http://dx.doi.org/10.4314/ajid.v8i2.7

PREVALENCE AND DETERMINANTS OF OCCUPATIONAL EXPOSURES TO BLOOD AND BODY FLUIDS AMONG HEALTH WORKERS IN TWO TERTIARY HOSPITALS IN NIGERIA

Dimie Ogoina[1], Kemebradikumo Pondei[2], Babatunde Adetunji[3], George Chima[4], Christian Isichei[5], Sanusi Gidado[6]

[1*]Department of Medicine, [2]Microbiology Niger Delta University, Wilberforce Island, Amassoma, Bayelsa State [3]Department of Medicine,[4] Family Medicine, [5]Chemical Pathology and Surgery, [6]Bingham University Teaching Hospital, Jos Plateau State.

***Email:** dimostic@yahoo.co.uk ; dimie.ogoina@mail.ndu.edu.ng

Abstract

Background: Healthcare associated infections among health workers commonly follow occupational exposures to pathogens infecting blood or body fluids of patients. We evaluated the prevalence and determinants of occupational exposures to blood/body fluids among health workers in two tertiary hospitals in Nigeria.

Methods: In a cross section study undertaken in two tertiary hospitals in North-central and South-south Nigeria in 2011, a structured self-administered questionnaire was used to obtain demographic data and occupational exposures to blood/body fluids in the previous year from doctors, nurses and laboratory scientists. Independent predictors of occupational exposures were determined in an unconditional logistic regression model.

Results: Out of 290 health workers studied, 75.8%, 44.7%, 32.9%, 33.9% and 84.4% had skin contact with patient's blood, needle stick injuries, cut by sharps, blood/body fluid splashes to mucous membranes and one or more type of exposures respectively. Ninety one percent, 86%, 71.1%, 87.6%, 81.3%, and 84.4% of house officers, resident doctors, consultant doctors, staff nurses, principal/chief nursing officers and laboratory scientists, respectively had one or more type of exposures in the previous year (P>0.05). Professional group was found to be the only independent predictor of cut by sharps. House officers and nurses had higher and more frequent occupational exposures than other professional groups.

Conclusion: Our results suggest high rates of occupational exposures to blood/body fluid among health workers in Nigeria, especially among newly qualified medical doctors and nurses. Health facilities in Nigeria ought to strengthen infection prevention and control practices while targeting high risk health workers such as house officers and nurses.

Key words: Prevalence, occupational exposures, needlestick injuries, sharps, healthcare workers, Nigeria.

Introduction

Health care workers (HCW), are at risk for occupational exposures to more than 27 blood-borne pathogens.(Collins et al, 1987) The World Health Organization estimates that about 3 million HCWs face occupational exposure to blood borne viruses each year (2 million to HBV, 900,000 to HCV, and 300,000 to HIV), 90% of the infections that result from these exposures are in low income countries, especially those in sub-Saharan Africa. (WHO 2002; Pruss-Ustun et al 2005) Exposures occur through needle-sticks or cuts from other sharp instruments, contact of the eye, nose, mouth, or skin with a patient's blood/body fluids.

Blood-borne infections such as HIV, hepatitis B virus (HBV), and hepatitis C virus (HCV), are highly endemic in Nigeria (WHO, 2013), one the most populated developing nation in the world. Although a few studies from Nigeria have reported high prevalence of various forms of occupational exposures to blood and body fluids among health workers (Ansa et al, 2002; Erhabor et al 2007; Isara et al 2012; Medubi et al 2006), there remains of dearth of studies from Nigeria describing the prevalence and determinants of these exposures in the different professional groups of health workers. The aim of this study was to shed further light on the prevalence, patterns, and determinants of occupational exposures among the three major professional groups of health workers in two major tertiary hospitals in North-Central and South-South Nigeria.

