prevalence of Multi-Drug Resistant *Staphylococcus aureus* in Clinical Specimens Obtained from Patients Attending the University of Benin Teaching Hospital, Benin City, Nigeria, Journal of Natural Sciences Research, (2013; 3(5),154-159.
17. Araoye, M. Research Methodology with Statistics for Health and Social Sciences. Nathadex publishers, Ilorin, .2003; pp118.
18. Cheesbrough, M. Parasitological Tests: Examination of Blood for Malaria Parasites in District Laboratory Practice in Tropical Countries Part 1, Second Edition (updated) Cambridge University Press New York 2009; pp 239-258
19. AbdelHalim, R., Kassem, N., and Mahmoud, S. Detection of Biofilm Producing Staphylococci among Different Clinical Isolates and Its Relation to Methicillin Susceptibility. Open Access Macedonian Journal of Medical Sciences, 2018; 6(8):1335-1341.
20. Abirami, L., Thyagarajan, R., Radhika, K., Leela, K., Suganthi, M., Lavanya, K., Hemalatha, S. Biofilm Formation and Methicillin Resistance among the *Staphylococcus aureus* causing Burn Wound Infections in a Tertiary Care Hospital: A Comparative Study of the Antibiotic Susceptibility Pattern between Biofilm Producers and Non-biofilm Producers. Journal of Pharmaceutical and Biomedical Sciences, 2016; 6(3):179–183.
21. Filho, R., Silva, Agostinho, Saramago, C., Bento, C., Souza, I., Souza, M., Carvalho, K., and Boas M. Biofilm Production Clinical Isolates of *Staphylococcus epidermidis* and its Relationship with Genotypic Profile, Presence of Virulence-Related Genes and Antibiotic Resistance, African Journal of Microbiology Research 2015; 9(14), 1026-1036.
22. Ayepola, O., Olasupo, N., Egwari, L., and Schaumberg, F. Antibiotic Susceptibility Pattern and Biofilm formation in Coagulase Negative Staphylococci, Journal of Infection in Developing Countries, 2014; 8(12): 1643-1645.
23. Neopane, P., Nepal, P., Shrestha, R., Uehara, O. and Abiko, Y. In vitro Biofilm Formation by *Staphylococcus aureus* Isolated from Wounds of Hospital-admitted Patients and their Association with Antimicrobial resistance, International Journal of General Medicine, 2017; 11:25-32.
24. Eyoh, A., Toukam, M., Atashili, J., Fokunang, C., Gonsu, H., Lyonga, E., Mandi, H., Ikomey, G., Mukwele, B., Mesembe, M., and Assoumou, M. Relationship between Multiple Drug Resistance and Biofilm Formation in *Staphylococcus aureus* Isolated from Medical and Non-Medical Personnel in Yaounde, Cameroun, Pan African Medical Journal, 2014; 17(186),1-11.
25. Sauer, K., Camper, A., Ehrlich, G., Costerton, J., and Davies, D. *Pseudomonas aeruginosa* displays Multiple Phenotypes during Development as a biofilm. Journal of Bacteriology; 2002; 184:1140-54.
26. Chika, E., Joseph, N., Chijioke, E. *et al* . Detection of constitutive and inducible-clindamycin-resistance in clinical isolates of *Staphylococcus aureus* from a Federal Teaching Hospital in Abakaliki, Nigeria. Journal of Bacteriology and Infectious Disease, 2018; 2(1):31-34.
27. Kaur, C. and Wankhede, S. Biofilm Formation and Antimicrobial Susceptibility Pattern of Methicillin Resistant *Staphylococcus aureus* from Wound Infection, Asian Pacific Journal of Health Science, 2014; 1(4): 322-328.
28. CLSI. Performance Standards for Antimicrobial Susceptibility Testing, 26th ed. CLSI supplement M100S, Wayne, PA: Clinical and Laboratory Standards Institute 2016.

Effectiveness of Isoniazid Preventive Therapy in HIV-Infected Children and Adolescents in a Tertiary Healthcare Institution in South West Nigeria.

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Abstract

Tuberculosis (TB), the most common of all opportunistic infections in people living with the human immunodeficiency virus (HIV) causes preventable acquired immune deficiency syndrome resultant mortality and morbidity. The World Health Organization recommends isoniazid preventive therapy (IPT) in HIV-positive children as an important public health intervention. This study evaluated the impact of IPT on the incidence of tuberculosis in HIV-positive children on anti-retroviral therapy (ART).

Data on the cluster of designation-4 (CD4+) cell counts, viral load, development of active TB and alanine transaminase (ALT) values were obtained from patients' medical records and via structured data collection instrument. These were used to determine the effectiveness of IPT and the hepatotoxic effects of isoniazid in children and adolescents on IPT at the Paediatrics Infectious Disease Unit, Antiretroviral Clinic, Infectious Disease Institute, College of Medicine, University of Ibadan, Nigeria over a 24 month period.

Out of 108 children and adolescents who commenced IPT between September, 2015 and August, 2016, 85 of these patients met the inclusion criteria and were randomly selected for this study. Increased CD4 cell count was observed by the 12th month of therapy with 50.6% of the study population achieving the desired level of CD4 cell count greater than 500 cells/ μ l and 57.7% by the end of the study. Viral load decreased to 10-199 copies/ml by the 12th month post initiation of ART; 72.9% had desirable viral load by the 24th month of the study. Increased ALT levels were noticeable in 17.6% of the patients at 6 months of IPT, these resolved by the 18th month; none of the study participants developed active TB.

In this study, IPT was effective in preventing the development of active TB in HIV-infected children and adolescents on ART.

Keywords: Isoniazid preventive therapy, IPT, tuberculosis, HIV, anti-retroviral therapy ART, CD4.

Introduction

Tuberculosis (TB), being the most common opportunistic infections in people living with the human immunodeficiency virus (HIV) contributes significantly to the development of acquired immune deficiency syndrome (AIDS) related mortality and morbidity in patients especially in Sub-Saharan Africa. The risk of acquiring TB in HIV-positive individuals is 26-37 times greater than for HIV-negative individuals.^{1,2} TB/HIV co-infection has an important impact on HIV as TB accelerates the progression of HIV disease by increasing viral replication. Indeed, the HIV/TB interaction is defined as syndemic as they act synergistically to magnify the burden of disease.³⁻⁶ The high rate of TB infection in HIV infected individuals in resource-limited settings gave rise to the need for strategies to prevent TB in this subset of the population. WHO recommends isoniazid preventive therapy (IPT) as part of the three "I's" strategy for TB/HIV co-infection. The other two being intensified TB case finding (ICF) and infection control (IC) for TB.⁷ The WHO currently recommends that HIV/AIDS programs include IPT as part of their package of care for HIV-positive individuals. The recommended regimen is six months of IPT for HIV-positive children aged one year and above, without TB disease even in the absence of a known TB contact, and for up to 3 years for HIV-positive adolescents and adults.^{2,8}

Pulmonary TB is the most common disease manifestation in HIV-infected children and is a common cause of acute pneumonia in HIV-positive children in Africa and may lead to chronic lung diseases and tubercles. It is also a common cause of death in HIV-positive children.⁹⁻¹¹

In 2018, 11% of all TB cases were in children under 15 years of age. However, the burden of childhood TB disease is not as well documented as in adults, partly because of the difficulty of confirming diagnosis.^{12,13} Thus preventing TB infection and disease in HIV-positive children is an important public health intervention. Antimycobacterial drugs used in the management of tuberculosis such as rifampicin have undesirable drug interactions with antiretroviral therapy (ART), complicating treatment. Rifampicin, an inducer of cytochrome P450 CYP3A, decreases the

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concentration of both the protease inhibitors (such as lopinavir) and non-nucleoside reverse transcriptase inhibitors (such as efavirenz) leading to sub-therapeutic drug concentrations and consequent drug resistance.¹⁴⁻¹⁷ The large pill burden of two or multiple regimens for the management of TB increases the risk of adverse drug effects, such as organ toxicity and the possibility of poor adherence.^{16,18} Isoniazid, an antimycobacterial agent, has however been used successfully for prophylactic treatment in HIV-negative individuals following TB exposure, and in HIV-infected adults with a positive tuberculin skin test where treatment with IPT reduced TB disease by 62%.^{2,16,19,20} Isoniazid also produced a 40% reduction in active TB among HIV-positive adults on anti-retroviral therapy (ART), reduced active TB at the community and population level and prevented progression of latent TB to active TB in those at high risk of developing active TB.²¹⁻²³ However, the effectiveness of IPT may be compromised by low adherence over the period required to complete a single course of IPT, a problem worsened in HIV-TB co-infected individuals for whom IPT durations are prolonged. In contrast to adults, preventive treatment in children is aimed at preventing primary infection rather than reactivation of disease.²

In settings of high TB prevalence, the rate of TB re-infection is high in short course prophylaxis and may also be potentially inadequate, thus longer-term prophylaxis or repeat course may be necessary. Also in hyperendemic regions, the rate of recurrent TB disease is much higher than the rate for first-time disease infection.²⁴⁻²⁶ Prophylaxis with antimycobacterial agents is highly recommended in HIV-positive children, though this carries a potential of drug interaction and toxicity, adverse drug reactions requiring cessation of therapy rarely occurs. The benefits of IPT far outweigh the risk of adverse drug effects in HIV-infected children. Indeed the incidence of isoniazid induced toxicity including hepatotoxicity from various studies is less than 0.3%.^{2,27-30}

As data regarding the use of IPT in HIV-positive children in Nigeria, is not well documented, this study was carried out to evaluate outcomes of IPT on incidence of TB in HIV-positive children, and document adverse drug reactions, if any associated with IPT in HIV-positive children.

Material and Methods

Study Setting

The study was carried out at the pediatrics Infectious Disease Unit (IDU)/ARV clinic, Infectious Disease Institute, College of Medicine, University of Ibadan, Nigeria. Ethical approval for the study was obtained from the University of Ibadan/University College Hospital Ethics Committee (UI/EC/19/0417)

Study Design

This was a descriptive, retrospective study to determine the effectiveness of IPT in HIV-positive children and adolescents on IPT between September, 2015 and August, 2016. Data for this cohort study was obtained from medical records of patients enrolled for ART in the ARV clinic at 6 months intervals over a period of 24 months. A structured data collection instrument was used to collect demographic information, base line data and patients' hepatic function. The interpretation for the hepatic enzyme values was based on the AIDS Clinical Trial Group grading system of ALT elevation.³¹

Study Population and Patient Sampling

The study population were HIV-positive children and adolescents under 15 years of age who were commenced on IPT at the study location and who remained on treatment within the study period. Only patients who tested negative for tuberculosis at the time of IPT initiation and who had complete baseline investigations and follow-up ALT results were included in the study. Patients on post-exposure prophylaxis or prevention of mother to child transmission treatment and those with incomplete ALT measurements during follow-up were excluded.

The required sample size for the study was determined using the Yamane sample size determination formula.³²

Data Analysis

Data collection instruments were inspected to ensure they were properly filled. Data was coded and analyzed using descriptive statistics. Statistical Package for Social Sciences (SPSS) version 23.0 was employed. Demographic data was analyzed using descriptive statistics to determine mean, frequency and percentage distribution of patients by age, gender, IPT completion, baseline CD4+ counts and ALT.

Results

A total of 85 case files were evaluated. Forty-seven (55.3%) of the patients were males while 38 (44.7%) were females. Most of the participants were between the ages of 6 and 15 years. Demographic data of participants is presented in Table 1.

Clinical Parameters of Study Participants

The CD4+ cell counts, viral load and ALT of patients at the start of the study and up to 24 months are presented in table 2. At the start of the study, 14.1% participants of the participants had CD4 cell counts less than 200 cells/ μ l while 30.6% had values above 500. By the end of the study, no participant had CD4 cell less than 200 while 57.7% had attained the desirable level of CD4 counts above 500 cells/ μ l.

Among these patients, 24.7% had baseline

Table 1: Demographic Characteristics of Study Participants

Characteristics	Frequency	Percentage (%)
Gender		
Male	47	55.3
Female	38	44.7
Age (Years)		
1-5	11	13.0
6-10	37	43.5
11-15	37	43.5

Table 3: IPT Completion Ratio of Study Participants

Completed IPT	Yes n(%)	No (%)
Gender	41 (48.2)	44(51.8)
Male	22(46.8)	25(53.2)
Female	19(50)	19(50)
Age		
1-5	5(45.5)	6(54.)
6-10	13(35.1)	24(64.9)
11-15	23(62.2)	14(37.8)

Table 2: Clinical Parameters of Study Participants

Clinical Parameter	Baseline	6 months n(%)	12 months n(%)	18 months n(%)	24 months n(%)
CD4+ (cells/μl)					
<200	12(14.1)	10(11.8)	8(9.4)	6(7.1)	-
200-349	15(17.6)	18(21.2)	15(17.6)	11(12.9)	15(17.6)
359-499	32(37.7)	36(42.4)	22(25.9)	25(29.4)	21(24.7)
>500	26(30.6)	21(24.6)	40(47.1)	43(50.6)	49(57.7)
Viral load (copies/ml)					
10-199	49(57.7)	49(57.6)	58(68.2)	50(58.)	62(72.9)
200-500	15(17.6)	23(27.1)	7(8.2)	25(29.4)	15(17.6)
>500	21(24.7)	13(15.3)	20(23.6)	10(11.8)	8(9.5)
ALT (units/l)					
1-10	19(22.4)	15(17.6)	17(20)	32(37.6)	39(45.9)
11-20	23(27.1)	21(24.7)	25(29.4)	29(34.1)	29(34.1)
21-30	31(36.5)	26(30.6)	22(25.9)	13(15.3)	11(12.9)
31-40	12(14)	8(9.4)	14(16.4)	11(12.9)	6(7.1)
>50	-	15(17.6)	7(8.2)	-	-

viral load greater than 500 copies/ml and 57.6% had 10-199 viral cells per millilitre of blood. These values decreased during the course of the study and by the 24th month, 9.5% patients had viral load of greater than 500 copies/ml; 72.9% met the target of 10-199 copies/ml.

With respect to the ALT values, at the initiation of the study all participants had baseline values of 10-40 units/l; 17.6% and 8.2% had elevated ALT levels by the 6th month and 12th month respectively. These values normalized by the 18th month.

IPT Completion of Study Participants: Comparative data of IPT completion with reference to gender and age of the study participants is presented on Table 3.

