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Work Related Exposures to Biological Hazards and Compliance to Safe Work Practices among Nurses of a Tertiary Hospital in Sokoto, Nigeria

Kaoje Aminu Umar[1], Magaji Bello Arkilla[2] Bello Umar Aisha[3], Godwin Gana[4], Raji Mansur Olayika[5] and Mohammed Yahaya[6]

Abstract

Occupational hazards also exist where medical care is provided and the providers are at increased risk of injuries and infections. The aim is to assess prevalence and frequency of Work related exposures to Biological Hazards and compliance to Safe Work Practices among Nurses. The study is hospital-based and descriptive cross-sectional study. A two stage sampling method was used to select the 250 respondents and data collected using pretested questionnaires and analyzed with SPSS version 20.0. Quantitative variables were summarized using mean and standard deviation and categorical variables with frequencies and percentages. Work related exposures (WRE) rate experienced for six months period was determined and expressed as person-months including an individual Nurse Injury rate for the number of events. Almost all the respondents (94%) had not received training on safe work practices. WRE prevalence was 20.4% and total number of WRE experienced by the Nurses was 388 for a six-month period, with an individual nurse WRE rate of 1.6 events every six months. Common exposures were needle sticks prick, direct contact with contaminated materials and splash of body fluids into the eyes. Very few respondents reported use of facemask all the time while only 27% reported use of hand gloves and a fraction (4.2%) have had supervisory safety visit to their unit. WRE prevalence was high and most common exposure remains needle stick injury. There should be safety orientation and training on safe work practices and regular safety supervisory visit to all units to

[1] Usmanu Danfodiyo University, Sokoto Nigeria, Department of Community Health Garba Duba Road, Sokoto, +234, NIGERIA.
[2,3,4,5,6,] Usmanu Danfodiyo University, Sokoto Nigeria, Department of Community Health Str Garba Duba Road ZIP/Post code +234, Sokoto, NIGERIA

promote compliance.

Keywords: Work related Exposures, Biological hazards, Nurses, Tertiary Hospital.

1 Introduction

The health care work environment and process of delivering medical care to patients is risk laden. Occupational exposures to body fluids through percutaneous and other sharp injuries, accidental splashes to mucosal surfaces of the eyes, nose, or mouth can facilitate transmission of blood-borne pathogens. [1] Improper handling and disposal of needle occur most commonly in the clinics/wards and is reported to result to an annual estimate of 800,000 needle stick injuries. [2] WHO report in 2000 revealed that 16,000 HBV and 1,000 HIV infections occurred worldwide among health care workers due to their occupational exposure to sharp injuries and 39%, 37% and 4.4% of HCV, HBV and HIV infections respectively among health care workers is attributable to occupational exposure through per cutaneous injuries. [3] The prevalence of work hazard varies greatly across different countries and within the same country. On average, healthcare workers (HCWs) in Africa suffer two to four needle stick injuries per year, [4] while in USA incidence of 16.3% for needle stick injury among nurses was reported, [1] and 13.9% in Australia. [5]

In Europe, Needle stick injuries are one of the most common and serious risks to healthcare workers and represent a high cost for health care systems and society at large. Even when a serious infection is not transmittable, emotional impact of sharps injury can be severe and long lasting. In view of this, The European Social partners in the hospital and healthcare sector, HOSPEEM (European Hospital and Healthcare Employers' Association) and European Public Services Union (EPSU) signed a Europe-wide framework agreement on the prevention of sharps injuries. [6]

Standard precautions have been recommended by Centre for Disease Control (CDC) to be used on all patients regardless of diagnosis and their infection status. [3] Compliance with standard precautions is compliance to safe work practice and is found to reduce the risk of direct physical exposure to blood and other body fluids. [7] However, studies on compliance with standard precautions among nurses have revealed a low practice in spite of being a sufficient means in preventing and controlling nosocomial infections in patients and health care providers. [8]

Although needle stick injury can happen to every category of health care workers, nurses showed the highest percentage of an occupational exposure to blood and body fluids (BBF) followed by physicians and laboratory staff. [9] This study is necessitated on this fact and also because nurses constitute the majority of the healthcare work force, spend most of their hours at work with patients and do

interact with patients more often than any other health care personnel in the hospital. Therefore they are mostly likely at an increased risk of various occupational hazards in the hospital, including exposure to blood-borne pathogens such as HIV and hepatitis B, C viruses especially through needle stick injury and contact with patient body fluids through accidental splash. The aim of this study is to assess prevalence and frequency of Work related exposures to Biological Hazards and compliance to Safe Work Practices among Nurses in a tertiary hospital.