Material and Methods

This cross sectional study was undertaken in two tertiary hospitals in Nigeria, namely Bingham University Teaching Hospital (BHUTH), Jos Plateau state and Niger Delta University Teaching Hospital (NDUTH), Bayelsa State. The BHUTH is 150 bed hospital located in Jos, an urban city in North Central, Nigeria while NDUTH is a 200 bed hospital located in Okolobiri, a semi-urban city in Bayelsa State, South-South Nigeria. Both hospitals provide tertiary level of patient care covering major medical and surgical disciplines. The study was conducted over a two month period in both sites; between March and April 2011 in BHUTH and between February and March 2012 in NDUTH. Ethical approval for the study was obtained from the various hospitals' ethical review committee and all study participants gave consent for the study.
The study population 381, health workers included all doctors (n=128), nurses (n=220), and laboratory scientists (n=33) of both hospitals. Of the 381 health workers, 216 (56.7%), were working in NDUTH.

Questionnaire and data collection

Data were collected using a self administered structured questionnaire which comprised of four categories of questions including: 1. Demographic and occupational data 2. Prevalence and frequency of exposures to needle stick injuries, cut by sharps, blood and body fluids splashing into mucous membranes and skin contact with patients' blood in the previous one year. For each exposure type, health workers were also asked if they had one, two or three or more episodes of occupational exposures in the previous year. The average numbers of episodes of occupational exposures (mean scores) in the previous year were calculated based on numeric scores of 1, 2 and 3 allotted for every one, two and three or more responses respectively.

http://dx.doi.org/10.4314/ajid.v8i2.7

Statistical analysis

Data was analysed using statistical package for social sciences (SPSS) version 17. Differences in qualitative and quantitative data were determined by Chi square, Fisher's exact test as appropriate, student's t-test and Anova as appropriate. An unconditional logistic regression model including variables associated with occupational exposures ($p<0.2$) on univariate analyses was used to determine independent predictors of exposures. $P<0.05$ was considered as statistically significant for all analyses.

Results

Demographic

A total of 290 health workers (166 from NDUTH and 124 from BHUTH) participated in the study, giving an overall response rate of 76%. The demographic and occupational characteristics of study participants are shown in table 1. Of the 290 health workers, 111 (38.3%) were doctors, 147 (50.7%) were nurses and 32 (11%) were laboratory scientists.

Table 1: Demographic and Occupational Characteristics of Study Participants

Variables	NDUTH	BHUTH	Total population
Age (years)			
Median (IQR)	34 (29,45)	39(33,48)	37(30,46)
Gender (n %)			
Male	86 (51.8%)	47(37.9%)	133 (45.9%)
Female	80 (48.2%)	77(63.1%)	157 (54.1%)
Years in profession			
Median (IQR)	6(3,20)	10 (4,22)	8 (3,21)
Training in infection control			
Yes	78 (57.4%)	58 (42.6%)	136 (48.6%)
No	78 (54.2%)	66 (45.8%)	144 (51.4%)
Professional group (n %)			
House officers	23 (13.9%)	-	23 (7.9%)
Medical officers/Resident doctors	30 (18.1%)	20 (16.1%)	50 (17.2%)
Consultant doctors	27 (16.3%)	11 (8.9%)	38 (13.1%)
Staff nurse/SNO	44 (26.5%)	55 (44.4%)	99 (34.1%)
PNO/ACNO/CNO	31 (18.7%)	17 (13.7)	48 (16.6%)
Laboratory scientists	11 (6.6%)	21 (16.9)	32 (11%)
Total	166 (57.2%)	124 (42.8%)	290 (100%)

Key: IQR-inter-quartile range, SNO-senior nursing officer, PNO-principal nursing officer, ACNO-assistant chief nursing officer, CNO-chief nursing officer, NDUTH-Niger Delta University Teaching Hospital, BHUTH-Bingham University Teaching Hospital

Prevalence and determinants of occupational exposures

The prevalence of occupational exposures in relation to study variables are shown in table 2. Of the 290 study participants, 243 (84.4%) had one or more type of exposures, with skin contact with patients' blood (75.8% of health workers) and needle stick injuries (44.7%), being the most frequent occupational exposures.