Discussion

The study was aimed at determining the impact of IPT on incidence of tuberculosis in children and adolescents who are HIV-positive and are on ART. A total of 85 children and adolescents were randomly selected from 108 patients who were commenced on IPT between September, 2015 and August, 2016.

CD4+ cell count increased while viral load of study participants decreased by the sixth month of the study, desirable levels of these indices were achieved by the twenty-fourth month of the study. Some of the study participants had slightly elevated ALT levels at sixth month of commencing IPT, this however resolved by the eighteenth month.

More than half of the study population were

males and majority of the participants were between the ages of 6 - 15 years with a mean age of 9.5 years. This is similar to the statistics of Mudzviti et al³³ who had a male to female ratio of 53.9 and 46.1% in their study conducted in Ethiopia. Tiruneh et al³⁴ however had a higher female population 59.3% compared to males (40.7%) and more patients aged 18-30 years (50.16%).

There was no incidence of tuberculosis reported in this study as all the study participants followed up for 24 months after IPT initiation did not develop active tuberculosis or signs of respiratory infections as recorded in the electronic medical records of patients in the Infectious Disease Institute. This is not surprising as evidence have shown that the risk of developing active TB is minimized with prolonged ART.³⁵ Effectiveness of IPT in preventing the development of active TB in HIV positive patients on ART was documented in similar studies in other parts of Africa.^{36,37} Interestingly, long before the advent of highly active ART, isoniazid was found to prevent incidence of TB in HIV negative individuals in community controlled trials in Alaska in the 1960s.^{38,39}

About forty-eight per cent (48.2%) of the study participants completed their six months course of IPT; this low completion rate was due to low levels of understanding of the benefits of IPT, insufficient counselling, adherence issues, missed clinic and drug refill appointments and peripheral neuropathy manifested as tingling, burning sensation or pain in the

hand and legs. In other studies completion rates were as high as 96.3%. Contributory factors included integration of TB/HIV clinics, strong counselling, better patients' understanding, adherence and flexible medication refill policy.^{29,40}

Possible hepatotoxicity evidenced in this study by elevated ALT values at the sixth month of IPT initiation was resolved before the end of the twenty-fourth month. While most studies report little risk of hepatotoxicity (0.07 to 1.9%) in IPT, some have demonstrated increased ALT in IPT especially with the use of nevirapine, a potentially hepatotoxic antiretroviral medication.^{23,33,41,42}

Clinical parameters showed an improvement in the CD4⁺ cell counts and viral load. This improved clinical state and lack of active TB infection further reiterates the positive effect of ART/TB co-management.

In conclusion, IPT is beneficial in improving clinical outcomes and preventing development of active TB in HIV-positive children and adolescents.

References

1. Ayles H, Schaap A, Nota A, Sismanidis C, Tembwe R, De Haas P et al Prevalence of tuberculosis, HIV and respiratory symptoms in two Zambian communities: implications for tuberculosis control in the era of HIV. *PLOS One*.2009;4(5)e5602.
2. World Health Organization. Guidelines for intensified tuberculosis case finding case finding and isoniazid preventive therapy for people living with HIV in resource constrained settings 2011. Available at http://globaltb.njms.rutgers.edu/wmatbcourse/module02/guidelines_eng.pdf. Accessed 30th June 2020.
3. Goletti D, Weisman D, Jackson RW, Graham NM, Vlahov D, Klein RS, et al. Effect of *Mycobacterium tuberculosis* on HIV replication; role of immune activation. *Journal of Immunology*. 1996;157:1271-1278.
4. Meya DB, McAdam KP. The TB pandemic: an old problem seeking new solutions. *Journal of Internal Medicine*. 2007;261(4):309-329.
5. Kwan CK, Ernst JD. HIV and Tuberculosis: a Deadly Human Syndemic. *Clinical Microbiology Review*. 2011;24(2):351-376.
6. Bruchfeld J, Correia-Neves, Kallenius G. Tuberculosis and HIV Coinfection. *Cold Spring Harbor Perspectives in Medicine* 2015;5(7):a017871.
7. WHO Three I's Meeting, 2008. Available at https://www.who.int/hiv/pub/meeting_reports/WHO_3Is_meeting_report.pdf?ua=1. Accessed 7th August, 2020.
8. World Health Organization. Antiretroviral therapy for HIV infection in infants and children towards universal access. Recommendation for a public health approach 2010. <https://www.who.int/hiv/pub/paediatric/infants2010/en/>. Accessed 30th December, 2019.
9. Madhi SA, Huebner RE, Doedens L, Aduc T, Wesley D, Cooper PA. HIV-1 co-infection in children hospitalised with tuberculosis in South Africa. *The International Journal of Tuberculosis and Lung Disease*.2000;4:448-454.
10. Zar HJ, Manslo D, Tannebaum F, Klein M, Argent A, Eley R et al. Etiological outcome of pneumonia in human immunodeficiency virus-infected children hospitalized in South Africa. *ActaPediatrix*. 2001;90(2):119-125.
11. Jeena PM, Pillay P, Pillay T, Coovadia HM. Impact of HIV-1 co-infection on presentation and hospital-related mortality in children with culture proven pulmonary tuberculosis in Durban, South Africa. *The International Journal of Tuberculosis and Lung Disease*. 2002;6:672-678.
12. Venturini E, Turkov A, Chiappini E, Galli L, de Martino M, Thorne C. Tuberculosis and HIV co-infection in children. *BMC Infectious Diseases*. 2014;14:S1-S5.
13. WHO, Global Tuberculosis Report. 2019. Available at: https://www.who.int/tb/publications/global_report/en/. Accessed 10th October, 2020.
14. Ren Y, Nutall JJC, Egbers C, Eley BS, Meyers TM, Smith PJ et al. Effect of Rifampicin on Lopinavir pharmacokinetics in HIV-infected children with tuberculosis. *Journal of Acquired Immune-Deficiency Syndrome* 2008;47:566-569.
15. Ren Y, Nutall JJC, Eley BS, Meyers TM, Smith PJ, Maartens G et al. Effect of Rifampicin on Efavirenz pharmacokinetics in HIV-infected children with tuberculosis. *Journal of Acquired Immune Deficiency Syndrome*: 2009;50:439-443.
16. Centre for Disease Control and Prevention Treatment of LTBI and TB for Persons with HIV. 2020. Available at: <https://www.cdc.gov/tb/topic/treatment/tbhiv.htm>. Accessed 4th August, 2020.
17. United States Department for Health and Human Protection. Guidelines for the Use of Antiretroviral Agents in Adults and Adolescents with HIV. 2020. Available at: <https://aidsinfo.nih.gov/guidelines/html/1/adult-and-adolescent-arv/27/tb-hiv>. Accessed 4th August, 2020.
18. Burmen WJ. Issues in the management of HIV-related tuberculosis. *Clinics in Chest Medicines* 2005;26:283-294.
19. Smieja MJ, Marchetu CA, Cook DJ, Smaill FM. Isoniazid for preventing tuberculosis in non-HIV infected persons. *Cochrane Database of Systematic Review*.1999;doi10.1002/14651858 Cd001363.
20. Akolo C, Adetifa I, Shepperd S, Volmink J. Treatment of latent infections in HIV infected persons. *Cochrane Database of Systematic Reviews* 2010;doi: 10.1002/14651858. CD000171 .pub3.
21. Grant AD, Charalambou S, Fielding KL, Day JH,

- Corbent EL, Chaisson RE et al. Effect of routine isoniazid preventive therapy on tuberculosis incidence among HIV-infected men in South Africa. *The Journal of the American Medical Association*. 2005;293(22):2719-2722.
22. Cohen T, Lipsitch M, Walensky RP, Murray M. Beneficial and adverse effects of Isoniazid preventive therapy for latent tuberculosis infection in HIV-tuberculosis co-infected population. *Proceedings of the National Academy of Science of the United States of America* 2006;103(18):7042-7047.
23. Rangaka MX, Wilkinson RJ, Boule A, Glynn JR, Fielding K, Cutsem G. Isoniazid plus antiretroviral therapy to prevent tuberculosis a randomized, double blind, placebo controlled trial. *Lancet*. 2014;384(9944):682-690.
24. Verver S, Warren RM, Beyers N, Richardson M, van der Spoy GD, Borgderff MW. Rate of reinfection tuberculosis after successful treatment is higher than rate of new infection. *American Journal of Respiratory and Critical Care Medicine*. 2005;171:1430-1435.
25. Wang JY, Lee LN, Lai HC, Hsu HL, Liaw YS, Hsueh PR, et al. Prediction of the tuberculosis reinfection proportion from the local incidence. *The Journal of Infectious Diseases*. 2007;196(2):281-288.
26. Uys P, Brand H, Warren R, van der Spuy G, Hoal EG, van Helden PD. The Risk of Tuberculosis Reinfection Soon after Cure of a First Disease Episode Is Extremely High in a Hyperendemic Community. *PLoS One* 2015;doi.org/10.1371/journal.pone.0144487.
27. Getahun H, Granich R, Sculier D, Gumberg C, Blanc L, Num P et al. Implementation of Isoniazid Preventive Therapy for people living with HIV worldwide barriers and solutions. *AIDS*. 2010;24(5):557-565.
28. Gray D, Nuttall J, Lombard C, Davies M, Workman I, Apolles P et al. Low rates of hepatotoxicity in HIV-infected children on antiretroviral therapy with and without Isoniazid prophylaxis. *Journal of Tropical Pediatrics*: 2015;56(3):159-165.
29. Masini EO, Sitienei J, and Weyeinga H. Outcomes of isoniazid prophylaxis among HIV-infected children attending routine HIV care in Kenya. *Public Health Action*. 2013;21:3(3):204-208.
30. Geremew D, Endalamaw A, Negas H M, Eshetie S, Tessema B. The protective effect of isoniazid preventive therapy on tuberculosis incidence among HIV positive patients receiving ART in Ethiopian settings: a meta-analysis *BMC Infectious Diseases* 2019;doi.org/10.1186/s12879-019-4031-2.
31. Division of AIDS (DAIDS). National Institute of Allergy and Infectious Disease. National Institute of Health US department of Health and Human services. Table for grading the severity of adult and pediatric adverse events. 2004; Available at <http://rcc.tech.res.con/DAIDS%20RCC%20forms/>.
32. Yamane In: Determination of appropriate Sample Size, Gauhati University Mathematics Association 1967; 2012 (12) Available at http://Importance_of_the_size_of_Sample_and_its_determination_in_the_context_of_data_related_to_the_schools_of_greater_Guwahati. Accessed 30th September, 2019.
33. Mudzviti T, Shamu T, Chimbetete C, Munengerwa T, Bote S. Tolerability of Isoniazid Preventive Therapy in an HIV-Infected Cohort of Paediatric and Adolescent Patients on Antiretroviral Therapy from a Resource-Limited Setting: A Retrospective Cohort Study. *Drug-Real World Outcomes* 2019;6:37-42.
34. Tiruneh G, Getahun A, Adeba E. Assessing the Impact of Isoniazid Preventive Therapy (IPT) on Tuberculosis Incidence and Predictors of Tuberculosis among Adult Patients Enrolled on ART in Nekemte Town, Western Ethiopia: A Retrospective Cohort Study. *Interdisciplinary Perspectives on Infectious Diseases* 2019;1413427. doi.org/10.1155/2019/1413427.
35. Badri M, Wilson D, Wood R. Effect of highly active antiretroviral therapy on incidence of tuberculosis in South Africa: a cohort study. *Lancet* 2002;359:2059-2064.
36. Semu M, Fenta TG, Medhin G, Assefa D. Effectiveness of isoniazid preventative therapy in reducing incidence of active tuberculosis among people living with HIV/AIDS in public health facilities of Addis Ababa, Ethiopia: a historical cohort study *BMC Infectious Diseases*. 2017;17:5.doi 10.1186/s12879-016-2109-7.
37. Sabasaba A, Mwambi H, Somi G, Ramadhani A, Mahande MJ. Effect of isoniazid preventive therapy on tuberculosis incidence and associated risk factors among HIV infected adults in Tanzania: a retrospective cohort study. *BMC Infectious Diseases*. 2019;19:62. <https://doi.org/10.1186/s12879-019-3696-x>.
38. Ferebee SH, Mount FW. Tuberculosis morbidity in a controlled trial of the prophylactic use of isoniazid among household contacts. *The American Review of Respiratory Disease*. 1962;85:490-510.
39. Comstock GW, Ferebee SH, Hammes LM. A controlled trial of community-wide isoniazid prophylaxis in Alaska. *The American Review of Respiratory Disease* 1967;95(6):935-943.
40. Ousley J, Soe KP, Kyaw NTT, Anicete R, Mon PE, Lwin Het al. IPT during HIV treatment in Myanmar; high rates of coverage, completion and drug adherence. *Public Health Action* 2018;8(1):20-24.
41. Grant AD, Mngadi KT, van Halsema CL, Luttig MM, Fielding KL, Churchyard GJ (2010). Adverse events with isoniazid preventive therapy: experience from a large trial. *AIDS*. 2010. 24(Suppl 5):S29-S36.
42. Tedla Z, Nyirenda S, Peeler C, Agizew T, Sibanda T, Motsamai O, et al. Isoniazid-associated hepatitis and antiretroviral drugs during tuberculosis prophylaxis in hiv-infected adults in Botswana. *American Journal of Respiratory and Critical Care Medicine*. 2010;182(2):278-285.

Occupational Safety Practices among Butchers in Selected Abattoirs in Igabi LGA, North-Western Nigeria

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Abstract

Butchers are exposed to diverse hazards in the course of their daily duties. This risk demands that appropriate precautionary measures be taken to forestall workplace injuries and infections among them and safeguard public health via the consumption of meat and meat products. The objective is to determine and assess the occupational safety practices among butchers in selected abattoirs in the study area. A descriptive, cross-sectional study was conducted among 321 butchers selected by stratified random sampling technique. Questionnaires were used to collect data, which were analysed using SPSS (version 21). Occupational safety practices were assessed and graded. Results were presented in tables and charts. Chi-square (χ^2) was used to test for associations between variables (p -value ≤ 0.05). Most respondents were within the age groups of 20-29 years (38.6%) and 30-39 years (37.4%), all were males and almost two-thirds (61.1%) were married. About 76.9% had at least secondary education. Almost half of them (44.2%) had average occupational safety practices; while another half (47.3%) had below average levels of safety practices. Marital status was the only statistically significant determinant of practicing occupational safety precautions. A low level of observance of safety practices, reflecting the situation in many other developing countries, was demonstrated. This calls for urgent and immediate interventions by health and veterinary authorities to institute formal and continuous training of abattoir workers on the need to consistently observe all safety measures.