2 Material and methods

This study was conducted in one of the tertiary Hospital in Sokoto state, Nigeria. The hospital has eleven outpatient clinics, seven theaters and a bed capacity of six hundred and fifty distributed in the twenty two wards, with Nurse work force of over six hundred. The study Population comprised of all nurses working in various wards, clinics, and theatres of the hospital for at least 6 months period and consented to participate in the study. However, not at risk nurses such as Nurse Tutors in the training school, those currently at administrative position and on study leave 6 months prior to the study were excluded. A descriptive cross-sectional study design was used and a required sample size for the study was determined using a formula, for population less than 10, 000. [10] A correction factor, for an assumed attrition rate of 20% that would result due to non-response, poorly completed questionnaires, or loss of part of or whole of filled questionnaire was made using a correction factor formula, [11] and a sample size of two hundred and fifty was obtained. A two-stage sampling technique was applied to select the respondents. Data was obtained using self-administered questionnaires containing mainly closed-ended questions and was analyzed using statistical package for social science (SPSS) version 20.0. IBM Corporation.

Exposure is defined as contact with blood, visibly bloody fluids, and other body fluids either through percutaneous injuries, mucous membrane exposures, and non-intact skin to which standard precautions apply or during the performance of duties by the nurses.

Work related exposures (WRE) were defined as the number of self-reported injuries and exposures experienced in the previous six months for the following accidental events: needle sticks, splashes of body fluid to the eye or mouth, direct physical contact with contaminated material, cuts. WRE rates, expressed as person-six months, were computed by dividing the total number of WRE experienced for each type of injury category by the person-time at risk. An aggregated measure of WRE was calculated by adding the number for each injury category experienced and reported by the nurse.
The mean and standard deviation was calculated for the continuous data while the

categorical data were expressed in frequencies and percentages. The total number of WRE experienced by the respondents for a six-month period was determined (WRE rates) and expressed as person-six months including an individual employee injury rate for the number of events every six months. An aggregated measure of WRE was also calculated adding the number for each injury category. Ethical clearance and permission to conduct the study in the hospital was sought and obtained from the Usmanu Danfodiyo University Teaching Hospital, Sokoto, Research Ethics Committee. In addition each of the respondent was asked to read the questionnaire information to make an informed decision whether to participate or not.

3 Main Results

Table 1 shows the respondents' mean age was 25.6 ± 3.2 years and nearly half (46%) of them were aged between 25 and 34 years, followed by those between 35and 44 years that accounted for one third (33%). There were more male participants than females (51% vs 49%) and more than three quarters (77.6%) of them were working in the wards, followed by 16.4% from theatres.

Results in table 2 showed that majority (86%) reported not being informed of work place hazards on employments and very large majority (94%) had not received training on work place safety practice. Very few respondents (4.2%) have had supervisory safety visit to their unit whereas only 16% of respondents in overall were aware of availability of injury/exposure register in their unit.

Table 3 revealed the prevalence of Work Related Exposures since working in the hospital and within the last 6 months preceding this study to be 71.2% and 20.4% respectively. The most common Work Related exposures since working in the facility were Needle sticks prick (76.4%), Cuts from sharp objects (30.3%) and Splash of body fluids into the eyes and Physical direct contact to contaminated materials was experienced each by 20%. Whereas the most common Work Related exposures within the last 6 months preceding were Needle sticks pricks (68.6%), Physical direct contact to contaminated materials (19.6%) and Splash of body fluids into the eyes (18%). In both time period, the common circumstance that led to the injury were during re-capping of needle (68% vs. 47%), Unstable patient or client while giving injection (34.6% vs 39.2%) and While trying to break open drug vial/ampoule (20.2% vs. 11.8%). These work related injury occurred mostly during the morning shift (82.6% vs. 90.2%) and most of these injuries were not reported to the supervisor nor documented in the injury register and only very few victims received post exposure prophylaxis after exposure/injury (31.5% vs. 33.3%). Respondents reported lack of training on safety practice as the main factor that facilitates the occurrence of injury followed by high workload.