The prevalence of occupational exposures were generally highest among house officers, medical officers and nurses, and lowest among consultants and laboratory scientists (Table 2.),. These observed differences in occupational exposures among the various professional groups was statistically significant ($p=0.002$, $X^2=19.1$, $df=5$ Chi square), with regard to cut by sharps but not significant in other types of exposures ($P>0.05$).

Specific occupational exposures were not related to age, sex, training in infection control or hospital location. However, total exposures, defined as presence of one or more types of exposures, was significantly higher among HCW in BHUTH.

With regard to needle stick injuries, skin contact with patient's blood, and total exposures, the median years of professional practice of exposed HCW was also significantly lower than unexposed HCW (Table 2). Although, surgeons reported generally higher occupational exposures than non-surgeons, the observed differences were not statistically significant.

Independent determinants of cut by sharps were determined in an unconditional logistic regression analysis including age, years of professional practice, hospital location and professional group. Professional group was found to be the only independent predictor of cut by sharps (table 3). Consultants, medical officers and laboratory scientists were significantly less likely to have cut by sharps than house officers. Although nurses were less likely to have cut by sharps than house officers, the differences were not statistically significant (Table 3).

Frequency of occupational exposures

The frequency of the various types of occupational exposures according to professional groups is represented graphically (figure 1) using average number of exposures reported (mean scores). House officers and nurses generally reported more frequent episodes of occupational exposures than other health workers, although the observed differences across professional groups were not statistical significant ($P>0.05$, ANOVA for all analyses).

http://dx.doi.org/10.4314/ajid.v8i2.7

Table 2: Prevalence and Distribution of Occupational Exposures

Variable	Needle stick injuries	Cut by sharps	Blood splashes	Skin contact with blood	Total exposure
Age (years)* Median (IQR) Exposed Not exposed	 36 (29,46) 37 (30,47)	 38 (31,48) 36 (29,45)	 40 (32,47) 34 (29,46)	 37 (30,46) 38 (29.5,53)	 36 (30,46) 40 (30,56)
Years in profession* (years) Median (IQR) Exposed Not exposed	 5 (3,20) 10 (4,21)	 8.5(3,20.5) 7 (3,20)	 10 (3,20) 7 (3,21)	 7 (3,20) 12 (4,25)	 7 (3,20) 12 (4,26)
P values	P=0.032	NS	NS	P=0.021	P=0.006
Gender* (n % exposed) Male Female	 59 (45.7%) 63 (43.8%)	 39 (30.9%) 49 (34.5%)	 43 (33.3%) 50 (34.5%)	 96 (73.9%) 117 (77.5%)	 109 (81.9%) 134 (86.5%)
Hospital (n % exposed) BHUTH NDUTH	 52 (48.1%) 70 (42.4%)	 36 (34.3%) 52 (31.9%)	 45 (39.8%) 48 (29.8%)	 95 (81.2%) 118 (72%)	 111 (91%) 132 (79.5%)
	NS	NS	NS	NS	P=0.008
Training in infection control* Yes No	 61 (47.3%) 57 (42.5%)	 46 (36.8%) 39 (29.3%)	 44 (34.4%) 47 (34.6%)	 102 (77.3%) 105 (75.5%)	 118 (87.4%) 119 (83.2%)
Professional group (n% exposed)					
House officer	14 (60.9%)	12 (52.2%)	8 (34.8%)	20 (87%)	21 (91.3%)
Medical officer/ resident doctor	25 (51%)	11 (22.9%)	21 (42.9%)	39 (78%)	43 (86%)
Consultant doctors	12 (32.4%)	4 (11.4%)	12 (32.4%)	24 (64.9%)	27 (71.1%)
Staff nurse/SNO	37 (41.6%)	36 (40.4%)	32 (35.2%)	73 (78.5%)	85 (87.6%)
PNO/ACNO/CNO	22 (47.8%)	19 (42.2%)	16 (34.8%)	37 (77.1%)	41 (85.4%)
Laboratory scientists	12 (41.4%)	6 (21.4%)	4 (14.3%)	20 (66.7%)	26 (81.3%)
Total	122 (44.7%)	88 (32.8%)	93 (33.9%)	213 (75.8%)	243 (84.4%)
P values	NS	P=0.002	NS	NS	NS
Doctors areas of practice(n% exposed)* Surgeons Non-surgeons	 16 (48.5%) 20 (38.5%)	 6 (20%) 9 (17.3%)	 13(39.4%) 19 (36.5%)	 27 (81.8%) 35 (66%)	 28 (82.4%) 41 (77.4%)