Keywords: abattoirs, butchers, occupational, practices, safety

Introduction

Butchery is the occupation that involves the slaughtering of animals in abattoirs (slaughter houses) and the preparation and/or processing of the meat (or meat products) for sale for public consumption. It dates back to time immemorial and has evolved over time to a huge industry, involving the use of tools and machinery of diverse types, particularly in the developed world.¹ Data for the exact global estimates of the manpower employed in this industry is not readily available.² This is largely due to fragmented data, variations in the occupational or industrial classification systems adopted by different countries or even outright non-existent data as is obtainable in many low and medium income countries. Global meat output and consumption levels have increased significantly in the recent past decades and are still projected to rise.²⁻⁴

Like workers involved in any other occupation, butchers are exposed to a number of hazards.^{1,2,5-9} These include biological hazards, particularly zoonotic infections and infestations, largely stemming from their close contacts with animals. Infections such as brucellosis, bovine tuberculosis, toxoplasmosis etc as well as infective dermatitis and *tinea pedis* are not uncommon among butchers.^{1,2,5,6,8,9} A Malaysian study reported that infectious diseases were the most prevalent occupational health problems among abattoir workers.⁶ Another study reported that many Nigerian abattoirs operate under unhygienic conditions while a Kenyan study revealed poor slaughter processes in abattoirs which all contribute to making the transmission of zoonotic infections rife.^{1,8} Butchers are also at risk of physical hazards such as injuries from sharp working tools, animal kicks, slips and falls from wet floors as well as musculoskeletal conditions like tenosynovitis of the upper limb joints and also back and shoulder pains.^{2,5-9} The latter are often linked to the frequent monotonous movements (often in awkward or uncomfortable positions) characteristic of their daily tasks, which include handling animals or their carcasses and the lifting or carrying of the same.⁶ While cuts from knives and bones constituted the highest occupational health problems among butchers in a southern Nigerian study (ranging between 50.3%-87.3%),⁸ authors working among butchers in Kano, northern Nigeria reported about 88.2% and 74.5%

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twelve months prevalence and point prevalence rates, respectively of work-related musculoskeletal disorders among them.⁷

With the advent of the aforementioned evolution in the meat industry leading to the use of sophisticated tools and machinery, butchers may also be exposed to mechanical and electrical hazards resulting in diverse types of injury including hearing impairment from prolonged exposure to loud noises and also electric shocks.^{2,5,6,8,9} These categories of hazards are quite insignificant in many developing countries owing to the rather rudimentary slaughter houses and processes therein;^{1,8} as opposed to developed countries where the meat industry is well advanced. For example, the highly mechanised meat industry in the United States is reported to account for 3 times more injury and illness rates relative to the entire manufacturing sector.^{2,9}

In view of these challenges, it is pertinent for butchers and authorities in the meat industry to ensure that adequate precautionary measures are taken to make their working environment safer to operate in.² Furthermore, considering that the meat industry not only employs labour, the products therefrom are also consumed by far many more individuals in the general public; thus, making this a topical public health concern.^{1,11} The intentional institution of standard precautionary measures in abattoirs and the adoption of occupational safety practices by the workers therein are generally acclaimed to avert many workplace accidents (bringing them to the barest minimum) by reducing occupational hazards or even eliminating them completely.^{2,5,8-10} This study's objective is to determine and assess the occupational safety practices among butchers in selected abattoirs in Igabi Local Government Area (LGA) in Kaduna State, north-western Nigeria.

Materials and Methods

Igabi LGA is located in the central area of Kaduna State and is made up of 13 districts. It partly extends into Kaduna metropolis (the State capital), but most of it is largely rural. It has an estimated population of 647,098 people. Majority of the inhabitants are Gbagyis, Hausas and Fulanis; other ethnic groups such as Igbos, Yorubas, Igalas etc also reside in the area. It is mainly an agrarian area with many of the inhabitants being peasant farmers. Animal husbandry is also practised (more of cattle rearing). The major abattoirs within the LGA are located in Rigasa, Igabi, Rigachikun, Afaka, and Maraban Jos. A descriptive, cross-sectional study was conducted among butchers working in these abattoirs. The calculated sample size was 266 with a 10% non-response rate (26.6) inputted resulting in a sample size of 293.

Stratified random sampling technique based on proportion was used to obtain the sample size from

the five major abattoirs. Based on information obtained from the Chairman of Igabi Butchers' Association, Rigasa abattoir is the largest with approximately 200 butchers who sometimes run shifts on alternate days. Igabi abattoir has 40 butchers, while Rigachikun and Afaka abattoirs have 50 butchers each, and Maraban Jos has 60 butchers; bringing the total number of butchers to approximately 400. Thus, the proportions of respondents per abattoir and the minimum number selected per abattoir are as follows:

Rigasa: $(200/400) \times 100 = 50\%$ of 293 (147 butchers)

Igabi: $(40/400) \times 100 = 10\%$ of 293 (29 butchers)

Rigachikun and Afaka: $(50/400) \times 100 = 12.5\%$ of 293 each (37 butchers each)

Maraban Jos: $(60/400) \times 100 = 15\%$ of 293 (44 butchers)

In each abattoir, simple random sampling method (by balloting) was used to select eligible respondents. More respondents than the minimum sample size were selected in each abattoir, thus a total of 321 butchers participated in the study.

Semi-structured, pre-tested, interviewer-administered questionnaires were used to collect data. Questions for practice of occupational safety precautions were scored 2 marks for each correct answer, 1 mark for each incorrect answer, while unknown answers and non-responses scored zero. The scores were added up and converted to percentages. The scoring system was graded as follows: $\geq 70\%$ (very good), 60-69% (good), 50-59% (average), 40-49% (fair) and $<40\%$ (poor). Data were analysed using Statistical Package for Social Sciences (SPSS-version 21). Results were presented in tables and charts. Chi-square(χ^2) was used to test for associations between variables (p -value ≤ 0.05).

Ethical clearance was obtained from the Research Ethical Committee of Barau Dikko Teaching Hospital, Kaduna. Permission was obtained from the authorities of Igabi LGA (Veterinary Department) and the Chairman of Igabi Butchers' Association. Respondents' anonymity and the confidentiality of the information obtained from them were assured, after which informed consent was obtained from each participant.

Results

Table 1 shows that most of the respondents were within the age groups of 20-29 years (38.6%) and 30-39 years (37.4%), all were males and almost two-thirds (61.1%) were married. Over three-quarters of them (76.9%) had at least secondary education; and more than one-third (35.8%) had 6-10 years working experience as butchers.

Table 2 reveals that only 36.4% of the respondents consistently used protective wears while working and 63.6% of them washed their protective wears daily. Out of the 298 (92.8%) butchers who

Table 1: Sociodemographic Profile of Respondents (n=321)

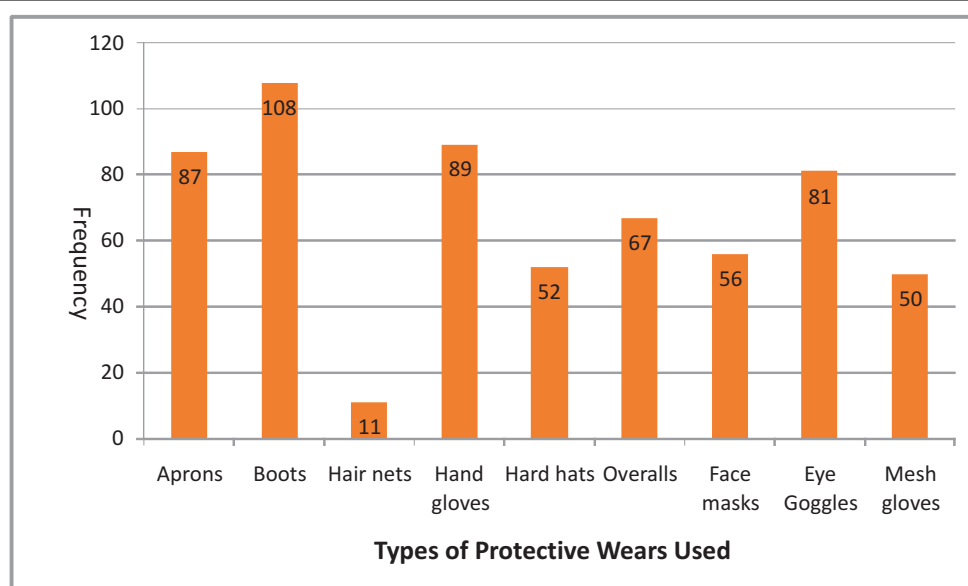
Variable	Freq. (%)	Variable	Freq. (%)
Age (years)		Marital status	
10-19	28 (8.7)	Single	112 (34.9)
20-29	127 (38.6)	Married	196 (61.1)
30-39	120 (37.4)	Divorced	1 (0.3)
40-49	34 (10.6)	Separated	12 (3.7)
50-59	11 (3.4)		
≥ 60	1 (0.3)	Level of education	
Sex		Qur'anic	34 (10.6)
Male	321 (100)	Primary	40 (12.5)
Female	0 (0.0)	Secondary	228 (71.0)
		Tertiary	19 (5.9)
Tribe		Duration of working experience (years)	
Hausa	305 (95)	1-5	42 (13.1)
Igbo	3 (0.9)	6-10	115 (35.8)
Yoruba	5 (1.6)	11-15	81 (25.3)
Others (Kanuri, Fulani etc)	8 (2.5)	16-20	37 (11.5)
		>20	46 (14.3)

Table 2: Personal Hygiene and Protective Practices among Respondents (n=321)

Variables	Frequency (%)
Practice of Always Wearing Protective Wears While Slaughtering Animals	
Yes	117 (36.4)
No	204 (63.6)
Frequency of Washing Protective Wears	
After slaughtering each animal	58 (18.1)
Once daily	204 (63.6)
Once in a week	42 (13.1)
Once in a month	17 (5.2)
Washing of Working Tools	
Yes	298 (92.8)
No	23 (7.2)
Timing of Washing of Working Tools (n=298)	
Once before slaughtering animals	17 (5.7)
Once after slaughtering animals	92 (30.9)
Before and after slaughtering animals	189 (63.4)
Hand-washing During Meat Handling	
Yes	269 (83.8)
No	52 (16.2)
Timing of Hand washing in Relation to Meat Handling (n=269)	
Before handling meat	15 (5.6)
After handling meat	82 (30.5)
Before and after handling meat	172 (63.9)
Items Used in Hand-washing (n=269)	
Water only	110 (40.9)
Water and soap	79 (29.4)
Water and detergent	80 (29.7)
Temperature of Water Used in Hand-washing (n=269)	
Cold water	207 (77.0)
Warm water	20 (7.4)
Both cold and warm water	42 (15.6)

washed their tools, 63.4% did so before and after slaughtering animals. About 269 (83.8%) of the respondents washed their hands while handling meat.

Figure 1 shows the most frequently used protective wears, which were boots (33.6%), hand gloves (27.7%) and aprons (27.1%).



(*Multiple responses were entertained)

Figure 1: Types of Protective Wears Used By Respondents (n=321)

Table 3: Workplace Behaviour and Practices among Respondents (n=321)

Variables	Frequency (%)
Direction of Handling Knives During Meat-cutting (in relation to butcher's body)	
Towards the direction of the body	263 (81.9)
Away from the direction of the body	58 (18.1)
Hanging of Carcasses (after slaughtering to facilitate bleeding, evisceration etc)	295 (91.9)
Yes	
Meat Inspection After Slaughtering of Animals	200 (62.3)
Yes	
Cleaning & Sharpening of Knives & Other Cutting Implements Before Slaughtering Animals	274 (85.4)
Yes	
Storage of Knives & Other Sharps in Scabbards & Sheaths	230 (71.7)
Yes	
Smoking in Abattoir Premises	29 (9.0)
Yes	
Eating in Abattoir Working Environment	115 (35.8)
Yes	
Wearing of Jewelry while Processing Meat	66 (20.6)
Yes	
Methods of Disposal of Wastes Generated in the Abattoirs	
Incineration	16 (5.0)
Burying	12 (3.7)
Dumping in the nearby surface waters	43 (13.4)
Open dumping	230 (71.7)
Burning	20 (6.2)
Regular Inspection of Abattoirs By Health Authorities	73 (22.7)
Yes	

Cleaning and sharpening of knives and other such implements before slaughtering animals was practised by 85.4% of them; and these tools were stored in sheaths and scabbards by 71.7% of the respondents. Smoking, eating and the use of jewelry in the working premises or during working hours were acknowledged

by 9%, 35.8% and 20.6%, respectively. The predominant method of disposing of abattoir wastes was by open dumping (71.7%). Only 22.7% of the butchers acknowledged regular inspection of the abattoirs by health authorities (Table 3).

A total of 55 respondents (17.1%) had

Table 4: Health-seeking Behaviour and Practices of Respondents (n=321)

Variables	Frequency (%)
History of Diarrhoea, Skin Disease, Back Pain or Sore Throat in the Last 3Months	
Yes	55 (17.1)
No	266 (82.9)
Formal Reporting of Illness to Health Authorities (n=55)	
Yes	25 (45.5)
No	30 (54.5)
Approach to Treatment of Illness (n=55)	
Self-medication	16 (29.1)
Visit to chemist	28 (50.9)
Visit to hospital	10 (18.2)
Others (visit to herbalist)	1 (1.8)
Continuation of Work During Period of Illness (n=55)	
Yes	29 (52.7)
No	26 (47.3)
Duration of Stay Away From Work (n=26)	
Less than one week	11 (42.3)
1-2 weeks	14 (53.8)
3-4 week	1 (3.9)
Condition(s) Informing Resumption to Work (n=26)	
After feeling fit enough to work again	7 (26.9)
After health workers' clinical assessment	1 (3.9)
After feeling generally better	14 (53.8)
Just decided to resume work	4 (15.4)
Regular Medical Examination among Butchers(n=321)	
Yes	71 (22.1)

Table 5: Grading of Respondents' Occupational Safety Practices(n=321)

Score (%)	Grade	Frequency (%)
≥70	Very good	1 (0.4)
60-69	Good	26 (8.1)
50-59	Average	142 (44.2)
40-49	Fair	125 (38.9)
<40	Poor	27 (8.4)

experienced symptoms of infectious diseases 3 months prior to the study; such as diarrhoea, skin disease and sore throat. Out of these, 45.5% had formally reported to health authorities; only 18.2% visited hospitals and 52.7% continued working in spite of their symptoms. Out of the 26 (47.3%) butchers who stayed away from work due to ill health, only one resumed duty following an assessment by a health worker. Overall, only 22.1% of the butchers consented to undergoing regular medical examination (Table 4).

