



## ASSESSMENT OF INADVERTENT EXPOSURE TO BLOOD AND BODY FLUIDS AMONG HEALTH CARE PERSONNEL: A CROSS-SECTIONAL STUDY AT PRE-TERTIARY LEVELS OF HEALTH CARE IN SOUTHERN NIGERIA

<sup>1,\*</sup>Ferguson Ayemere Ehimen and <sup>2</sup>Ibora Samuel Akpan

<sup>1</sup>Department of Preventive Healthcare and Community Medicine, Lily Hospital, Warri, Nigeria

<sup>2</sup>Department of Family Medicine, Lily Hospital, Benin City, Edo State, Nigeria

Received 17<sup>th</sup> November 2020; Accepted 25<sup>th</sup> December 2020; Published online 29<sup>th</sup> January 2021

### Abstract

On a daily basis, Health care personnel (HCP) are inadvertently at significant risk of infections with blood-borne pathogens and these infections have been known to pose a substantial financial burden for follow-up testing, treatment and staff replacement. This situation is worse in developing countries like ours where there is sub-optimal infection control practices like lack of equipment, training and compliance with standard precautions. **Objectives:** To assess HCP inadvertent exposure to blood and body fluids. Also, this study is met to focus on patterns of mucocutaneous and percutaneous exposures to BBFs among HCP at the primary and secondary level of health care. **Methods:** The cross-sectional study was conducted amongst 291 Health care personnel working in thirty primary health care and three secondary health care facilities in a Southern state of Nigeria. **Results:** One hundred and fifty five (53.3%) and one hundred and seventy eight (61.2%) of the respondents had sharps injuries and exposure to blood and body fluid splashes. (BBFs). Comparatively, more (50.4%) of the health care workers in the Primary health care (PHC) centres had a sharp injury compared to the secondary health care (SHC) workers, however, more (62.8%) of the SHC workers had splash exposure to Blood and body fluids (BBFs) compared to the PHC. Furthermore, the major circumstances of unintentional exposure to blood and body fluids were: Recapping/manipulation of needles and sudden movement of a patient during hospital care, they account for 30.4% and 24.6% circumstances for exposures respectively. This study further reveals that job category, work experience and sex of the respondents were significantly associated with the occurrence of accidental exposure to BBFs. **Conclusion:** In this study, health care workers at the Primary and Secondary health care setting had substantial exposure to blood and body fluids. This significant exposure to BBFs is quite an alarming situation bearing in mind the health impact and financial loss resulting from treatment of blood borne infections. Therefore, there is a need for all health authorities to organize regular standard precautions training for all their health care workers; this training must be focused on injection safety practices and use of personal protective equipment.

**Keywords:** Inadvertent, blood and body fluids, pre-tertiary, southern-Nigeria.

### INTRODUCTION

Globally, there are 35 million Health care workers (HCWs) providing care to patients on a daily basis; of this population of health care workers, about 3 million are exposed to blood-borne pathogens through a exposure to blood and body fluids (BBFs) (World Health Organization, 2010; Amita Gupta *et al.*, 2008; Pruss-Ustun *et al.*, 2005). These exposures usually leads to 15,000 hepatitis C virus infections, 70,000 HBV infections and 500 HIV infections each year (World Health Organization, 2020). The risk of transmission of these viral diseases occurring from accidental exposure to blood and body fluids usually ranges 0.2%-0.3% following parental and less than 0.1% following mucous membrane for HIV, 1.8%-3% for HCV and up to 30% for hepatitis B virus (Mekonnin *et al.*, 2018; Rapti *et al.*, 2005). The aforementioned realities above call for serious concern considering the fact that Sub-Saharan African countries have the highest share of HIV prevalence and occupational exposure to BBFs (accounting for more than 90% of occupational exposure to BBFs) (Elias Weldesamuel *et al.* ; Mashoto *et al.*, 2013). The high burden of occupational exposure to BBFs is rather worrisome as these exposures can cause illnesses among HCWs, disability and death, hence impacting on the quality of the healthcare delivery (Bekele *et al.*, 2008; Tadesse and Tadesse, 2010; Kebede *et al.*, 2012). Studies done in Nigeria, other Africa and developing countries have reported a high prevalence of occupational exposure to