NB: * =For these variables p values were not significant (NS) or p>0.05 for all types of occupational exposures, IQR-inter-quartile range, SNO-senior nursing officer, PNO-principal nursing officer, ACNO-assistant chief nursing officer, CNO-chief nursing officer, NDUTH-Niger Delta University Teaching Hospital, BHUTH-Bingham University Teaching Hospital

http://dx.doi.org/10.4314/ajid.v8i2.7

Table 3: Determinants of Cut By Sharps among Health Workers

Variables	Unadjusted odds ratio (95% CI)	Adjusted		P values
		Odds ratio	95% CI	
Age (years)	1.0 (0.98-1.03)	1.03	(0.98-1.09)	0.23
Years in profession	1.0 (0.98-1.03)	0.9	0.94-1.05	0.81
Hospital location				
NDUTH	0.89 (0.53-1.51)	0.94	0.52-1.72	0.85
BHUTH	1	1		
Professional group				0.002
House officers	1	1		
MO/Residents	0.27 (0.09-0.79)	0.24	0.08-0.72	0.01
Consultants	0.12 (0.03-0.45)	0.07	0.02-0.34	0.001
Staff nurse/SNO	0.62 (0.25-1.56)	0.54	0.19-1.49	0.23
PNO/ACNO/CNO	0.67 (0.24-1.84)	0.42	0.12-1.57	0.20
Laboratory scientists	0.25 (0.07-0.85)	0.21	0.06-0.77	0.02

Key: CI-confidence interval, MO-medical officer, SNO-senior nursing officer, PNO-principal nursing officer, ACNO-assistant chief nursing officer, CNO-chief nursing officer, NDUTH-Niger Delta University Teaching Hospital, BHUTH-Bingham University Teaching Hospital