Almost half (44.2%) of the respondents had average occupational safety practices; another half (47.3%) had below average levels of safety practices (Table 5). Table 6 reveals that marital status

was the only statistically significant determinant of practicing occupational safety precautions (p-value=0.048); all other socio-demographic characteristics were not significant.

Discussion

Over three-quarters of the respondents were within the age groups of 20-29 years (38.6%) and 30-39 years (37.4%). Almost two-thirds (61.1%) were married and all were males. This corresponds with studies in northern Nigeria where the occupation was predominantly practised by males;^{8,13} as opposed to findings in the southern parts of the country and outside Nigeria.^{2,6,8,10-11,13-15} This is likely due to the

Table 6: Bivariate Analysis between socio-demographic characteristics of respondents and their practice of occupational safety precautions (n=321)

Variables	Poor(%)	Fair(%)	Average(%)	Good(%)	Very Good (%)	Total(%)
Age (years)						
10-19	0 (0)	4 (18.2)	13 (59.1)	5 (22.7)	0 (0)	22 (100)
20-29	9 (7.1)	21 (16.5)	77 (60.6)	18 (14.2)	2 (1.6)	127 (100)
30-39	12 (9.5)	20 (15.8)	64 (50.8)	27 (21.4)	3 (2.4)	126 (100)
40-49	3 (8.8)	2 (5.9)	25 (73.5)	3 (8.8)	1 (2.9)	34 (100)
50-59	0 (0)	2 (18.2)	6 (54.5)	3 (27.3)	0 (0)	11 (100)
≥60	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	1 (100)
Total	24 (7.5)	49 (15.3)	185 (57.6)	57 (17.8)	6 (1.9)	321 (100)
p = 0.568 df= 20 $\chi^2=18.292$						
Tribe						
Hausa	24 (7.9)	47 (15.4)	174 (57.0)	54 (17.7)	6 (2.0)	305 (100)
Igbo	0 (0)	0(0)	2 (66.7)	1 (33.3)	0 (0)	3 (100)
Yoruba	0 (0)	0 (0)	3 (60.0)	2 (40.0)	0 (0)	5 (100)
Others (Kanuri,Fulanietc)	0 (0)	2 (25.0)	6 (75.0)	0 (0)	0 (0)	8 (100)
Total	24 (7.5)	49 (15.3)	185 (57.6)	57 (17.8)	6 (1.9)	321 (100)
p = 0.857 df = 12 $\chi^2 = 7.004$						
Marital Status						
Single	5 (4.5)	20 (17.9)	71 (63.4)	15 (13.4)	1 (0.9)	112 (100)
Married	17 (8.7)	28 (14.3)	105(53.6)	41 (20.9)	5 (2.6)	196 (100)
Divorced	1 (100)	0 (0)	0 (0)	0 (0)	0 (0)	1 (100)
Separated	1 (8.3)	1 (8.3)	9 (75.0)	1 (8.3)	0 (0)	12 (100)
Total	24 (7.5)	49 (15.3)	185 (57.6)	57 (17.8)	6 (1.9)	321 (100)
p = 0.048 df = 12 $\chi^2 = 21.137$						
Level of Education						
Qur'anic	2 (5.9)	6 (17.6)	23 (67.6)	3 (8.8)	0 (0)	34 (100)
Primary	3 (7.5)	2 (5.0)	26 (65.0)	8 (20.0)	1 (2.5)	40 (100)
Secondary	17 (7.5)	37 (16.2)	131 (57.5)	39 (17.1)	4 (1.8)	228 (100)
Tertiary	2 (10.5)	4 (21.1)	5 (26.3)	7 (36.8)	1 (5.3)	19 (100)
Total	24 (7.5)	49 (15.3)	185 (57.6)	57 (17.8)	6 (1.9)	321 (100)
p = 0.215 df = 12 $\chi^2 = 15.499$						
Duration of Working Experience (years)						
1-5	3 (7.5)	7 (17.5)	23 (57.5)	7 (17.5)	0 (0)	40 (100)
6-10	5 (4.3)	22 (19.0)	67 (57.8)	18 (15.5)	4 (3.4)	116 (100)
11-15	8 (9.8)	11 (13.4)	42 (51.2)	21 (25.6)	0 (0)	82 (100)
16-20	4 (10.3)	4 (10.3)	22 (56.4)	7 (17.9)	2 (5.1)	39 (100)
>20	4 (9.1)	5 (11.4)	31 (70.5)	4 (9.1)	0 (0)	44 (100)
Total	24 (7.5)	49 (15.3)	185 (57.6)	57 (17.8)	6 (1.9)	321 (100)
p = 0.213 df = 16 $\chi^2 = 19.149$						

predominantly conservative culture in the far north which would rather keep the women folk in seclusion and also tends to exempt them from engaging in vocations that involve rigorous activities. About 76.9% of the respondents had at least secondary level of education; and only 13.1% had less than 6 years working experience as butchers.

With regards to the use of protective wears (Table 2), only one-third of the butchers (36.4%) attested to consistently wearing them while working.

This is corroborated by similar studies in Kano, northern Nigeria (37.36%)¹² and Uganda (<40%),¹⁴ but lower than reports from authors in Kenya (53%) and Brazil (47.3%).^{1,10} The non-use of protective wears is a recognised occupational health risk for infections and injuries among abattoir workers.^{1,5-6,8-9,11-12,15} The most frequently used protective wears were boots, hand gloves and aprons- and these were worn by only a few (Fig. 1). This is consistent with a study in Uyo, southern Nigeria.⁸ About 81.7% of the butchers washed their work clothings at least once daily and a large majority of them (92.8%) washed their working tools. Hand-washing in relation to meat-handling was observed by 83.8% of them. These are commendable hygienic practices. However, only 29.4% used soap and water for hand-washing. Majority (77%) used cold water instead of warm water, which is more guaranteed to effectively rid their hands of the animal fat, blood and other secretions they may have been exposed to, particularly after handling animal carcasses with bare hands, as most of them do. Standard guidelines recommend the use of soap as well as warm or hot water for hand hygiene and for cleaning working tools and surfaces, respectively.¹ These measures when strictly adhered to, forestall meat contamination and hence, secure public health.^{5,11,15}

Certain workplace habits are known to impact on the safety of butchers. Some of these include the manner of use and storage of sharp tools and good house-keeping practices in general.^{5,9} In this study, only 18.1% of the butchers handled knives and other sharp tools by cutting away from the direction of their bodies (Table 3), which is unsafe both for them and other butchers, particularly in overcrowded working spaces.^{8,9} Furthermore, 71.7% of them kept their knives and other sharps in sheaths and scabbards and 85.4% cleaned and sharpened such implements before slaughtering animals. Cutting tools may become blunt due to repeated use or by being laden with animal fat, blood and secretions; and dull or poorly-designed implements would require more exertion of force, leading to exhaustion and the danger of sustaining cuts and musculoskeletal injuries.^{8,9} Smoking and eating around the abattoir premises were admitted by 9% and 35.8% of the butchers, respectively. A Kenyan study reports that 21% of the butchers eat at the slaughterhouse, including animal carcasses cooked over nearby open fires.¹ Such practices contribute to the transmission of zoonotic and other infectious diseases from hand to mouth and should be discouraged.^{1,5,13} About 20.6% wore jewelry and accessories such as rings, bracelets and watches while handling meat. These could serve as niches for microbes to proliferate and thus, contribute to meat contamination.

Similar to the aforementioned study conducted in Kenya where 18% of the butchers reported ill,¹ about 55 butchers (17.1%) in this study had taken ill with

diarrhoea, skin disease, back pain or sore throat in the preceding 3 months (Table 4). Only 25 (45.5%) of them formally reported to appropriate health authorities. This is slightly lower than findings from a South African study also conducted in a largely rural setting (55%).¹⁵ Out of the 55 ill butchers in this study, only 18.2% visited hospitals in contrast to the 47.5% in the South African study;¹⁵ the others either self-medicated or consulted chemists or herbalists. These actions reflect poor health-seeking practices among the butchers. Work continued as usual for about half (52.7%) of them, and resumption to work following a health worker's clinical assessment was reported by only one butcher (3.9%). Working while ill should be discouraged, as such butchers pose a threat to the health of other workers and are a potential source of meat contamination.¹

Overall, almost half (44.2%) of the butchers in this study had average occupational safety practices, and another half (47.3%) were below average (Table 5). A similar study in Kano, northern Nigeria reported that 95% of their respondents had only fair safety practices.¹² This is further corroborated by another study in the neighbouring Katsina State that the overall level of practice of abattoir safety measures was low among majority of the butchers understudied.¹⁶

Marital status was the only statistically significant determinant of practicing occupational safety precautions in this study (Table 6), with married men being more likely to observe occupational safety precautions. This may be attributed to the relatively higher sense of responsibility this status may confer on the married respondents, who have numerous dependents (such as wives, children and extended family members) to cater for compared to the bachelors among them. A Malaysian study found gender to be a significant determinant, with females having better practices.¹¹ However, all the respondents in this index study are males.

Conclusion

Occupational safety practices were found to be average among many of the butchers in this study; less than 10% of them had good practices with almost half being below average. Marital status was the only significant determinant of practice. This low level of practice reflects the situation in many other developing countries. It calls for urgent and immediate attention to be given to the formal sensitisation and awareness of abattoir workers in this area, in order to create awareness on the need to consistently observe all safety measures. Health and veterinary authorities as well as labour unions and associations in this sector need to ensure the adherence to all regulations and practices that will make for safe and healthy working environments in all slaughter houses.

References

1. Cook EAJ, de Glanville WA, Thomas LF, Kariuki S, de Clare Bronsvort BM and Fèvre EM. Working conditions and public health risks in slaughterhouses in western Kenya. *BMC Public Health* 17, 14 (2017).
2. Tomoda S. Safety and health of meat, poultry and fish processing workers- International Labour Organization (ILO) Working Papers 993220483402676. Available at: https://www.ilo.org/global/topics/safety-and-health-at-work/resources-library/publications/WCMS_219576/lang--en/index.htm (Accessed on the 11th of November, 2020)
3. Food and Agricultural Organisation (FAO). Meat Market Review: Overview of global meat market developments in 2018, March 2019. Rome. Available at: <http://www.fao.org/3/ca3880en/ca3880en.pdf> (Accessed on the 10th of November, 2020)
4. Sohaib M and Jamil F. An Insight of meat industry in Pakistan with special reference to halal meat: a comprehensive review. *Korean Journal for Food Science of Animal Resources* 2017; 37(3):329-341
5. Occupational Safety and Health Council, Labour Department. Occupational health for butchers, July 2006. Available at: <https://www.labour.gov.hk/eng/public/oh/butcher.pdf> (Accessed on the 10th of November, 2020)
6. Abdullahi A, Hassan A, Kadarman N, Yakubu J, Adeyemo O and Lua PL. Occupational hazards among the abattoir workers associated with non-compliance to the meat processing and waste disposal laws in Malaysia. *Risk Management Healthcare Policy* 2016; 9:157-163
7. Kaka B, Idowu OA, Fawole HO, Adeniyi AF, Ogwumike OO and Toryila MT. An analysis of work-related musculoskeletal disorders among butchers in Kano metropolis, Nigeria. *Safety and Health at Work* 2016; 7(3):218-24
8. Johnson OE and Etokidem AJ. Occupational hazards and health problems among butchers in Uyo, Nigeria. *Nigerian Medical Journal* 2019; 60(3):106-112
9. Occupational Safety and Health Administration (OSHA). Safety and health guide for the meatpacking industry. U.S. Department of Labor. Available at: <https://www.osha.gov/Publications/OSHA3108/osha3108.html> (Accessed on the 13th of November, 2020)
10. Takeda F, Moro ARP, Machado L and Zanella AL. Indicators of work accidents in slaughter refrigerators and broiler processing. *Brazilian Journal of Poultry Science* 2018; 20(2), 297-304
11. Abdullahi A, Hassan A, Kadarman N, Saleh A, Baraya YS, Lua PL. Food safety knowledge, attitude, and practice toward compliance with abattoir laws among the abattoir workers in Malaysia. *International Journal of General Medicine* 2016; 12(9):79-87
12. Gajida AU, Ibrahim UM, Iliyasu Z, Jalo RI, Chiroma AK and Saidu FA. Knowledge of occupational hazards, and safety practices among butchers in Kano metropolis, Kano State, Nigeria. *Pyramid Journal of Medicine* 2019; 2:41 43-48
13. Banjo TA, Onilude AA, Amoo AOJ, Busari A., Ogundahunsi OA, Olooto WE, Familoni OB, Amballi AA, Oyelekan AAA and Abiodun OA. Occupational health hazards among abattoir workers in Abeokuta. *Academia Arena* 2013; 5(10):29-36
14. Kyayesimira J, Rugunda GK, Bunny LJ and Matofari JW. Compliance to post-harvest handling practices of beef along the beef value chain in Uganda. *Journal of Nutrition & Weight Loss* 2019; 4(1)-116:1-5
15. Nyamakwere F, Muchenje V, Mushonga B, Kandiwa K, Makepe M and Mutero G. Evaluation of meat safety knowledge, attitudes and practices among slaughter house workers of Amathole District in Eastern Cape Province, South Africa. *Journal of Food Safety & Hygiene* 2017; 3(1-2):7-15
16. Olutegbe NS and Ikwuakam OT. Awareness and utilization of abattoir safety measures in Katsina South and Central Senatorial Districts, Nigeria. *Journal of Agricultural Extension* 2017; 21 (3):1-10

Impact of Household Use of Fuelwood for Cooking on the Health of Women in Nigeria.

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Abstract

The study assessed the impact of cooking with fuel wood on the health of women among households in Nigeria using secondary data on National Demographic Health Survey [DHS] (2018-19). The study employed descriptive statistics, Logistic and Tobit regressions.