BBFs ranging from 32. 75%-71. 9% (Medubi *et al.*, 2006; Karani *et al.*, 2011; Samir *et al.*, 2008; Holla *et al.*, 2014). Furthermore, the circumstances of exposure to BBFs include the followings; recapping of needles, the sudden movement of patients, during surgical procedures and failure to use PPEs. Samir *et al.*, Amira *et al.* and Adejumo *et al.* in a separate study in Nigeria and India reveals that recapping of needles remains one of the commonest circumstance for exposure to blood and body fluids amongst healthcare workers (Samir and Amitav, 2008; Amira and Awobusuyi, 2014; Adejumo and Taofikat, 2014). Apart from the circumstances of exposure enumerated above, other factors implicated for exposure BBFs are socio-demographic factors (work experience, qualification, job category) and environmental factors (like poor illumination, long working hours) of the health care personnel (Yenesew and Fekadu, 2014; Kaweti and Abegaz, 2016). Currently, from a detailed review of literatures and from authors' best knowledge, there is no study on comparative assessment of occupational exposure to BBFs among HCWs in the senatorial district. Thus, this study aimed to bridge this gap by assessing primary and secondary HCWs occupational exposure to blood and other body fluids via assessing circumstance for exposures and possible sociodemographic factors influencing exposures to BBFs.

### METHODOLOGY

The study was conducted among primary and secondary health care workers in the Edo central senatorial district, Edo State,

\*Corresponding Author: Ferguson Ayemere Ehimen

Department of Preventive Healthcare and Community Medicine, Lily Hospital, Warri, Nigeria.

Nigeria. The Edo central senatorial district is one of the senatorial district in Edo State, the district comprises of five local government areas( Esan North East, Esan West, Esan South East, Esan central and Igueben) with administrative headquarter in Uromi, Ekpoma, Ubiaja, Irrua and Igueben.

### Study Population and duration

The study involves 291 health workers in 33 health care facilities (30 primary health care centres and 3 secondary health care centres) in Edo central senatorial district. The study was carried out within a period of 3 months

### Inclusion/exclusion criteria

All consenting HCWs who are involved in direct patient care and having been working in primary and secondary health care setting for at least 12 months prior to the study were included in the study while HCWs on leave were excluded.

### Study design, sample size determination and Data collection method

The study was a descriptive cross-sectional design; participants were selected via a multistage sampling technique. The minimum sample size for the HCWs was determined using formula for comparative cross sectional studies. An interviewer-administered semi-structured questionnaire was designed and used to collect information from the health care workers at the primary and secondary health care levels. This data collection instrument was used in collecting information on socio-demographic data, exposure to blood and body fluids (BBFs), type of exposures etc.

### Data management

Data were entered into a spreadsheet and analyzed using IBM SPSS (statistics product and service solution) version 20.

### Ethical Considerations

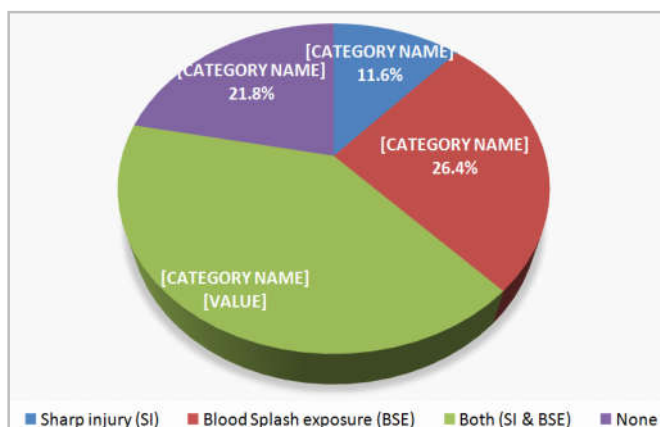
1. Ethical Approval: Ethical Approval to conduct this research was obtained from Ethics and Research Committee of Irrua Specialist Teaching Hospital.