Table 4 results shows that the total number of Work Related Exposures experienced by the Nurses was three hundred and eighty-eight for a six month period, for an individual employee exposure rate of 1.6 events every six months. The needle sticks injury (165 events by 35 employees), splash of body fluids into the eyes/mouth (99 events by 14 employees) and physical skin contact with contaminated material (70 events by 10 employees) were the three most common exposure events, accounting for 86.2% of all exposures.

Results in table 5 revealed that large majority (94%) of the respondents reported having direct contact with their patient. Almost two-third (65%) had exposure to biological hazards in their work place, 19% exposed to chemical hazards while very few were exposed to radiation (5.2%). Table 6 results shows that half (50%) of the respondents reported that personal protective equipment are available in their unit in most of times. When the need use of these personal protective equipment arises, very few reported use of facemask always (14%) while 38% do not use it at all and 27% use hand gloves always. Less than 20% always ensure hand hygiene between patients' contacts and 32% always dispose their sharps into sharps container while 3.6% don't use sharp container at all.

In the table 7 results, only 34% of the respondents correctly knew that the site of needle stick injury should be allowed to bleed freely and 41% correctly stated that the affected area should be washed immediately with soap and water even though nearly two third said disinfectants should be applied. Nearly two third (60%) of respondents do not know that such injury should be reported to the supervisor and documented in the accident/injury register. A little above half (52%) knew that the victim of used needle stick prick should be counseled and immediately receives post exposure prophylaxis.

Table 8 results revealed that more males than females experienced work related exposures since working in the facility and within the last 6 months (56.7% vs. 43.3% and 62.7% vs. 37.3%). These exposures are more prevalent in the ward (77% and 88% respectively) and majority (83% and 90% respectively) were reported to have occurred during the morning shift.

4 Labels of figures and tables

Table1: Socio-demographic characteristics of the respondents

Variables	**Number**	**Percentage**
Age groups (years)		
21-24	4	1.6
25-34	144	45.6
35-44	86	34.4
45-54	46	18.4
Sex		
Males	127	50.8
Females	123	49.2
Marital status		
Married	186	74.4
Single never married	54	21.6
Divorced	4	1.6
Widow	6	2.4
Religion		
Islam	146	58.4
Christianity	104	41.6
Tribe		
Hausa/Fulani	88	35.2
Yoruba	83	33.2
Igbo	35	14.0
Others	44	17.0
Duty post in the hospital		
Ward	194	77.6
Theatre	41	16.4
Clinic	15	6.0

Table 2: Workers in-service training and Supervision (n= 250)

Variables	**Frequency**	**Percentage**
No information on work place hazards on employments	214	85.6
No training on work place safety practice	234	93.6
Injury/exposure register in ward/clinic/theatre	41	16.4
Supervisory safety visit	12	4.2

Table 3: Work Related Exposures and facilitating circumstances

	Since working in the facility		**Within the last 6 months**	
Variables	Freq.	Percent	Freq.	Percent
Ever had injury/exposure since working in this facility	**178**	**71.2**	na	
Injury/exposure within the last 6 Months	na		**51**	**20.4**
Splash of body fluids into the eyes	35	19.7	9	17.6
Splash of body fluids into the mouth	9	5.1	5	9.8
Needle sticks prick	136	76.4	35	68.6
Physical direct contact to contaminated materials	35	19.7	10	19.6
Cuts from sharp objects	54	30.3	6	11.8
Skin scratch/abrasion	10	5.6	2	3.9
Electric shock	13	7.3	7	13.8
CIRCUMSTANCES THAT LED TO INJURY				
During re-capping of needle	121	68.0	24	47.1
Accidental prick/cut from a colleague	1	0.6	0	0
Unstable patient or client while giving injection	62	34.8	20	39.2
While trying to break open drug vial/ampoule	36	20.2	6	11.8
Slippery floor due to water	9	5.1	3	5.9
Poor patient reception/handling	21	11.8	6	11.8
Other circumstances	2	1.1	0	0.0
Severity of the injury to warrant work absenteeism	19	10.7	6	11.8
Injury/exposure reported to a superior or supervisor	121	68.0	28	54.9
Injury/exposure documented in the injury register	18	10.1	8	15.7
Time of the day when the injury occurred				
Morning	147	82.6	46	90.2
Evening	21	11.8	2	3.9
Night	10	5.6	3	5.9
Factors that facilitate the occurrence of injury				
Lack of training on safety practice	135	75.8	42	82.4
High work load	43	24.2	9	17.6
PEP after exposure/injury	56	31.5	17	33.3

freq= frequency; na= not applicable

Table 4: Work Related Exposures among Nurses in six months period (N =250)