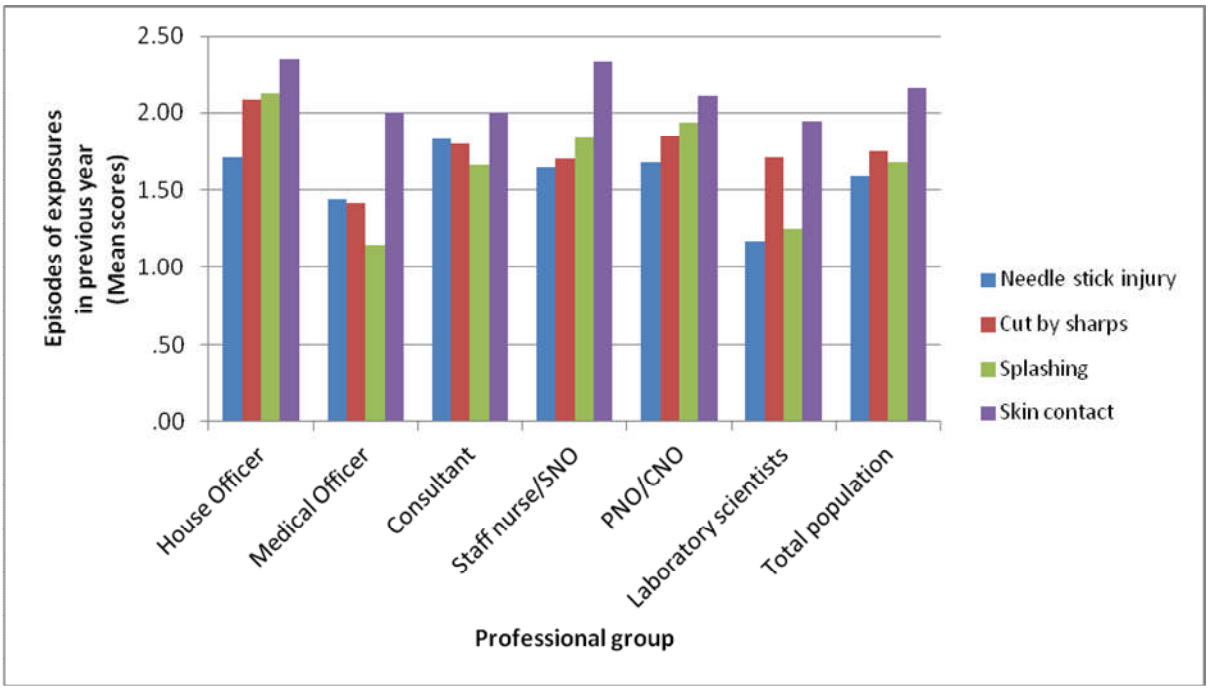

Figure 1: Bar Chart Showing Avaerage Episodes of the Various Types Occupational Exposures across Professional Groups in the Previous 1year. House officers and nurses had generally more frequent exposures than other health workers

High frequencies of exposures (three or more exposures) to needle stick injuries, cut by sharps, blood splashing and skin contact with patients' blood were reported by 22(18%), 20(21.5%), 21 (22.6%), and 106 (50%), health workers respectively.

Discussion

The results of this study undertaken in two major tertiary hospitals in South-South and North-central Nigeria indicate that occupational exposures to blood and body fluids by health workers in form of needle stick injuries, cut by sharps, blood/body fluids splashes, and skin contact with patients' blood are common, with 85% of the studied health workers reporting one or more type of exposures in the previous year. The high frequency of skin contact with patients' blood and needle stick injuries reported in this study may reflect low practice of standard precautions of infection control especially as it relates to use of personal protective equipments and safe injection practices. This assertion is supported by a study of infection control practices in three tertiary hospitals in South- South Nigeria where high risk of occupational exposures were reported to be due to inadequate facilities for infection control and low practice of infection control.(Ansa et al, 2002) Comparatively, lower rates of accidental blood exposures were reported among health workers from other West African countries where 45.7% of health workers had at least one type of exposure in the previous year (Tarantola et al, 2005) and from studies from United States of America where only 5.5% of health workers reported occupational exposures yearly.(Dement et al, 2004)

The study data has revealed that professional group was an independent predictor of cut by sharps with generally higher prevalence and more frequent episodes of occupational exposures among recently qualified doctors and nurses than all other health workers. Among doctors, medical officers were also more frequently exposed than consultants, and doctors working in surgical-related fields had slightly higher exposures than those working in non-surgical related fields. The risk for occupational exposures among health workers has been reported to be greatest

http://dx.doi.org/10.4314/ajid.v8i2.7

during the training and initial years of professional practice (Erhabor et al, 2007; Dement et al, 2004), and also found to be greater among nurses and surgeons than other health workers. (Medubi et al, 2006; Tarantola et al, 2005; Dement et al, 2004; Turner et al, 1999; Hosoglu et al, 2009; Tarantola et al, 2003) House officers are most often engaged in the 'dirty jobs' associated with exposures such as veni-puncture, insertion of intravenous line, naso-gastric tube insertion, among others. It is also plausible that these newly qualified doctors have poorer knowledge of infection control practices than their older counterparts. Surgeons are frequently exposed during operative procedures while the higher exposure rates in nurses may be due to closer and more frequent contact with patients during nursing care, than other health workers.

Our study is not without limitations. In a cross sectional questionnaire-based study evaluating previous exposures, there is always the possibility of recall bias. By limiting the responses on frequency of exposures to three categories (one, two or three/more episodes) we probably might have reduced the magnitude of recall bias. However, this approach limited our ability to ascertain the exact numbers of prior occupational exposures in the preceding year. Nevertheless, we believe that the calculated average scores presented in our study is a true reflection of the variability in episodes of occupational exposures across professional groups in Nigeria as corroborated by other studies. (Erhabor et al, 2007; Dement et al, 2004) Since we could not get significant numbers of house officers in BHUTH to include as study participants, we cannot exclude a possible underestimation of the overall prevalence of the various types of occupational exposures among the health workers in BHUTH.