## RESULTS

A large proportion 248 (85.2%), of the participants was working at the primary health care level while 14.8% of them studied reported working at the secondary health care level. Similarly, the majority of the respondents, were within the age group of 30-39. Out of the total HCP recruited 199 (68.4%) were females and 92 (31.6%) were males. Most, 122 (41.9%), of the HCP had a tertiary level of education while one quarter (25.8%) of them had a primary level of education. Majority, 198 (68.1%), of the participants were married while 76 % (26.1%) were singles. One hundred and forty ninety (51.3%) of the respondents were nurses while 16 (5.5%), 121 (41.5%) and 5 (1.7%) were doctors, health assistants and laboratory workers respectively (Table 1). As shown in figure 1, almost forty percent of the participants had both lifetime Sharp injury and blood and body fluids splash, while 11.6% and 26.8% had sharp injury and Blood Splash exposure only respectively. Less than one-third (21.8%) of respondents had no exposure to blood and body fluids.

**Table 1. Sociodemographic distribution of the health care personnel**

Variable	Frequency(n=291)	Percent (100%)
PHC	248	85.2
SHC	43	14.8
<b>Age group</b>		
20-29	36	12.4
30-39	123	42.3
40-49	73	25.1
50-59	59	20.2
<b>Marital status</b>		
Single	76	26.1
Married	198	68.1
Divorced	7	2.4
Widowed	10	3.4
<b>Level of education</b>		
Primary	75	25.8
Secondary	94	32.3
Tertiary	122	41.9
<b>Sex</b>		
Males	92	31.6
Females	199	68.4
<b>Job category</b>		
Doctor	16	5.5
Nurse	149	51.3
Health Assistants	121	41.5
Laboratory Workers	5	1.7
<b>Work experience</b>		
0-4 years	135	46.4
>4years	156	53.6



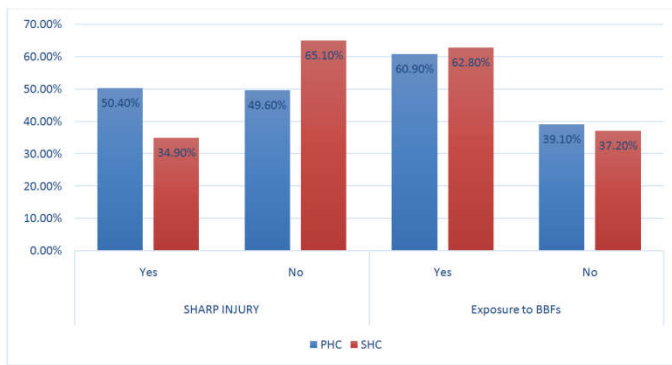
**Figure 1. Life time exposure to BBFs**

**Table 2. Sharp injuries and exposure through splashes of BBFs within 12months**

Exposed	Frequency(n=291)	
	Yes	No
Sharp Injury	155(53.3%)	136(46.7%)
Splash exposures	178(61.2%)	113(38.8%)

The result of sharp injuries and exposures through splashes of BBFs within the 12 months preceding the study are presented in table 2. More than one-half, 155 (53.3%), of the health workers were exposed to blood and body fluids through sharp injuries, while greater than half, 178(61.2%), of the HCWs at all levels of health care had splashes to blood and body fluids (Table 2).

Figure 2 presents the relative prevalence of occupational exposure to BBFs at the pre-tertiary levels of health care. More (50.4%) of the health care workers in the Primary health care (PHC) centres had a sharp injury compare to the secondary health care (SHC) workers. However, more (62.8%) of the SHC workers had splash exposure to Blood and body fluids (BBFs) compare to the PHC workers.



