

## Occupational Exposure to Blood and Body Fluids among Health Care Workers in Arada Sub-city Health Centers of Addis Ababa, Ethiopia

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Received date: October 5, 2018; Accepted date: November 1, 2018; Published date: November 9, 2018

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### Abstract

**Background:** Healthcare professionals (HCPs) are at high possibility of contracting blood-borne infections due to their occupation. The occurrence of these infections among HCPs is higher in low-income countries (e.g. Ethiopia). This study intended to examine the degree of occupational exposure (OE) to BBFs and its associated factors among HCPs in Arada Sub-city, Addis Ababa Ethiopia.

**Methods:** A cross-sectional study conducted from November 3, 2017, to December 19, 2017. Three hundred and sixty-one HCPs selected for study using a simple random sampling technique. The data were collected using a structured questionnaire and analyzed using SPSS version 20. To identify factors associated with blood and body fluids bivariate and multivariate analysis used.

**Results:** Among health care professional one hundred and forty-nine, (41.3%) of had have exposure to BBFs in the past year. Profession (Nurse) 0.76 [adjusted odds ratio (AOR) 0.5, 95% confidence interval (CI) 0.26-0.98], Shortage of personal protective equipment (PPE) in the Past Year 1.99 (AOR 1.86, 95% CI 1.11-3.11), Lack lifetime training on IP 8.18 (AOR 7.08, 95% CI 3.57-14.03) and not Using PPE 2.19 (AOR 2.25, 95% CI 1.3 -3.89) were among the factors associated with OE to BBFs.

**Conclusions:** This study shows a high proportion of HCP exposed to BBFs, Exposure to BBFs is observed in the practices carried out without proper equipment and standard precautions thus thereby ensuring the availability of proper equipment, proper training regarding the standard precautions and encouraging the HCPs to implement standard precautions to avoid such exposures.

**Keywords:** Occupational health; Health care professionals; Occupational exposure; Blood and body fluids; Infection prevention

### Introduction

An occupational exposure that may place a worker to different infections; A percutaneous injury; either needle-stick or cut with sharp objects; or contact of mucous membrane; or contact of non-intact skin that is, chapped, abraded, or afflicted with dermatitis; with blood, tissue or other infectious body fluids [1,2].

Occupational health and safety are one of the most important aspects of human concern. It aims an adaptation of working environment to workers for the promotion and maintenance of the highest degree of the physical, mental and social well-being of workers in all occupations. Each year, work-related injuries and diseases kill an estimated 2 million people worldwide, which is greater than the global annual number of deaths from malaria. Annually, an estimated 160 million new cases of work-related diseases occur worldwide, including respiratory and cardiovascular diseases, cancer, hearing loss, musculoskeletal and reproductive disorders, mental and neurological illnesses [1,3].

Occupational exposure to blood and infectious body fluid remains a major occupational safety problem for healthcare workers (HCWs). Exposure to human BBFs poses at risk of blood-borne infections like

hepatitis B, hepatitis C and human immunodeficiency virus (HIV). Body fluids are encountered during different medical interventions and are hence responsible for occupation-related HIV transmission [4,5].

Each year all most 6% of healthcare professionals percutaneous exposed to blood borne pathogens worldwide; out of the total exposure 2 million of those to HBV, 0.9 million to HCV and 170000 to HIV. This exposure may end up with infections in 15 000 HCV, 70 000 HBV, and 500 HIV. Most of the infections (which is 90%) through exposure occurred in developing countries [6,7].

These infections are preventable, as shown by the low rates achieved in certain countries that have engaged in serious prevention efforts, including training of HCW, HBV immunization, post-exposure prophylaxis, and improved waste management [6].

In Ethiopia, 30.5% of HCWs have a lifetime risk of needle stick injury and 25.7% sharp injury all over their career life but the lifetime risk of BBFs exposure was less than that of needle stick injury it accounts 28.8%.

In the year 2010, the prevalence of needle sticks injury in Ethiopia was 17.5% and sharp injury were 13.5%, but exposure to BBF was greater than both needle stick and sharp injury accounts 20.2% [8].

Factors for risky occupational practices among HCW had sub-optimal practices and unfavorable attitudes related to standard precautions such as needle recapping (46.9%), high workload 44.3%, lack of protective barriers 33.3% and lack of knowledge on standard pre-cautions 17.8% [8,9]. CDC has proposed standard precautions (SPs), which are a series of procedures for preventing OE and for handling potentially infectious materials. HCPs are advised to follow SPs regularly, such as: observing regular personal hygiene; using protective barriers, e.g. gloves and gowns, whenever there is contact with the mucous membranes or BBFs of patients; and disposing of sharps and other clinical waste correctly [10,11]. Regardless of the implementation of safety measures prevention of exposure to BBFs still there is a problem of exposure to BBFs is existing [1]. This study will have a significant input in the formulation of appropriate strategy to modify and facilitate the overall prevention of OE to BBFs, for program planning and evaluation as well as baseline information for policymakers and regulatory bodies to improve the occupational safety in Health Facilities.