The result showed that the mean household size is 6, with 66% of the households having only one woman. Also, 86% of the household heads are male, with an average age of 44years. The poorest class has the highest frequency of wealth classification of 29%. The health symptoms recorded include cough by 35%, shortness of breath 33% blocked nose 24%. The coefficient of the proportion of women in the household, sex of household head and the coefficient of poor/poorer household are all positive and significant at 1% to the likelihood of using fuelwood. The results also revealed that cooking with fuel wood significantly causes shortness of breath at 5% level.

The study concludes that some of the households' socio-economic characteristics strongly influence the likelihood of household choice for fuelwood. Moreover, blocked nose and chest symptoms, including shortness of breath, are the major respiratory problems experienced by women who cook with fuelwood. It is therefore recommended that policies aimed at poverty reduction, efficient energy utilization and the sensitization on the harmful effect of cooking with fuel wood to both rural and urban households should be employed.

Keywords: Household, fuelwood, cooking, health, women

Introduction

Households in developing countries use wood, charcoal and other solid fuels (mainly agricultural residues and coal) as their sources of cooking fuel and

are often burned in open fires or poorly functioning stoves.¹

In Nigeria, the pattern of energy demand shows that the household sector is characterized by various energy sources with records of high use of dirty fuels. About 86% of rural households and a high proportion of urban poor households depend on inefficient energy sources.² These inefficient energy sources result in incomplete combustion that release minute substances detrimental to human health in the household environment.³

Indoor air pollution is associated with the use of solid fuels which, when exposed to it has been implicated, with various degrees of certainty, as a causative factor in several adverse health outcomes. In total, around 1.6 million deaths a year could be attributed to indoor air pollution of this type globally.⁴ Similarly, among the rural women and children who have had long time exposure to biomass combustion, a good number present with chronic obstructive lung diseases. Other ailments include heart diseases, acute respiratory infections, low birth weight, eye disorder, conjunctivitis, blindness and cancer.⁵ Often Chronic Obstructive Pulmonary Disease [COPD] caused by exposure to smoke from biomass fuels are seen in women with the presence of lower Body Mass Index (B.M.I.) and more clinical symptoms.⁶ Thus, the implication to this means there is a strong correlation between the high elemental concentration of aerosol particles, increased mortality and high morbidity in biomass users.⁷

Despite the availability of alternative clean sources of cooking, wood fuel remains the primary fuel in many States of Nigeria among women cooking in both indoor and outdoor kitchen locations. Moreover, cooking with such energy is one of the causes of respiratory diseases. There are a lot of studies conducted on the health implication of cooking with inefficient energy sources. To mention but a few⁸ looked at the prevalence factors associated with the use of alternative energy sources for cooking, attitude, as well as barriers. While⁹ examined the quality of air at a cooking point, Carbon dioxide (CO₂) concentration in-breath and Carboxyhemoglobin (CoHb) in a village in Ogun state. However, these studies did not analyze the extent to which the health implication impended the health of the women cooking with fuelwood, as well as

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specify the significant health symptoms caused by the smoke emanating from the use of wood fuel.

This study, therefore, bridges a gap in research by considering a broader/macro perspective in terms of the study area. It examines the socio-economic characteristics of the households that cook with fuel wood in Nigeria, determines the factors that influence the choice of fuel wood for cooking, identifies the major respiratory ailments reported by the women and assesses the health impact of wood fuel used in cooking.

Materials and Methods

Study Area

The study area is Nigeria which lies between latitudes 4° 12' 40.37" N to 13°51' 36.50 " N of the equator and longitudes 2° 45' 47.735" E to 14°42' 55.123" E of the Greenwich meridian. Nigeria spans over an area of 923,768 sq. km (356,669 sq mi), extending 1,127 km (700 mi) East to West and 1,046 km (650 mi) North to South. The country has 36 states and a projected population of 214, 312, 387 at the end of 2019.¹⁰

Sources of Data

This study utilizes 2018 Demographic and Health Survey [11] for Nigeria by National Population Commission (N.P.C.) and I.C.F. International (2018) which covered the entire population residing in non-institutional dwelling units in the country. The survey adopted cluster sampling frame of Enumeration Areas (E.A.s) used for the 2006 population census in Nigeria. The data set considered a total of 904 cluster zones, 372 urban areas and 532 rural areas and a sample of 40,680 households based on random sampling.

Model Specification and Method of Estimation

Descriptive Statistics

Descriptive statistics was used in describing the characteristics of the data sets through the use of frequencies, mean and standard deviation. Hence, it presents the socio-economic factors of the household heads and their respiratory symptoms.

Logistic Model

Logistic regression procedure was used to determine the socio-economic factors affecting wood fuel consumption in Nigeria and the implication of cooking indoor or outdoor on the health of women in Nigeria. The choice of the model was informed by the fact that it is the appropriate statistical technique for analyzing models of dichotomous dependent variables¹². The equation is presented in this form:

$\ln[p/(1-p)] = \alpha + \sum (\beta_k)(X_k)$, where p is the probability that a household uses fuel other than wood to cook. $p/(1-p)$ is the odds that a household uses an energy source other than wood to cook. α is a constant term, β_k

represents the effects parameters of the explanatory variables, and X_k represents the explanatory variables in the model. Coefficient in a logit model give the change in the log-odds of using alternative fuel for a unit change in the explanatory variables.

Results

The descriptive results show that about 45% of the households have 5-8 members with a mean size of 6 and also 66% have one wife with a mean of 1. The household gender with the highest frequency is male with 86% and about 34% fall within the age group of 31-43 years with 44 years as the average age. The

Table 1: Household Socioeconomic Factors and Respiratory Symptoms

Variables	Frequency	Mean	St. dev
Size			
1-4	36	6	3
5-8	45		
9-12	13		
13-16	4		
>=17	2		
Women			
1	66	1	0.8
2	24		
3	7		
4	2		
>=5	1		
Sex			
Male	86	0.9	0.3
Female	14		
Age			
18-30	19	44	14
31-43	34		
44-56	28		
57-69	14		
>=70	6		
Wealth index			
Poorest	24	-29025	85807
Poorer	23		
Middle	21		
Richer	19		
Richest	13		
Place of Cooking Food			
Indoor	54		
Outdoor	44		
Respiratory Symptoms			
Cough	34	0.9	0.06
Shortness of breath	33	0.9	0.1
Blocked nose	24	0.7	0.4
Blocked chest	5	0.2	0.3
Blocked nose and chest	4	0.1	0.3

Source: DHS, 2018.

Table 2: The Socioeconomic Determinants of Fuel Wood Consumption in Nigeria

Variable	Coefficient	standard error	t value	p>[t]
Constant	2.769	1.287	2.08	0.037**
Womenhh	1.896	0.0348	5.46	0.000***
Sex	1.595	0.053	2.99	0.003***
Age	-0.299	0.011	-26.94	0.000***
Richest	-0.186	0.0063	-29.1	0.000***
Richer	-0.676	0.109	-6.15	0.000***
Middle	-0.298	0.111	-2.68	0.005***
poor/poorer	0.48	0.165	2.91	0.004***
log likelihood	-6726.4			
chi2 value	9506.5			
prob chi2	0.000***			

Source: DHS,2018.

Table 3: Health Impact of Cooking with Fuel wood on Women

Variable	Coefficient	Standard error	T value	p>[t]
Constant	1.049	0.106	9.91	0.000***
Had cough	-0.639	0.119	-0.54	0.591 ^{NS}
Shortness of breath	0.122	0.064	1.91	0.056**
Blocked chest and nose	-0.051	0.013	-3.63	0.000*
Log-Likelihood	-36756.53			
Chi2 value	0.0017			
Prob Chi2	0.002*			

Source: DHS, 2018

wealth classification index shows that the poorest households constitute the majority with 29% and a mean wealth index of - N29,025. Majority (54%), cook in an indoor location. The major respiratory symptoms recorded included cough with 34%, shortness of breath 33% and blocked nose 24%.

The results on the household's likelihood to choose fuel wood for cooking in Table 2 showed that the log-likelihood value is greater than one and is significant at 1%. The findings also revealed that all the coefficient of the variables considered i.e. proportion of women, sex, age and wealth classifications (richest, richer, middle and poor/poorer) are positive and significant at 1%.

From Table 3, it can be observed that the log-likelihood value of the model is significant at 1%. This indicates that the variables are fit for the equation. Thus, it determines the relationship between the smoke from cooking with fuel wood and its impact on the health of women. The respiratory symptoms assessed in the study revealed that the cough had a negative and

an insignificant coefficient, while, the coefficient of shortness of breath and blocked chest and nose were positive and significant at 5% and 1% respectively.

Discussion

The mean household size obtained from this study coincides with the findings of⁶ and the average number of women in the households and the gender of the household head in the study were similar to the results of² for Nigerian households. Also the wealth classification of the households agrees with the findings of.¹⁶ With regards to the use of fuel wood, it was reported to cause some acute and chronic respiratory symptoms such as cough, shortness of breath, blocked nose, blocked chest and nose and chest together. These results were consistent with other studies.^{13, 14 & 15.}

Furthermore, the findings revealed that the proportion of women in the household influences the use of fuel wood for cooking. This indicates that *ceteris*

parabus an addition of a co-wife in a household would increase the likelihood to use fuelwood. It could be attributed to the fact that an increase of one more wife, means more financial burden on the existing household income. Thus, the household head would have no other option being the financial supporter as reported by,^{16,17} than to resort to the use of a cheaper energy sources, which would further burdens the health statues of the households.

Similarly, the sex of household head reveals that if the household head is male, the likelihood of using fuelwood for cooking would be high. This agrees with the findings of.² The reason for such could be narrowed down to the fact that the role of the household head as expected by the cultural norms of Nigeria includes that of the bearing of the financial burden of his household. Hence, with all things being equal, a household headed by man would prefer to use fuel wood to save more cost from buying expensive alternative fuels.

Also, the older a household head becomes the lesser the likelihood of using fuelwood. This means that as the age of household head reaches a certain level, he/she will be more likely to use alternative sources of energy than fuel wood for cooking. Implying that the older the household head the more conscious he becomes about the disastrous effects associated with continuous usage of fuelwood. Hence, he would use his life savings or retirement benefits for the consumption of less harmful energy sources. This agrees with the findings of.¹⁶

Furthermore the wealth classification shows that poor/poorer house holds are more likely to use fuelwood. However, as the household's wealth status improves the possibility of using fuelwood declines. When a household head's wealth status improves his economic status also increases, hence less use of fuel wood. This conforms to the energy ladder theory and the findings of.¹⁷

On the effects of fuel wood on the health of women, cough as a respiratory symptom is not related to cooking with fuel wood which is in contrast to the study of¹⁸ which postulated a positive prevalence in relation to the use of fuel wood among women. Similarly,¹³ also reported that the use of fuelwood exposes women to chronic cough and chronic phlegm. The lack of relationship between cough and cooking with fuelwood is in line with the finding of⁹ who opined that most of the respondents did not consider this respiratory ailment suffered by them as a severe problem probably because health problems from air pollution are known to be subtle. Furthermore,²⁰ revealed that there was no significant difference between those cooking with fuelwood and non-fuel wood users when it comes to cough as an ailment. Interestingly, shortness of breath is related to cooking with fuel wood implying that the more the number of

women who cook with fuelwood, the more they are affected by shortness of breath. Thus, a 1% increase in the number of women that cook with fuel wood would increase the incident of shortness of breath by 19%. This corresponds with the previous findings of.²¹ With regards to blocked chest and nose, the result shows that the lesser the number of women who cook with fuelwood, the lesser the health implication of blocked nose and chest. Thus a 1% decrease in the number of women who cook with fuelwood, would reduce the ailment by 36%. This result is similar to previous studies^{22,23}, considering that the marginal effects of these respiratory problems, blocked nose and chest, reduces drastically, followed by shortness of breath then coughs as the number of women who cook with fuelwood reduces.

Conclusions

The findings presented suggest that some of the household's socio-economic characteristics strongly influence the likelihood of the choice for fuelwood. Economic status affects the likelihood of household fuelwood consumption in the country. However, cough is not a determinant of a respiratory problem experienced by women who cook using fuelwood. While, block nose and chest, as well as shortness of breath, are the significant health implications experienced by women in both urban and rural settlements of Nigeria.

Recommendations

There is a need for policies to be directed towards poverty reduction through provision of social security insurance scheme. Also, effective and efficient energy policies are needed to accelerate the transition to clean and healthy energy sources. Furthermore, sensitization awareness and education should be given to both rural and urban dwellers on the health implication of cooking with fuel wood by engaging community health workers and health educators on a regular door to door health campaigns and the use of media advocacy for disseminating health information.