**Figure 2. Occurrence of accidental exposure to BBFS in the last years before study**

The major circumstances of inadvertent exposure to blood and body fluids were: Recapping/manipulation of needles and sudden movement of a patient during hospital care, they account for 30.4% and 24.6% circumstances of exposure respectively. Failure to use PPEs and encounter during surgeries account for 13.3% and 5.5% of the exposures (Table 2).

**Table 3. Circumstances leading to exposure to blood and body fluids**

Risk factors	*Frequency(n=398)	Percent (%)
Recapping/ Manipulation of needles	121	30.4%
Sudden movement of patient	98	24.6%
Failure to use PPEs	53	13.3%
During clean up	44	11.1%
medical procedure	39	9.8%
During surgery during	22	5.5%
During discarding of needle	17	4.3%
Others**	4	1.0%

\*Multiple response \*\*others are push from a colleagues, poor illumination etc

**Table 4. Relationship between occurrence of overall exposure to sharp injury in the past 12months and respondents' characteristics of the HCWs**

	Exposure to sharp injury		$\chi^2$	P -Value
	Yes	No		
<b>Job category</b>				
Doctor	7(43.8%)	9 (56.2%)	16.0592	0.001103*
Nurse	96(64.4%)	53(35.6%)		
Health Assistants	49(40.5%)	72(59.5%)		
Laboratory Workers	3(60%)	2(40%)		
<b>Age category</b>				
20-29	22(61.1%)	14(38.9%)	39.2424	0.00001*
30-39	77(62.6%)	46(37.4%)		
40-49	46(63.0%)	27(37%)		
50-59	10(55.9%)	49(44.1%)		
<b>Sex</b>				
Male	30(32.6%)	62(67.4%)	23.0585	0.00001*
female	125(62.8%)	74(37.2%)		
<b>Work Experience</b>				
0-4 years	57(42.2%)	78 (57.8%)	12.3351	0.000445*
>4years	98(62.8%)	58(37.2%)		

\*Statistically significant

The relationship between sharp injury and all the respondents' characteristics were found to be statistically significant. Of note, majority (64.4%; 62.8%) of those who had sharp injury were nurses and female respondents. Health care workers within the age range of 40-49years had more sharp injuries compared to other age categories while 62.8% of the respondents with work experience of >4years had more sharp injuries (Table 4).

**Table 5. Relationship between occurrence of overall exposure to splash exposure in the past 12months and respondents' characteristics of the HCWs**

	Exposure to BBFs splash		$\chi^2$	P -Value
	Yes	No		
<b>Job category</b>				
Doctor	7(43.8%)	9(56.2%)	13.2392	0.004147*
Nurse	105(70.5%)	44(29.5%)		
Health Assistants	62(51.2%)	59(48.8%)		
Laboratory Workers	4(80%)	1(20%)		
<b>Age category</b>				
20-29	22(61.1%)	14(38.9%)	3.4483	0.327527
30-39	79(64.2%)	44(35.8%)		
40-49	47(64.4%)	26(35.6%)		
50-59	30(50.8%)	29(49.2%)		
<b>Sex</b>				
Male	53(57.6%)	39(42.4%)	0.7177	0.396901
female	125(62.8%)	74(37.2%)		
<b>Work Experience</b>				
0-4 years	91(67.4%)	44(32.6%)	4.1269	0.042207*
>4years	87(55.8%)	69(44.2%)		

\*Statistically significant

Majority (80%:70.5%) of the laboratory scientist and nurses reported exposure to BBFs via Mucocutaneous route. The relationship between exposure to BBFs splash and work category of the staff was found statistically significant. Sixty four percent of the staff between the ages of 30-39 and 40-49 had more occupational BBFs splash exposure when compared to the other age category. However, this relationship were not statistically significant. Expectedly, HCWs with shorter duration of work experience (0-4years) had more exposure (67.4%).