		Work Related Exposures		
Type of exposures	**Number of nurses**	**Frequency of WRE**	**Percent**	**Rate**
Splash of body fluids into the eyes/mouth	14	99	25.5	0.40
Needle sticks prick	35	165	42.5	0.66
Physical direct contact to contaminated materials	10	70	18.1	0.28
Cuts from sharp objects	6	36	9.3	0.14
Skin scratch/abrasion	3	18	4.6	0.07
Total	**51**	**388**	**100.0**	**1.6**

Table 5: Work place exposure to some occupational hazards

Variables	**Frequency**	**Percentage**
Direct contact with patient		
Yes	235	94.0
No	15	6.0
Exposure to chemical products		
Yes	47	18.8
No	202	80.8
Exposure to radiation		
Yes	13	5.2
No	237	94.8
Exposure to biological hazards		
Yes	162	64.8
No	88	35.2
Exposure to physical hazards		
Yes	29	11.6
No	221	88.4

Table 6: Availability of personal protective equipment and compliance to safe work practice

Variables	Frequency	Percentage
How often are PPE available in your unit		
Always	15	6.0
Most times	124	49.6
Sometimes	108	43.2
Never available	3	1.2
Use of safety precaution/practice	186	74.7
How often do you use:		
FACE MASK		
Always	35	14.0
Most times	120	48.0
Don't use	95	38.0
HAND GLOVES		
Always	68	27.2
Most times	182	72.8
HAND HYGIENE BETWEEN PATIENTS CONTACTS		
Always	47	18.8
Most times	192	76.8
Don't use	8	3.2
Disposal of sharps into sharps container		
Always	80	32.0
Most times	160	64.0
Don't use	9	3.6
Use of Protective aprons		
Always	9	3.6
Most times	54	21.6
Don't use	187	74.8
Ensure good house keeping		
Always	99	39.6
Most times	147	58.8
Don't use	4	1.6

PPE = personal protective equipment

Table 7: Knowledge of what to do when needle stick injury (NSI) occurs

Variables	**Frequency**	**Percentage**
Allow the site to bleed freely		
Yes	85	34.0
No	165	66.0
Squeeze the area to stop bleeding		
Yes	142	56.8
No	108	43.2
Wash immediately affected area with soap or water		
Yes	102	40.8
No	148	59.2
Apply disinfectant		
Yes	158	63.2
No	92	36.8
Report and document the incident to your supervisor		
Yes	99	39.6
No	151	60.4
Counseling and receive PEP		
Yes	131	52.4
No	119	47.6

Table 8: Cross tabulation of WRE by respondents' sex, and work place characteristics

	Since working in the facility (n=178)		**Within the last 6 months (n=51)**	
Variables	Freq.	Percent	Freq.	Percent
Sex				
Male	101	56.7	32	62.7
Female	77	43.3	19	37.3
Place of duty				
Ward	137	77.0	45	88.2
Theatre	28	15.7	1	2.0
Clinic	13	7.3	5	9.8
Training on safety practice				
Yes	6	3.4	0	0
No	172	96.6	51	100.0
Time of the day when the WRE occurred				
Morning	147	82.6	46	90.2
Evening	21	11.8	2	3.9
Night	10	5.6	3	5.9

WRE= Works related exposure; freq= frequency

5 Discussion

Healthcare workers function in environments considered to be one of the most hazardous occupational settings. [12] These categories of workers do experience diverse hazards due to their work related activities in addition to the usual workplace related exposures. [13-14] This includes hazards from splashes of potentially infectious body fluids into eyes and mouth, needle stick injuries, physical direct contact with contaminated materials, cuts and skin scratch or abrasions from sharp objects etc. These biological hazards tend to be more commonly experienced in healthcare settings in low and middle income countries.