References

1. Vitali, F., Parmigiani, S., Vaccari, M., & Collivignarelli, C. Agricultural waste as household fuel-Techno-economic assessment of a new rice-husk cook stove for developing countries. *Waste management*. 2013 Dec 1;33(12): 2762-2770.
2. Maina, Y. B., Kyari, B. G., & Maina, M. B., 2019. Households' clean energy demand in Nigeria and Its Implication on the Environment. *Journal of agricultural economics, environment and social sciences*, 2019 Dec 31;5(1 and 2): 35-55.
3. Smith, K. R., Rogers, J., & Cowlin, S. C. Household fuels and ill-health in developing countries:2005 Retrieved from Association. <https://scholar.googleusercontent.com/scholar?q=cac>

- he:2QdAt2_sIkAJ:scholar.google.com/+smith+rogers+and+cowlin+ 2005&hl=en&as_sdt=0,5.
4. Ezzati, M., & Kammen, D.M. The health impacts of exposure to indoor air pollution from solid fuels in developing countries: knowledge, gaps, and data needs. *Environmental health perspectives*, 2002 Nov;110(11): 1057-1068.
 5. Edokpa, D.A., & Ikelegbe, O.O. Ambient air quality and Human Health in Oil-producing rural communities of Edo State. In Nigerian Meteorological Society (NMetS) conference proceedings of 2012. Theme: climate change and variability: saving our tomorrow today (pp.180-185).
 6. Cheng, L. L., Liu, Y. Y., Su, Z. Q., Liu, J., Chen, R. C., & Ran, P. X. Clinical characteristics of tobacco smoke-induced versus biomass fuel induced chronic obstructive pulmonary disease. *Journal of internal translational medicine*. 2015 Sep 1;3(3): 126-129.
 7. Maloni, J. A., Kane, J. H., Suen, L. J., & Wang, K. K. Dysphoria among high-risk pregnant hospitalized women on bed rest: a longitudinal study. *Nursing research*. 2002 Mar 1;51(2):92-99.
 8. Ozoh, O. B., Okwor, T. J., Adetona, O., Akinkugbe, A. O., Amadi, C. E., Esezobor, C., ... & Mortimer, K. Cooking fuels in Lagos, Nigeria: Factors associated with the household choice of kerosene or Liquefied Petroleum Gas (L.P.G.). *International journal of environmental research and public health*. 2018 Apr;15(4): 641.
 9. Oyeboji, F. F., Adeofun, C. O., Adedeji, O. H., Ekpo, U. F., Oguntoke, O., & Ojekunle, O. Z. Assessment of respiratory health impact of fuel wood utilization on exposed rural women in Odeda, southwestern, Nigeria. *Global Journal of science frontier research*. 2013; 13(4).
 10. National Population Commission. *Federal republic of Nigeria official gazette no 4:94. Legal notice on Population of the 2006 Census Report*. 2007.
 11. Demographic Health Survey. 2018 https://dhsprogram.Standard-DHS_2018.cfm?flag=0.
 12. Kmenta, J., & Balestra, P. Missing measurements in a regression problem with no auxiliary relations. *Advances in econometrics*. 1986,5, 289-300.
 13. Kurmi O.P., Semple S., Devereux G.S., Gaihre S., Lam K.B.L., Sadhra S., Steiner M.F., Simkhada, P., Smith W.C., Ayres J.G. The effect of exposure to biomass smoke on respiratory symptoms in adult rural and urban Nepalese populations. *Environmental health*. 2014 Dec 1;13(1):92.
 14. Desalu O.O., Adekoya A.O., Ampitan B.A. Increased risk of respiratory symptoms and chronic bronchitis in women using biomass fuels in Nigeria. *Journal of. Brasileiro de Pneumologia*. 2010, Aug;36(4):441-446.
 15. Alim, M.A., Sarker, M.A.B., Selim, S., Karim, M.R., Yoshida, Y., Hamajima, N. Respiratory involvements among women exposed to the smoke of traditional biomass fuel and gasfuel in a district of Bangladesh. *Environmental health preventive medicine*. 2014 Mar 1;19(2):126-134.
 16. Buba, A., Abdul, M., Adamu, I., Jibir, A., & Usman, Y.I. Socio-economic determinants of Households Fuel Consumption in Nigeria. *International Journal of research Granthaalayah*. 2017; 5(10),348-360.
 17. Maina, Y. B. An empirical analysis of household energy demand and the negative externality of carbon dioxide (CO₂) emission in northeastern Nigeria. *An unpublished Ph.D. Thesis submitted to the Postgraduate school, in fulfilment for the award of the Degree of Doctor of Philosophy in Economics Usmanu Danfodiyo University, Sokoto, Nigeria*. 2018 Sep;24;pp.254.
 18. Stabridis, O., & van Gameren, E. Exposure to firewood: Consequences for health and labor force participation in Mexico. *World development*. 2018 Jul 1;107:382-395.
 19. Mac: Indoor Air Pollution Create Problems for Rural Areas. 2009. <http://www.lifeofearth.org>
 20. Regalado J., Sarker M.A., Selim S., Karim M.R., Yoshida Y., Hamajima N. The Effect of Biomass Burning on Respiratory Symptoms and Lung Function in Rural Mexican Women. *American journal of respiratory and critical care medicine*. 2006 Oct 15; 174 (8):901-905.
 21. Siddiqui A.R., Lee K., Gold E.B., Bhutta Z.A. Eye and respiratory symptoms among women exposed to wood smoke emitted from indoor cooking: A study from southern Pakistan. *Energy for sustainable development* 2005 Sep 1;9(3):58-66.
 22. Solomon O.G., Collins N. N., Sidikat I. K., & Kayode O.A. Gas flaring attendant impact of criteria and particulate pollutions. A case of the Niger Delta region of Nigeria. *Journal of King Saud University-Engineering Sciences*. 2019 July 1;31(3):209-217,2019.
 23. Sana, A., Meda, N., Badoum, G., Kafando, B., & Bouland, C. Primary cooking fuel choice and respiratory health outcomes among women in charge of household cooking in Ouagadougou, Burkina Faso: cross-Sectional Study. *International journal of environmental research and public health*. 2019 Jan 16; 16(6):1040.

Commercial and Non-commercial Alcohol Use Among Petroleum Tanker Drivers in Ilorin, Nigeria.

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Abstract

There has been global increase in use of commercial alcohol and alcohol-containing local herbs. Alcohol use has been associated with road traffic accidents. Many studies examined the use of commercial alcohol but not that of both commercial and non-commercial (unrecorded) alcohol.

Four hundred petroleum tanker drivers (PTDs) were interviewed using a modified WHO student drug survey questionnaire. Respondents were all male and aged 20-70 years with a mean of 42.2 ± 10.9 years. Ninety eight percent of respondents were aware of the ready availability of alcohol in the neighbourhood or around the motor park. Current use prevalence for commercial alcohol was 124 (31%) and 76 (19%) for non-commercial alcohol. One hundred and ninety (48%) drank locally made concoctions while at work or just before coming to work. Seventy-six (19%) were aware the concoctions contained commercial or non-commercial alcohol, while 81% were not. The most frequently used alcohol-containing concoctions include *jedi* (52.3%), *agbo iba* (30.3%), *opa eyin* (28%) and *ale* (20%).

One hundred and forty-five (36.3%) PTDs have had previous vehicular accidents while 255 (63.7%) had not. Of the 145 who previously had vehicular accidents, 51 (35.2%) was related to drug use (alcohol constituting 23.6%) while 94 (64.6%) was not. Predictive factors for commercial alcohol use were income ($p=0.04$; $OR=0.460$; $95\%CI=0.249-0.851$) and presence of multiple sex partners ($p=0.000$; $OR=0.187$; $95\%CI=0.114-0.306$) while predictive factors for non-commercial alcohol use was presence of multiple sex partners ($p=0.000$; $OR=0.326$; $95\%CI=0.195-0.544$).

Commercial and non-commercial alcohol use is still common around motor parks, often leading to vehicular accidents. Enlightenment against drinking and driving and use of alcohol or alcohol-based medicaments for self-medication should be intensified.

Key Words: commercial alcohol; non-commercial alcohol; petroleum tanker drivers; Nigeria

Introduction

Non-commercial alcohol includes traditional home-made drinks produced legally or illegally for home consumption or limited local trade. Adelekan noted that though this definition may suggest that non-commercial alcohols are non-commercialized, in African setting they are commoditized¹. The definition of non-commercial alcohol as elucidated above would seem more encompassing than that of unrecorded alcohol which is home-made, illegally produced, smuggled as well as surrogate alcohol that is not officially intended for human consumption as present in substances such as mouthwash, perfumes, and eau-de-colognes². In order to precisely estimate the per capita alcohol use and the burden associated with it, there is a need to factor in home brews and non-commercial alcohol use².

The worldwide consumption of alcohol per capita in 2010 was 6.2 litres. In Nigeria the per capital alcohol consumption was 13.4, recorded alcohol 9.6, unrecorded alcohol 3.8, proportion of which was beer 7.9%, wine 0.4%, spirit 0.6%, others 91.1%³. Nigeria as at 2016 ranked 6th globally in adults' alcohol drinking (age 15+) in litres per year, making it one of the leading African countries in alcohol consumption³. These ranking fails to take into cognizance, the unrecorded production and consumption of illicit and locally made alcoholic beverages sold freely at various places within the society including institutions of higher learning⁴. In some countries, unrecorded alcohol production in the informal sector is about 80%⁵ which is similar to what obtains in Nigeria. Unrecorded alcohol use among Nigerians is therefore quite important as a significant per cent of adults take herbal products in which both commercial and non-commercial alcohol are used as solvents⁶. In most of these products, the alcohol concentration and level of contamination are often unknown because of absence of proper regulation of process of manufacturing and sales^{6,7}.

Unrecorded alcohol has been reported to constitute significant health hazards due to toxic metals, such as lead from contaminated water sources or unsuitable distillation equipment, volatile constituents such as acetaldehyde or higher alcohols, which may be produced in significant amounts due to

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faults in production technology or microbiological spoilage. Other hazardous substances include, ethyl carbamate (urethane), a carcinogenic contaminant with major occurrence in certain fruit and sugarcane spirits, biologically active flavour compounds (e.g. coumarin in cosmetics used as non-beverage alcohol) and toxic compounds used to denature alcohol (e.g. methanol or diethyl phthalate)⁷.

In a study in Athens, 40.7% of road traffic-related fatalities were associated with alcohol consumption. Other psychoactive substances were detected in 18.9% of the subjects. Of these 18.9%, cannabis was found in 46.6%, benzodiazepines in 25.9%, opiates in 16.4% and cocaine in 11.1%. Also, 4.5% of the subjects had consumed alcohol and other substances before the road traffic-related accident⁸. In Africa, the number of road traffic injuries and deaths have been increasing over the last three decades with a rate of 26.6 per 100,000 population in 2013⁹. Also, in the last two decades, there has been increased prevalence of alcohol and cannabis use among drivers involved in fatal crashes by five folds from below 2% in 1991 to 10% in 2008.

It has been reported that drivers with blood alcohol concentration (BACs) of 0.05 to 0.09 per cent were twice as likely to have road traffic accidents compared with drivers with a zero BAC. Alcohol increases risk taking by decreasing driver's time-to-collision (TTC) at 0.08% target BAC relative to placebo¹⁰. In general, the relative risk of involvement in a fatal vehicle crash increased steadily with increasing driver BAC in every age or gender group among both fatally injured and surviving drivers.

In Nigeria, it is not uncommon to find non-commercial alcohol being sold in or around the motor parks. They are sold as diluents or solvents in herbal concoctions against febrile conditions, low back aches or as sexual performance enhancement drug. These herbal products include *agbo iba*, *opa eyin*, *ale* and *jedi-jedi* respectively. Often buyers are unaware of the components of such herbal drugs especially the alcohol content^{6,7}.

While previous studies have made efforts in estimating alcohol use among petroleum tanker drivers (TDs) by focusing more on consumption of commercial alcohol, this study takes a closer look at consumption of both commercial and non-commercial (unrecorded) alcohol intake among PTDs. This is in keeping with WHO recommendation that for more precise estimate of per capita alcohol use and its associated burden, there is a need to estimate both commercial and non-commercial alcohol consumption in a given population⁵. It is hoped that this study will be more representative of alcohol use among PTDs in the study location.

Method

Study setting: Ilorin is a transportation hub located mid-way between the northern and southern parts of Nigeria with a population of about 2.5million¹¹. The city has a Federal owned large size Nigerian National Petroleum Corporation (NNPC) fuel (petrol, diesel and kerosene) depot and three petroleum loading bays located in its outskirts. Most motorized PTDs usually make a stop-over in Ilorin or its outskirts to refill fuel, eat, drink or rest. As at the time of study, the total number of tanker drivers, as estimated by the organized tanker drivers' union was 4000.

Sample size determination: A proportionate sampling of 400 PTDs representing 10% of the total sample size of PTDs (as recommended for drug surveys by Smart et al¹²) were interviewed from the three petroleum depots (*Oke-Oyi, Olooru and Gbede*).

Instrument for data collection: A modified, semi-structured self-report questionnaire based on the World Health Organization's guidelines for substance use survey was used. This instrument has been previously used in Nigeria and found reliable and valid¹³. The modified version of the questionnaire, has also been previously used among long distance vehicle drivers in Ilorin, Nigeria^{14,15}.

Ethical Considerations: Biomedical Ethics approval for the study was obtained from the Ethics Committee of the University of Ilorin Teaching Hospital Ilorin (NHREC/02/05/2010). Informed Consent was obtained from each participant after they were duly informed about the study and its purpose. Participants were further reassured of utmost confidentiality of information given by them.

Inclusion Criteria: All PTDs seen at the selected motor parks within the study period and gave consent to participate in the study. The respondents must have attained the minimum legal driving age of 18 years.

Procedure: A pilot study was conducted among 20 randomly selected non-petroleum tanker drivers in a transport company in the study location. The company also engages in long distance travels. The questionnaire items were well understood and could be completed within 20 minutes on the average.

During the main study, a simple random sampling of a proportionate sample of all PTDs who satisfy the inclusion criteria was done. Respondents were reassured of confidentiality of information given.

Data Analysis: Data was analyzed using the SPSS version 17 software. Frequency tables and means were generated and relevant cross tabulations done.

Proportions were compared using chi-square test while means were compared using t-test.

Results

Four hundred respondents comprising of 200 from *Oke-Oyi* Nigerian National Petroleum Corporation (NNPC) depot park, 100 from *Olooru* motor park and 100 from *Gbede* motor park were interviewed. All of them were males and aged 20-70 years with a mean of 42.2 ± 10.9 years. Majority, 310 (77.5%) claimed they were very religious, 68 (17%) claimed they were moderately religious while 22 (5.5%) were not religious. Two hundred and five (50%) had primary school education, 107 (26.8%) had secondary school education, 8(2%) had tertiary education, while 81 (20.3%) had no formal education.

Knowledge and attitude of respondents to alcohol use: Almost all (97.5%) respondents were aware of the ready availability of alcohol in the neighbourhood or around the motor park, 90% know someone using alcohol while 67.8% claimed they have been offered alcohol. Table 2 shows what motivates respondents to use alcohol, who introduced them to alcohol, perceived

problems associated with alcohol use, suggested methods of treating alcohol abuse and relationship of alcohol use to road traffic accidents.

Prevalence of commercial and non-commercial alcohol use among PTDs: The lifetime use prevalence of commercial alcohol use was 199 (49.8%). The current use prevalence for commercial alcohol was 124 (31%) while current use prevalence for non-commercial alcohol was 76 (19%).

Pattern of current use of commercial alcohol among PTDs: The current use pattern for commercial alcohol shows occasional use of 1-2 times per month 35 (8.8%), often use of 2-3 times per week 20 (5%) and daily use of 69 (17.3%). Also, 27.3% of current users of alcohol, were current users of cannabis while 37.1% of current users of cannabis were current users of alcohol (Pearson $\chi^2=2.5$; $p=0.11$).