## DISCUSSION

During medical intervention and management of patients, HCP are exposed to different blood-borne infections, this in turn have had an impact on their wellbeing and the quality of health care services in many countries, particularly developing countries where there is a significant constraint of human, capital and infrastructural resources (Jemal Yasin *et al.*, 2019; Lee, 2009). In this study, the lifetime exposure to blood and body fluids was found to be relatively high among the primary and secondary health care workers as almost half of the respondents reported exposure to BBFs. The findings in this study is not similar to the reported results from surveys conducted in Nigeria and Iran, where the lifetime prevalence was greater than sixty percent, however, a study by Musa *et al* in Nigeria reveals a lifetime a life time prevalence of less than sixty percent (Medubi *et al.*, 2006; Rezaeian *et al.*, 2012; Musa, 2007). The difference in lifetime prevalence may be due to differences in study participants, recall bias and the level of health care surveyed. This high life time prevalence calls for sober reflection and the urgent need for all health authorities to put measures in place to protect health care workers. The overall prevalence of occupational exposure to BBFs in the pre-tertiary levels of health care 12 months preceding the study was established to greater than fifty percent. The observation was found to be different from other studies where the prevalence of exposure to BBFs was reported to be less than fifty percent (Samir and Amitav, 2008; Everline *et al.*, 2013; Akeem *et al.*, 2011; Bi *et al.*, 2006). However, other studies conducted in Nigeria and other developing/developed countries have shown that greater half of the respondents had exposure to BBFs (Medubi *et al.*, 2006; Nwankwo and Aniebue, 2011; Ljiljana *et al.*, 2014). Comparatively, more of the health care workers at the Primary health care (PHC) centres had a sharp

injury compared to their secondary health care (SHC) worker counterparts. However, regarding splash exposures more of the SHC workers had splash exposure to Blood and body fluids (BBFs) compared to the PHC workers. The prevalence of sharp injuries recorded in the primary health care centres was far higher compared to what was reported among primary health care workers in studies conducted by Musa et al and Mahfouz et al in Nigeria and Australia, where the prevalence of sharp injuries was less than 35 percent (Musa, 2007; Mahfouz *et al.*, 2009). The high level of splash exposure in the secondary health centres mirrors the observation noted in another study in Nigeria, where greater half of the health workers had splash exposure, however, in another study less than one-third of the HCWs had splash exposure (Everline *et al.*, 2013; Ogunnowo *et al.*, 2012).

The variation in levels of exposure may not be unrelated with circumstances of study, age of the respondents and the differences in work experiences. The high exposure to BBFs is probably a reflection of the absence of continuous training on occupational infection prevention and lack of standard precautions tools. In this study, the majority of the accidental exposure to blood and body fluids occur as a result of recapping of needles. This is not surprising as many other studies have implicated the practice of recapping of needles as the key cause of exposure to BBFs (Samir and Amitav, 2008; Amira and Awobusuyi, 2014). Nevertheless, other studies done in advanced country reported other reasons for exposure to BBFs other than recapping of needles (Bi *et al.*, 2006; Hamid *et al.*, 2009). This is not unexpected considering the abundance of human and health infrastructural resources available in most developed countries. Some of the sociodemographic variables were significant predictors of the occurrence of occupational exposure to BBFs. For instance, in our study, the sex and work experience of the participants were significantly associated with the occurrence of exposure to BBFs. This finding corresponded with the report stated in other studies where such variations were implicated in the increase risk of occurrence of occupational exposure to BBFs (Samir and Amitav, 2008; Rezaeian *et al.*, 2012). Also, this study demonstrated a clear significant relationship between job categories of the health care workers and the occurrence of exposure to BBFs, as more nurses demonstrated exposure to BBFs. This observation is in contrast to what was reported in another study in Nigeria, where age, sex, cadre, years of practice had no statistical relationship occurrence of exposure to BBFs (Musa *et al.*, 2007).

### Conclusion / Recommendations

The observation from this study showed that health care workers in the pre-tertiary level of health care had significant exposure to BBFs, though HCWs at the primary care level had more exposure to sharp injuries compared to secondary health care counterparts. However, HCWs at the secondary care level had more BBFs splash exposure to their PHC counterparts. The study further reveals that a large proportion of the respondents at both the primary and secondary care levels had exposure to BBFs as a result of needle recapping and sudden movement of the patient. Therefore, there is urgent for all stakeholders and managers of health care to organize regular training on standard precautions and infection control practices. The government is also advised to make infection control materials available to ease adherence to basic infection control strategies.