In conclusion, our study has revealed high rates of occupational exposures to blood and body fluids among health workers in Nigeria. House officers who have just begun their medical practice were found to be particularly at higher risk of more frequent exposures. Health facilities in Nigeria ought to strengthen infection prevention and control practices and institute targeted interventions to prevent occupational exposures among high risk health workers such as house officers, surgeons and nurses.

Conflict of interest notification: None

References

1. Collins, C. H. and Kennedy, D. A. (1987). Microbiological hazards of occupational needle stick and sharps injuries. J. Appl. Bacteriol **62**:385–402.
2. World Health Organisation (2002). The world health report: reducing risks, promoting healthy life. Geneva, Switzerland: World Health Organization.
3. Prüss-Ustün, A., Rapiti, E., and Hutin, Y. (2005). Estimation of the global burden of disease attributable to contaminated sharps injuries among health-care workers Am J Ind Med. 2005 Dec; 48**(6):**482-90.
4. World Health Organisation. Nigeria Health profile. Updated May 2013. Available at www.who.int/gho/countries/nga.pdf. Retrieved May 2013.
5. Ansa, V.O., Udoma, E.J., Umoh, M.S., and Anah, M.U. (2002). Occupational risk of infection by human immunodeficiency and hepatitis B viruses among health workers in south-eastern Nigeria. East Afr Med J. May; 79 **(5):** 254-256.
6. Erhabor, O., Ejele, O.A., and Nwauche, C.A. (2007). Epidemiology and management of occupational exposure to blood borne viral infections in a resource poor setting: the case for availability of post exposure prophylaxis. Niger J Clin Pract. Jun; 10 **(2):**100-4.
7. Isara, A.R., and Ofili, A.N. (2012). Prevalence of Occupational Accidents/Injuries among Health Care Workers in a Federal Medical Centre in Southern Nigeria. West Afr J Med. Jan-Feb; 31(**1**):47-51.
8. Medubi, S.A., Akande, T.M., and Osagbemi, G.K. (2006). Awareness and Pattern of Needle stick Injuries among Health Workers at University Teaching Hospital Ilorin, Nigeria. Afri J Cln Exper Microbiol. Sept; 7 **(3)**: 178-184.
9. Tarantola, A., Koumaré, A., Rachline, A., Sow, P.S., Diallo, M.B., Doumbia, S., Aka, C., Ehui, E., Brücker, G., and Bouvet, E.; Groupe d'Etude des Risques d'Exposition des Soignants aux agents infectieux (GERES) (2005). A descriptive, retrospective study of 567 accidental blood exposures in healthcare workers in three West African countries. J Hosp Infect. Jul; 60**(3):**276-82.
10. Dement, J.M., Epling, C., Ostbye, T., Pompeii, L.A., and Hunt, D.L. (2004). Blood and body fluid exposure risks among health care workers: results from the Duke Health and Safety Surveillance System. Am J Ind Med. Dec; 46**(6):**637-48.
11. Turner, H.S., Hurley, J.L., Butler, K.M., and Holl, J. (1999). Accidental exposures to blood and other body fluids in a large academic medical center. J Am Coll Health ; **47:**199-206.
12. Hosoglu, S., Akalin, S., Sunbul, M., Otkun, M., and Ozturk, R. (2009). Occupational Infections Study Group. Predictive factors for occupational bloodborne exposure in Turkish hospitals. Am J Infect Control. Feb;37**(1):**65-9.
13. Tarantola, A., Golliot, F., Astagneau, P., Fleury, L., Brücker, G., and Bouvet, E.; CCLIN Paris-Nord Blood and Body Fluids (BBF) Exposure Surveillance Taskforce (2003). Occupational blood and body fluids exposures in health care workers: four-year surveillance from the Northern France network. Am J Infect Control. Oct 31**(6):**357-63.