Pattern of non-commercial alcohol use in form of locally made concoctions among PTDs: One hundred and ninety (48%) claimed they drink locally made concoctions while at work or just before coming to

Table 1: Sociodemographic characteristics of Petroleum tanker drivers (PTDs) in Ilorin (N=400)

Variable	Frequency (%)
Years of experience	
Range	1-55 years
Mean	15.7
S.D	10.3
Income per day/month	
<N5000 (\$31.85)*	140 (35)
N5001-N10000	118 (29.5)
>N10,000	142 (35.5)
Relationship with wife	
Not married	24 (6)
Very cordial	313 (78.3)
Just cordial	59 (14.8)
Not cordial	4 (1)
Presence of multiple sex partners	
Yes	149 (37.3)
No	251 (62.3)
Number of sex multiple partners	
Range	1-16
Mean	0.78
S.D	1.4
Relationship with employer	
Self-employed	19 (4.8)
Cordial	378 (94.5)
Not cordial	2 (0.5)
Perceived emotional problem	
Always	7 (1.8)
Occasional	84 (21)
Not at all	309 (77.3%)

*Exchange rate as at time of study was N158.7 to US Dollar

Table 2: Knowledge and attitude of petroleum tanker drivers in Ilorin in relation to alcohol use

Variable	Frequency (%) N=400
What motivates you to use alcohol	
Pleasure	131 (32.8)
To be alert	109 (27.3)
To relief tension	32 (8)
Imitation of others	27 (6.8)
No specific reason	101 (2.5)
Rate problem of alcohol abuse	
Increasing	244 (61)
Decreasing	120 (30)
No difference	36 (9)
Ever listened to anti drug use campaigns	
Yes	331 (82.8)
No	69 (17.3)
Had previous vehicular accidents	
Yes	145 (36.3)
No	255 (63.7)
Was it related to drug use	
Yes	51 (12.8)
No	321 (80.3)
Don't know	28 (7)
Which drug did you use (% of those who claimed accident was related to drug use)	
Tobacco	2 (3.9)
Alcohol	12 (23.6)
Cannabis	22 (43.1)
Mild stimulant	10 (19.6)
Strong stimulant	1 (2)
Sedatives	1 (2)
Cough syrup with codeine	3 (5.9)
Cocaine	-
Heroin	-
Do you keep drugs in your vehicle all the time	
Yes	83 (20.8)
No	317 (9.2)
Do you take drugs when you stop over	
Yes	164 (41)
No	317 (59)
Which drugs do you take at stop over (% of 164)	
Tobacco	31 (18.9)
Alcohol	57 (34.8)
Cannabis	34 (20.7)
Mild stimulant	37 (22.6)
Cough syrup with codeine	3 (1.8)
Solvents	3 (1.8)

work. Seventy-six (19%) claimed they were aware that the concoctions contain commercial or non-commercial alcohol, while 81% said the concoctions do not contain any form of alcohol. Of the 190 drivers who take concoctions, 16.3% of them still take commercial alcohol concurrently. The most frequently used alcohol-containing concoctions include *jedi* (52.3%), *agbo iba* (30.3%), *opa eyin* (28%) and *ale* (20%). The mean daily consumption of these alcohol containing concoctions ranged from 50-300mls with a mean of 80 ± 67.6 mls.

Vehicular accident rate and drug use: One hundred and forty-five (36.3%) PTDs claimed they have had previous vehicular accidents while 255 (63.7%) had

not. Of the 145 who previously had vehicular accidents, 51 (35.2%) claimed it was related to drug use while 94 (64.6%) said it was not. Of the 51 respondents who claimed the accident was related to drug use, the following, in descending order, were said to be responsible: cannabis 22 (43.1%), alcohol 12 (23.6%), mild stimulants 10 (19.6%), cough syrup with codeine 3 (5.9%), strong stimulant and sedatives 1 (2%) each.

Predictive factors for current use of commercial alcohol: Current use of commercial alcohol was found to have significant association with age, level of income, driving experience, presence of multiple sex partners, perceived emotional wellness and previous road accident. However, regression analysis showed

Table 3: Non-commercial alcohol use in form of locally made concoctions among PTDs in Ilorin (N=400)

Variable	Frequency (%)
Do you take herbal concoctions at work	
Yes	190 (47.5)
No	210 (52.5)
Does the herbal concoction contain alcohol	
Yes	76 (19)
No	324 (81)
Concoction taken with (as % of 190)	
Alcohol	31 (16.3)
Tobacco	70 (36.8)
Cannabis	22 (11.6)
Mild stimulants	21 (11.1)
Don't know	46 (24.2)
Type of herbal concoction taken	
Paraga	18 (4.5)
Opa eyin	112 (28)
Jedi	209 (52.3)
Ale	80 (20)
Naarun	39 (9)
Agbo Iba	121 (30.3)
Others	62 (15.5)

Table 4: Mean daily amount of concoction taken in millilitres (mls)

Herbal concoction	Range (mls)	Mean	Standard deviation
<i>Paraga</i>	50-300	80	67.6
<i>Opa eyin</i>	50-150	55	18.6
<i>Jedi</i>	50-150	56.6	20.5
<i>Ale</i>	50-150	60.5	23.5
<i>Naarun</i>	50-150	62	37.7
<i>Agbo iba</i>	50-150	58.2	23.6

that only income ($p=0.04$; $OR=0.460$; $95\%CI=0.249-0.851$) and presence of multiple sex partners ($p=0.000$; $OR=0.187$; $95\%CI=0.114-0.306$) were predictive. There was no significant association between current use of commercial alcohol and respondents' level of religiosity, level of education, number of children, perceived level of physical wellness and previous exposure to antidrug abuse campaign.

Among respondents who currently use both commercial alcohol and cannabis, presence of multiple sex partners ($p=0.000$; $OR=0.109$; $95\%CI=0.043-0.272$) and previous road traffic accident ($p=0.010$; $OR=0.372$; $95\%CI=0.175-0.791$) were found to have significant association. On regression analysis, both factors were also found to be predictive.

Presence of multiple sex partners was found to be predictive of current use of non-commercial alcohol use possibly as a sexual performance enhancer ($p=0.000$; $OR=0.326$; $95\%CI=0.195-0.544$).

Discussion

In Nigeria, the legal blood alcohol limit (BAC) is $0.05g/100ml$ but the enforcement of the law is weak. It has been estimated that mortality rate during road traffic accidents was $32.3\%^{16}$. While most studies tend to capture data on commercial alcohol drinking, it is important to include data from non-commercial or unrecorded alcohol use in order to accurately estimate the prevalence of alcohol use².

The study shows that about two-third of current users of alcohol were current users of non-commercial alcohol either alone or as diluent for herbal remedies. Previous studies have reported that the alcohol levels of these remedies could vary from 1.20% to 20.84% ⁶ and may also contain significant levels of contaminants⁷. While the alcohol levels might range between low to medium, it is important to note the daily volume per capita of alcohol consumed in this study which ranges from $50-300mls$ with a mean of $80\pm 67.6mls$.

Globally, one of the reasons for increased number of people using non-commercial or surrogate alcohol is its relatively cheap cost and sometimes high alcohol concentration¹⁷. A study in Novosibirsk, Russia showed that all respondents had occasionally used industrial alcohol, antiseptics, eau de cologne and Hawthorn tincture (alcohol containing medication)¹⁸. The main reasons for using such surrogate alcohol were ease of availability and cheapness relative to vodka. This is also true in the current study as some of the non-commercial alcohol drinks cost less and contains more alcohol volume relative to the available commercial alcohol products. This supports the finding in this study which shows that income was a predictive factor for concomitant use of non-commercial and commercial alcohol.

In Nigeria, access to health is low and payment is mostly out of pocket as the National Health Insurance Scheme has achieved only 15% coverage¹⁹. It is therefore not surprising that most people tend to patronize herbal products that sometimes have questionable medicinal values²⁰. More importantly, even where there may be some medicinal advantages, the negative effect of ingesting a continuously fermenting alcohol and toxic drink might outweigh the possible medicinal benefits⁷. There is therefore a need for proper regulation of the production, labelling, measurement and sales of non-commercial alcohol.

In this study, while low income and multiple sexual partners were predictive for use of commercial and non-commercial alcohol, only the presence of multiple sexual partners was predictive for use of non-commercial alcohol. This will corroborate the use of some of non-commercial alcohol drinks as herbal medicine for sexual performance enhancement as claimed by some respondents.

It is interesting to note that a third of PTDs who have had vehicular accidents attributed it to use of substances. In descending order, the PTDs attributed the cause of their vehicular accidents to cannabis (43.1%), alcohol (23.6%) and mild stimulants (19.6%). This will suggest that 83.6% of all vehicular accidents among PTDs was related to substance use of which alcohol constitute a third. There is therefore a need for more intensive campaigns against drinking-while-driving. Such campaign should also advise against selling alcoholic beverages and other psychoactive substances around motor parks in Nigeria and other parts of the world^{2,18}. In addition, sales of alcohol should be discouraged at designated motor vehicle rest-points as this study showed that 41% of respondents take alcohol at rest-points with alcohol being the most commonly used drug at such points by 34.8% of PTDs. In conclusion, this study shows that commercial and non-commercial alcohol use is still common in and around motor parks for pleasure, as energizer, treatment of ailments or as sexual enhancer. There is a

significant relationship between alcohol use and history of vehicular accident by PTDs. Low cost, easy accessibility to alcohol and poor access to health care are other factors for frequent use of non-commercial alcohol either alone or as a constituent of herbal medicine. There is therefore a need for improved access to health care in Nigeria, intensive enlightenment against drinking and driving and, use of alcohol or alcohol-based medicaments for self-medication.

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Compliance with ethical standards/Approval from Independent Review Board

Biomedical Ethics approval for the study was obtained from the Ethics Committee of the University of Ilorin Teaching Hospital Ilorin (NHREC/02/05/2010)

Conflict of interest

None

Authors' Contribution

Study design, analysis, original draft and final manuscripts were done by the author

References

1. Adelekan M.L. Non-commercial alcohol in sub-saharan Africa *In* Non-commercial alcohol in three regions. *ICAP Review*. 2008; 3: 3-5. Published by International Centre for Alcohol Policies, 1519 New Hampshire Avenue, NW Washington, DC 20036 USA. www.icap.org. Available online at https://www.researchgate.net/publication/215523013_Noncommercial_alcohol_in_Central_and_Eastern_Europe
2. WHO (2016) Pure alcohol consumption among persons aged 15+ in litres per capita per year.
3. WHO (2004) Global Status Report on Alcohol Policy, Geneva 2004
4. Abiona O. Analysis of alcohol policy in Nigeria: multisectoral action and the integration of the WHO 'best-buy' interventions. *BMC Public Health* 2019; 19(810): 1-9
5. Girotto E, Mesas AE, Selma Maffei de Andrade, Marcela Maria Birolim, Mabbott NA. Psychoactive substance use by truck drivers: a systematic review. *Occup Environ*

Med.2013;doi:10.1136/oemed-2013-101452

6. Oluwadiya S.K and Akinola EA. Taking alcohol by deception: an analysis of ethanol concentration of “paraga” an alcoholic herbal mixture in Nigeria. BMC Research Notes 2012 5:127.
7. Obi E, Akunyili DN, Ekpo B, Orisakwe OE. Heavy metal hazards of Nigerian herbal remedies. Sci. Total Environ. 2006; 369(1-3):35-41.
8. Athanasia H. Papalimperi, Sotirios A. Athanaselis, Areti D. Mina, Ioannis I. Papoutsis, Chara A. Spiliopoulou and Stavroula A. Papadodima. Incidence of fatalities of road traffic accidents associated with alcohol consumption and the use of psychoactive drugs: a 7-year survey (2011-2017). Experimental and Therapeutic Medicine. 2019; 18: 2299-2306.
9. Adeloye D, Thompson JY, Akanbi MA, Azuh D, Samuel V, Omoregbe N and Ayo CK. The burden of road traffic crashes, injuries and deaths in Africa: a systematic review and metanalysis. Bulletin of the World Health Organization. 2016; 94: 510-521A. doi.http://dx.doi.org/10.2471/BLT.15.163121
10. Van Dyke NA, Fillmore MT. Laboratory analysis of risky driving at 0.05% and 0.08% blood alcohol concentration. Drug Alcohol Depend. 2017; 175:127-132.
11. Nigeria National Population Estimates 2006 by National Population Commission. Available at www.nigerianstat.gov.ng
12. Smart RG, Hughes PH, Johnson LD, Anumonye M. A methodology for a Student drug use surveys. WHO offset publication 1980; No 50, Geneva.
13. Adelekan M.L. Self-reported drug use among secondary school students in the Nigerian state of Ogun. Bull Narc. 1989; 41 (1-2): 109-16. PMID: 2765717
14. Makanjuola A.B., Oyeleke A. Sabitiu. and Akande Tanimola M. Psychoactive substance use among long distance vehicle driver in Ilorin. Nigerian Journal of Psychiatry, 2007; 5(1); 14-18.
15. Makanjuola A.B, Aina O.F and Onigbogi Lanre. Alcohol and other psychoactive substance use among tanker drivers in Lagos, Nigeria. European Scientific Journal. 2014; 10(15): 545-559.
16. Ogazi C, Edison E. The drinking driving situation in Nigeria. Traffic Inj Prev. 2012; 13(2): 115-9. doi. 10.1080/15389588.2011.645097. PMID.22458788.
17. Razvodovsky YE. Consumption of noncommercial alcohol among alcohol-dependent patients. Psychiatry Journal. 2013: 2-5. Article ID 691050. http://dx.doi.org/10.1155/2013/691050
18. Bobrova N, West R, Malutina D, Koshkina E, Terkulov R, and Bobak M. Drinking alcohol surrogates among clients of an alcohol-misuser treatment clinic in Novosibirsk. Substance Use & Misuse. 2009; 44(13): 1821–1832.
19. Akpomuvie OB. Poverty, access to health care services and human capital development in Nigeria. African Research Review. 2010; 4: (3a):41-55
20. Akshaya Srikanth Bhagavathula, Asim Ahmed Elnour, and Abdulla Shehab. Pharmacovigilance on sexual enhancing herbal supplements. Saudi Pharm J. 2006; 24(1): 115–118. doi: 10.1016/j.jsps.2015.01.018.

Knowledge of Dental Specialties Among Medical Doctors in a South Western State of Nigeria, Implication for Dental Care Delivery.