**Acknowledgement:** All thanks and gratitude goes to health care workers who paid the supreme sacrifice during the Covid-19 pandemic. Special appreciation to staff and management of Lily Hospitals Ltd for their unalloyed support and encouragement.

**Competing interests:** The authors declare that they have no competing interests

**Funding:** The research was self-sponsored.

### REFERENCES

- Adejumo PO, Taofikat B. 2014. Exposure to work-related sharp injuries among nurses in Nigeria. *Journal of Nursing Education And Practice*, 4(1):229–236.
- Akeem BO, Abimbola A, Idowu AC. 2011. Needle stick injury pattern among health care workers in primary health care facilities in Illorin, Nigeria. *Academic Research International.*, 1: 419-27
- Amira CO, Awobusuyi JO. 2014. Needle-stick injury among health care workers in hemodialysis units in Nigeria: a multi-center study. *Int J Occup Environ Med.*, 5:18.
- Amita Gupta, Shuchi Anand, Jayagowri Sastry, Anandini Krisagar, Anita Basavaraj, Shreepad M Bhat, et al. 2008. High risk for occupational exposure to HIV and utilization of post exposure prophylaxis in Pune, India. *BMC Infectious Diseases*, 8:142-145
- Bekele A, Kotisso B, Shiferaw S. 2008. Work-related operating theatre accidents among surgical residents in Addis Ababa, Ethiopia.
- Bi p, Tully PJ, PearceS, and Hiller JE. 2006. Occupational blood and body fluid exposure in an Australian teaching hospital. *Epidemiol Infect.*, 134(3):465–471
- Elias Weldesamuel, Hailay Gebreyesus, Berhe Beyene, Mebrahtu Teweldemedhin, Zemichael Welegebriel & Desalegn Tetemke, Assessment of needle stick and sharp injuries among health care workers in central zone of Tigray, northern Ethiopia. *BMC Research Notes*, 12: 654
- Everline M M, Zipporah NG, Peter W, Jared O. 2013. Prevalence and factors associated with percutaneous injuries and splash exposures among health-care workers in a provincial hospital, Kenya. *Pan African Medical Journal*, 14:10. doi:10.11604/pamj.2013.14.10.1373
- Hamid S, Naghavi R, & Sanati KA. 2009. Accidental blood and body fluid exposure among doctors in Uk. *Occupational Medicine*, 59:101–106
- Holla R, Unnikrishnan B, Ram P, Thapar R, Mithra P, Nithin K, et al. 2014. Occupational Exposure to Needle Stick Injuries among Health Care Personnel in a Tertiary Care Hospital: A Cross Sectional Study. *J Community Med Health Educ S.*, doi: 10.4172/2161-0711.S2-004
- Jemal Yasin, Roman Fisseha, Feleke Mekonnen, Ketsela Yirdaw, 2019. Occupational exposure to blood and body fluids and associated factors among health care workers at the University of Gondar Hospital, Northwest Ethiopia. *Environ Health Prev Med.*, 24: 18.
- Karani H, Rangiah S, Ross AJ. 2011. Occupational exposure to blood-borne or body fluid pathogens among medical interns at Addington Hospital, Durban. *S Afr Fam Pract.*, 53(5):462-466
- Kaweti G, Abegaz T. 2016. Prevalence of percutaneous injuries and associated factors among health care workers