Work-related injuries constitute a major public health problem resulting in serious but preventable social and economic consequences if appropriate measures are taken. [15] Nurses are at high risk for work-related injury due to the physically demanding nature of their work and the environment under which such works are carried out. Work-related injuries often impact on the health and economic well-being of nurses. [16]

This study revealed that almost three-quarters of respondents have had at least one

occupational health exposure or injury since they began working at their present duty post. However more than three quarters of the respondents had not received any training on safety practices while at work. This may explain the very high rate of occupational exposures/injuries among the respondents. This finding is higher than that among nurses in Philippines where about 40% have suffered occupational related injuries within the last year, [17] and among health workers in Uganda where 50% had ever experienced an occupational health hazard [14] but lower than among nurses in Ibadan Nigeria where 87.6% had suffered occupational related injuries, [18] which was mainly deduced to be due to failure to follow recommended safety measures. In order of occurrence, the kind of exposures experienced were Needle sticks pricks, Physical direct contact to contaminated materials and Splash of body fluids into the eyes. This is most probably due frequent prescription of injectable medicine over the oral medication by providers that resulted to too many injection practice. Improving rational prescription behavior and practice among different health providers will help reduce the incidence of the needle stick pricks. Contrarily, findings from a study among public hospital employees in Costa Rica, revealed that although needle stick injury was among four common injuries reported, it was the least. [19] The difference could be due trainings received by the workers and rationale drug prescription unlike this study which revealed that large proportion of the respondents were not adequately trained.

Only very few of the respondents always had personal protective equipment's (PPEs) available for use at any given time in their respective units. This may explain why the most common type of occupational related hazards the respondents are exposed to is due to direct skin to skin contact with patients. Personal protective equipment's (PPEs) are important infection control measures in the healthcare workplace. [18] A study in Uganda showed that independent predictors for experiencing hazards in the health workplace included not wearing the necessary PPEs while attending to patients. [13] Furthermore, needle stick injuries was the commonest occupational related injuries the respondents had experienced (76.4%) which is similar to findings in Ibadan, Nigeria, [18] where the use of recommended safety measures was lacking but differed from findings in Philippines where the most common occupational injury is back pain which rather resulted from long working hours. [17]

Only about one-third of respondents' had good knowledge of steps to take when needle stick injury occurs. This correlates well with the fact that majority (82%) of the respondents' had not been trained about safety workplace practice measures. This was further buttressed by the fact that only one third of those that had previously experienced occupational injuries actually sought and got post-exposure prophylaxis. This is an important finding because nurses are a very significant portion of the health workforce. Unreported needle stick and sharps injuries are serious public health problems that can reverse the gains made in the

control of nosocomial infections if the trend is not reversed. [20] The fact that nurses need to be properly trained on the use of safety measures in the workplace cannot be overemphasized. The lack of this training and in the face of increasing outbreaks of highly infectious diseases with very high case fatality rates such as Lassa fever and Ebola can lead to nurses abandoning their role of caring for patients while sick thereby worsening the current deplorable state of healthcare in developing country climes like that in Nigeria.

Because of descriptive nature of this study, the sociodemographic, occupational and organizational characteristics that are correlated with and predict WRI were not assessed. Similarly, due to the lack of reliable and valid injury registers in the study setting, self-reports were the only way to obtain the data presented in this study which were retrospectively measured for a six month period. This was likely introduce biases, such as recall bias or the courtesy bias where the respondents likely reported socially acceptable responses. Although the study was able to provide some insight into prevalence and frequency of health workers exposure to biological hazards during the health care delivery, there is need to conduct further studies to assess the contribution of various occupational and organization factors attributable to work related exposures and also preventive interventions to reduce or eliminate the associated problems.

6 Conclusion

In conclusion, the one in five respondents have had exposure to biomedical hazard and most common in order of occurrence were Needle sticks pricks, Physical direct contact to contaminated materials and Splash of body fluids into the eyes, accounting for 86.2% of all exposures. More than three quarters of the Nurses reported not being informed of work place hazards on employments neither received training on work place safety practice. Personal protective equipment were available in some unit in most of times. However, very few respondents reported use of facemask always while 38% do not use it at all and 27% use hand gloves always. Less than 20% always ensure hand hygiene between patients' contacts and only 32% always dispose their sharps waste into sharps container while 3.6% don't use sharp container at all.

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