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Abstract

Adequate knowledge of dental specialties by medical doctors is essential for appropriate and timely communication between medical doctors and dentists especially in dentists' access challenged settings like Nigeria where medical doctors are often the first point of contact with dental patients. This study seeks to determine the level of knowledge of dentistry among medical doctors with respect to dental conditions and its' specialties that manage them. This cross-sectional study was descriptive in design. Data on sociodemographics, exposure to dentistry, knowledge of dental specialties and management of dental conditions was acquired using a structured questionnaire from medical doctors in Ondo State from whom informed consent was obtained. Ethical approval for this study was obtained from the University of Medical Sciences Research Ethics Committee. The results were presented in frequencies, percentages and tables. Chi square was used to determine associations at 95% confidence interval with p value set at ≤ 0.05 . A total of 175 respondents participated in the study. The mean age was 40.33 ± 8.2 years. Males were 131 (74.9%) males and 44 (25.1%) females. In this study, 135 (77.3%) of the respondents have encountered a dental-related complaint during their clinical practice but only 6.9% of these respondents could make a diagnosis. Also, only 4.4% of the respondents wrote a referral to a dental specialist. Suboptimal knowledge was noted in dental specialties of Conservative Dentistry, Periodontics and Prosthetic Dentistry. Respondents who attended Universities that offer dentistry as a course had better knowledge of dentistry ($p = 0.039$). The knowledge of dental specialties was inadequate in this group. Noted consequence of this deficiency in the knowledge of dentistry was poor management skill set for dental complaints among the respondents. Oral health education is recommended to enhance the utility of this group in dental care delivery.

Keywords: Dental Specialties, Medical Doctors, Dental Care

Introduction

The clinical practice of dentistry involves the management of diseases, disorders and/or conditions of the oral cavity, maxillofacial area and/or the adjacent and associated structures and their impact on humans; provided usually by a dentist, in accordance with the ethics and laws of the profession.¹ The dental profession is widely considered necessary for complete oral health and has contributed immensely to the quality of life and well-being of humanity.¹ Various specialties exist in the field of dentistry with the aim of improving oral health care and these specialties include Oral and maxillofacial Surgery, Oral Pathology, Oral Medicine, Periodontics, Orthodontics, Paedodontics, Oral Radiology, Prosthodontics, Conservative Dentistry inclusive of Endodontics, Family Dentistry and Dental Public Health.²

The awareness and knowledge of dentistry as a profession especially the various specialties contained therein is still grossly inadequate among many health care workers.³ The implication of this is that the vast majority of patients who should benefit from expert dental services for their various dental ailments would be unable to assess the services due to the poor awareness and knowledge of dentistry by the attending health care providers.^{4,5} Furthermore, reports indicate that better awareness and knowledge of dentistry among health-care providers is positively associated with contact with dental knowledge during clinical training or utilization of dental services.⁶ Studies have shown that medical doctors have vital roles to play in the oral health care of the population.⁷ When medical doctors' knowledge of dentistry and oral health care practices are low or poor, inappropriate dental treatments and advice or referrals of patients will be the likely outcome.⁶ Hence, patients suffer.^{4,7} Medical doctors are the primary care givers for the vast majority of health related complaints and they are also expected to play active roles in oral health promotion.⁶ A smooth interaction between the medical and dental team is therefore essential in achieving effective health care delivery.^{4,7} The need for medical practitioners to participate in oral health promotion is highly essential especially in Nigeria where there are limited number of dentists. Reports indicated that a dentist caters for approximately 40,000 Nigerians. In addition, dentists

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are unequally distributed in Nigeria.^{4,7} This distribution is grossly in favour of urban areas. This unequal distribution of dentist and their limited number makes access to the dentist quite challenging.⁴ Most medical doctors may eventually be the primary point of call for patients with dental conditions.² Hence, the need for medical practitioners to have adequate knowledge of dental specialties in order to facilitate appropriate and timely management cannot be overemphasized. Therefore, this study is aimed at assessing the knowledge of medical doctors about the various specialties in the field of Dentistry.

Methods

This cross sectional study was carried out among medical doctors in Ondo State. Ondo State is located in southwestern Nigeria and its capital is Akure. It has tertiary health centres (the Federal Medical Centre, Owo and the University of Medical Sciences Teaching Hospital Complex) located in its' major towns comprising of Akure, Ondo and Owo.

Data was acquired using a structured questionnaire from respondents. Informed consent was obtained before the data collection tool was applied. The tool for data collection was a modification of the questionnaire previously utilized by Adeghe et al.,⁶ in a study among medical students of a Nigerian university. Also, the data collection tool received input from an experienced oral health epidemiologist. The questionnaire was divided into 3 sections. Section A contained information on participants' bio-data such as age and gender. Section B assessed their history of previous dental treatment on self, history of

management of a patient with a dental condition and what was done for the patient. Section C contained 22 questions spread throughout all the specialties in Dentistry that assessed their knowledge of the various commonly encountered dental conditions and the specialty they should be referred to. Correct answers were scored 1, while wrong answers or no response were scored 0. A score less than 7 was rated as poor knowledge, 7-14 points as fair knowledge and scores above 14 points were rated as good knowledge.

Ethical approval for this study was obtained from the University of Medical Sciences Research Ethics Committee. Data was coded in Microsoft Excel. After ensuring the completeness of data, it was transferred to IBM SPSS version 26.0 for statistical analysis.⁹ The results were presented in frequencies, percentages and tables. Chi square was used to determine associations at 95% confidence interval with p value set at ≤ 0.05 .

Results

A total of 175 respondents participated in the study. The mean age was 40.33 ± 8.2 with the modal age of 40 years. There were 131 (74.9%) males and 44 (25.1%) females. In this study, 135 (77.3%) of the respondents have encountered a dental-related complaint among patients during their clinical practice but only 6.9% of these respondents could make a diagnosis. Also, referral to the dentist was done by 91.2% of respondents who had encountered a patient with a dental-related complaint. However, only 4.4% of the concerned respondents wrote a referral to a dental specialist.

Table 1: Profile of respondents' previous contact with dentistry

Variable	n	Percentage
Presence of dental schools in medical schools attended		
Yes	107	61.1
No	68	38.9
Previous dental visit		
Yes	106	60.6
No	69	39.4
Total	175	100.0

Table 2: Respondents' knowledge of various dental specialties

Dental specialties	Correct n (%)	Incorrect n (%)
Community Dentistry	158 (90.3)	17 (9.7)
Conservative dentistry	70 (40.2)	105 (59.8)
Periodontics	60 (34.3)	115 (65.7)
Prosthetic Dentistry	82 (47.1)	93 (52.9)
Paediatric Dentistry	140 (79.8)	35 (20.2)
Orthodontics	100 (57.4)	75 (42.6)
Oral medicine	128 (73.2)	47 (26.8)
Oral pathology	143 (81.7)	32 (18.3)
Oral Radiology	150 (85.7)	25 (14.3)

Table 3: Association between respondents' knowledge of dental specialties with previous dental visit and presence of dental school in medical school attended.

Variable	Knowledge of dental specialties			Total n (%)	X ²	p
	Poor n (%)	Fair n (%)	Good n (%)			
Previous dental visit						
Yes	7 (53.8)	53 (56.4)	46 (67.6)	106 (60.6)	2.112	0.092
No	6 (46.2)	41 (43.6)	22 (32.4)	69 (39.4)		
Presence of dental school						
Yes	7 (53.8)	52 (55.3)	48 (70.6)	107 (61.1)	3.569	0.039*
No	6 (46.2)	42 (44.7)	20 (29.4)	68 (38.9)		
Total	13 (7.4)	94 (53.7)	68 (38.9)	175 (100.0)		

*Statistically significant

Previous contact with Dentistry

Concerning the respondents' past dental history, 107(61.1%) attended medical schools which offered Dentistry as a course and 106 (60.6%) of them had visited the dentist in the past (Table 1).

Level of knowledge in dental specialties

About the study respondents' knowledge of dental specialties, 13(7.4%), 94(53.7%) and 68 (38.9%) had poor, fair and good knowledge respectively. However, less than 50% of the study participants did not have the correct knowledge of dental specialties of Conservative Dentistry, Periodontics and Prosthetic Dentistry (Table 2).

Knowledge of dental specialties with previous dental visit and presence of dental school in medical schools attended.

In this study 46 (67.6%) of the respondents having good knowledge of dental specialties, had visited the dental clinic in the past. However, 7(53.8%) of the respondents with poor knowledge of dental specialties had attended medical schools which offered dentistry as a course. There is no significant association between the knowledge of dental specialties and previous dental visits. But the association between the knowledge of dental specialties and presence of dental school in the medical schools attended was significant (Table 3).

Discussion

This study accessed the level of knowledge of medical doctors on dental specialties and its associated factors. Concerning knowledge of dental specialties, approximately one-third of the respondents had good knowledge of dental specialties. Although this proportion is higher than the value of 5.6% reported in a previous Nigerian study amongst doctors in a tertiary health facility about a decade ago,² the level of knowledge of dental specialties among this group is

still inadequate. However, this study finding is an indication of improvement in oral health knowledge. The improvement in oral health knowledge may be due to the growing attention to oral health since the introduction of Nigerian Oral Health policy.¹⁰ In addition, another probable contributory factor is that Ondo State is one of the very few states in Nigeria with a Directorate of Dental services in its Ministry of Health. This has facilitated advocacy for oral health, implementation of oral health promoting programs and ensured oral health issues are given considerable attention in the health matters in Ondo State.¹¹

About three-fifth of the respondents had visited a dentist in the past. This reflects suboptimal oral health behaviour with regards to dental clinic visits among respondents. The noted inadequate knowledge of dentistry may account for the suboptimal dental visits in this group.⁴

The respondents' knowledge of specialties in dentistry was markedly inadequate in the specialties of Conservative Dentistry, Periodontics, Prosthetic Dentistry and Orthodontics. This inadequacy in knowledge may be related to lack of corresponding specialties in medicine as in the case of other specialties like Community Dentistry, Paediatric Dentistry and Oral Radiology which might offer the respondents a clue to the scope of these specialties.² In addition, specialists in the field of Conservative Dentistry, Periodontics, Prosthetic Dentistry and Orthodontics rarely come in contact with other specialists in medicine in their clinical practice.^{2,12} This may also be a causal factor to this observation.

Better knowledge of dental specialties was associated with respondents who attended universities that offered dentistry as a course of study. This is not surprising as dentistry and medicine in many aspects have a common curriculum in Nigerian universities.^{4,6} Hence, undergraduate students of dentistry and medicine share many classes in the university.⁶ These classes can provide opportunities for

exchange of knowledge in relation to dentistry and medicine among the students.⁶ These opportunities will facilitate better knowledge of dentistry with the concerned medical students.

Nearly all the respondents have been the first point of call of patients with dental complaints. This study validates previous reports that medical doctors are a significant point of first contact for patients with dental complaints.⁷ But in this study, only a few of the respondents could make a dental diagnosis or referral to a dental specialist. This observation suggests that the general clinical knowledge of dentistry is very poor among the respondents. In view of this observation, there is a need for training of this group in the basic clinical knowledge of dentistry including its specialties.^{2,6} Furthermore, introduction of basic clinical knowledge of dentistry in the medical students' curriculum may be a viable long-term solution to improve the utility of medical doctors in the dental care delivery value chain.^{2,13}

Conclusion

The knowledge of dentistry specialties is inadequate in this group against the background of majority of the respondents being the first point of contact of patients with dental complaints. Potential consequences of this deficiency in the knowledge of dentistry include suboptimal oral health behaviour and management skill set for dental complaints among the respondents. To facilitate better utilization of this group in dental health delivery, training in management of basic dental complaints for medical doctors and medical doctors-in-training is recommended.

Conflict of interest: There is no conflict of interest.

Authors' contribution : All the authors contributed to draft of the proposal, data collection, data analysis, have read and agreed to the final manuscript.

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References

1. Lamster I, Eaves K. A model for dental practice in the

21st century. *Am J Public Health*. 2011; 101(10):1825-1830.

2. Azodo C, Ehigiator O, Ehizele A, Ololo O. Medical Doctors' Knowledge of Dental Specialty: Implication for Referral. *Saratov J Med Sci Res* 2010; 6 (2):140–143.

3. Umezudike K, Onajole A, Ayanbadejo P. Periodontal health knowledge of nonmedical professionals and their oral hygiene behavior in a teaching hospital in Nigeria. *Eur J Gen Dent* 2015;4 (2):48-54.

4. Sofola O. Implications of low oral health awareness in Nigeria. *Niger Med J*. 2010; 51(3): 131-133.

5. Jain N, Mitra D, Ashok K, Dundappa J, Soni S, Ahmed S. Oral hygiene-awareness and practice among patients attending OPD at Vyas Dental College and Hospital, Jodhpur. *J Indian Soc Periodontol*. 2012; 16(4): 524-528.

6. Adeghe H, Ehigiator O, Azodo C, Ehizele A. Nigerian clinical level medical students' knowledge of dental specialty. *Ann Med Health Sci Res*. 2012; 2(2): 157-160.

7. Sa'adu Z, Abdulraheem I. Oral health care practice and socio-demographic findings among the physicians in Ilorin. *Niger J Med*. 2003; 12(4): 211-216.

8. Uguru N, Onwujekwe O, Ogu U, Uguru C. Access to Oral health care: a focus on dental caries treatment provision in Enugu Nigeria. *BMC Oral Health* 2020, 145. Available on: <https://doi.org/10.1186/s12903-020-01135-1> (Accessed on 19th May, 2021).

9. IBM SPSS Statistics for Windows, Version 26.0. IBM Corp., Armonk, N.Y., USA: Released 2019.

10. Adeniyi A, Sofola O, Kalliecharan R. An appraisal of the oral health care system in Nigeria. *International Dental Journal*. 2012; 62(6):292-300.

11. Abosede O, Sholeye O. Strengthening the Foundation for Sustainable Primary Health Care Services in Nigeria. *Primary Health Care* 2014; 4: 167-175.

12. Stuart J, Hoang H, Crocombe L. Relationships between dental personnel and non-dental primary health care providers in rural and remote Queensland, Australia: dental perspectives. *BMC Oral Health* 2017; 17: 99. Available on: <https://doi.org/10.1186/s12903-017-0389-y> (Accessed on 19th May, 2021).

13. Richmond S, Chestnutt I, Shennan J, Brown R. The relationship of medical and dental factors to perceived general and dental health. *Community Dent Oral Epidemiol*. 2007; 35(2):89-97.

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