- in Hawassa referral and adare District hospitals, Hawassa, Ethiopia, January 2014. *BMC Public Health*, 16(1):1.
- Kebede G, Molla M, Sharma HR. 2012. Needle stick and sharps injuries among health care workers in Gondar city, Ethiopia. *Saf Sci.*, 50(4):1093–7.
- Lee R. 2009. Occupational transmission of bloodborne diseases to healthcare workers in developing countries: meeting the challenges. *J Hosp Infect.*, 72(4):285–291. doi: 10.1016/j.jhin.2009.03.016.
- Ljiljana C, Jadranka M, Milan M, and Rok Č. 2014. Occupational exposure to blood among hospital workers in Montenegro. *Arh Hig Rada Toksikol.*, 65:273-280
- Mahfouz A, Abdelmoneim A, Khan I, Daffalla MY, Diab AA, Shaban H et al. 2009. Injection safety at primary health care level in south-western Saudi Arabia. *Eastern Mediterranean Health Journal*, 15(2): 443–450.
- Mashoto KO, Mubyazi GM, Makundi E, Mohamed H, Malebo HM. 2013. Estimated risk of HIV acquisition and practice for preventing occupational exposure: a study of healthcare workers at Tumbi and Dodoma Hospitals, Tanzania. *BMC Health Serv Res.*, 13(1):1.
- Medubi SA, Akande TM, Osagbemi GK. 2006. Awareness and Pattern of needle stick injury among health workers at a University Teaching Hospital, Illorin Nigeria. *Africa Journal of Clinical and Experimental Microbiology*, 7(3):178-184
- Mekonnin T, Tsegaye A, Berihun A, Kassachew H, Sileshi A. 2018. Occupational Exposure to Blood and Body Fluids among Health Care Workers in Mizan Tepi University Teaching Hospital, Bench Maji Zone, South West Ethiopia. *Med Saf Glob Health*, 7: 146. doi: 10.4172/2574-0407.1000146
- Musa, OI. 2007. Needle sticks Injuries among Primary health care workers in Northern Nigeria. *CEJOEM*, 13(2): 177-178
- Nwankwo TO, Aniebue UU. 2011. Percutaneous injuries and accidental blood exposure among surgical residents: Awareness and use of prophylaxis in relation to HIV. *Niger J Clin Pract.*, 14:34-7
- Ogunnowo B, Anunobi C, Onajole A, Odeyemi K. 2012. Exposure to blood among mortuary workers in teaching hospitals in south-west Nigeria. *Pan Afr Med J.*, 11: 61.
- Pruss-Ustun A, Rapiti E, Hutin Y. 2005. Estimation of the global burden of disease attributable to contaminated sharps injuries among health-care workers. *Am J Ind Med.*, 48(6):482-490.
- Rapti E, Prussustun A, Hutin Y. 2005. Sharps injuries assessing the burden of disease from sharps injuries to health workers at national and local level. *Environmental burden of disease series*, 11: 1-585.
- Rezaeian M, Asadpour M, Khademrezaeian H. 2012. Epidemiology of occupational exposure to needlestick and body fluids among doctors and medical students in Rafsanjan University of Medical Sciences. *JOHE, Spring*, 1(1):44–49.
- Samir AS, Amitav B. 2008. Occupational Exposure to Blood and Body Fluids among Health Care Workers in a Teaching Hospital in Mumbai, India. *Indian J Community Med.*, 33(1): 26–30.
- Tadesse M, Tadesse T. 2010. Epidemiology of needlestick injuries among health-care workers in Awassa City, Southern Ethiopia. *Tropical doctor*, 40(2):111–3.
- World Health Organization, 2010. Migration of health care workers. WHO, Geneva. 2010
- World Health Organization: Health care worker safety: AIDEMEMOIRE for a strategy to protect health workers from infection with bloodborne viruses. 2013. [http://www.who.int/injection\\_safety/toolbox/en/AM\\_HCW\\_Safety\\_EN.pdf](http://www.who.int/injection_safety/toolbox/en/AM_HCW_Safety_EN.pdf) (accessed October 1st 2020).
- Yenesew MA, Fekadu GA. 2014. Occupational exposure to blood and body fluids among health care professionals in Bahir Dar town, Northwest Ethiopia. *Saf Health Work*, 5(1):17–22.

\*\*\*\*\*