There were no adequate studies conducted to assess the occupational Blood and body fluid exposure in the sub-city so, that this study will be the source of information for future researchers.

### Limitation of the study

The research was sensibly prepared, we are still aware of its limitations and shortcomings. First, the research conducted in the

health center, which is the lowest level of the health care unit in the structure of the Ethiopian healthcare unit.

Second, self-Social desirability bias is also a potential limitation in self-reported studies like this one, and also there was no clear registration for occupational exposure to blood and body fluids, to minimize the problems items are included from other researchers for comparison. Additionally, during interpretation design, related limitation considered.

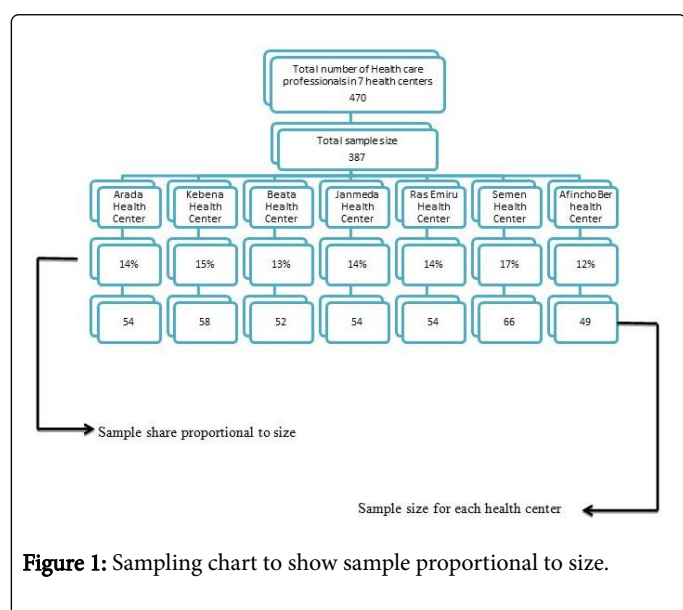
### Methods

This study was undertaken in Arada sub city, Addis Ababa. From seven health centers there are 3702 health professionals in the sub-city. The study was conducted from November 3-December 19, 2017, Across-sectional study with an internal comparison. The sample size for the study was calculated using EPI info software version 7 unmatched case-control by assuming; P1=factors associated with BBFs exposure (Profession), P2=factors associated with BBFs (Age)(10) with a Confidence interval of 95%, Power 80%.

Finally, by adding a 10% non-response rate final sample size required 387 (Table 1 and Figure 1).

Factors	%of controls exposed	%of cases exposed	CI	Power	Allocation ratio	Sample size for group 1	Sample size for group 2	Total sample size
Profession Midwifery	1.85	10.04	95%	80%	01:02	77	154	231
Age ( < or = 24)	12.96	24.40	95%	80%	01:02	117	234	351
Compliance with standard precaution	60	73	95%	80%	01:02	99	198	297

**Table 1:** Showing Sample size for to assess occupational exposure to blood and body fluid exposure Arada sub city health center, Addis Ababa, Ethiopia, 2017.



**Figure 1:** Sampling chart to show sample proportional to size.

The data from participants collected using a structured interviewer-administered questionnaire.

Data entry performed by using Epi Info version 7 and analysis performed using SPSS version 20.0 software (SPSS Inc., Chicago, IL, USA). After conducting a descriptive analysis for some variables, multivariate analysis made to observe the relative effect of independent variable on the dependent variable by controlling the effect of other variables. Only variables that reached a p-value less than 0.05 at the bivariate analysis level kept in the succeeding model.

Ethical clearance was first obtained from ethical clearance committee of Haramaya University and Addis Ababa health bureau. Thereafter ethical approval and written consent was submitted to the respective sub city and verbal consent was requested from all the participants during data collection. To ensure confidentiality names and other identity related information is not included.

### Result

Three hundred seventy-one participants are participated, which gives 96% response rate. Ten incomplete questionnaires discarded, and the analysis based on the remaining 361 respondents.

Overall 143 of the HCPs (39.6%) were men. The mean age of the respondents was  $27 \pm 5.46$  years. Most of the study participants, 49.3% were nurses, 22.7% were working in outpatient departments, and the mean overall working experience of the respondents had had 3.9 years (Table 2).

Variable	No (%) of subjects (n = 361)
Sex	
Male	143 (39.6)
Female	218 (60.4)
Age group	
<24	118 (32.7)
25-29	163 (45.2)
>30	80 (22.2)
Professional category	
Health Officer	66 (18.3)
Nurse	173 (47.9)
Midwife	57 (15.8)
Lab Technician/Technologist	33 (9.1)
Pharmacists	26 (7.2)
Medical Doctor	6 (1.7)
Current working department	
Regular OPD	82 (22.7)
Emergency OPD	49 (13.6)
Delivery Room	65 (18)
Laboratory	33 (9.1)
ART clinic	26 (7.2)
Injection Room	37 (10.2)
TB Room	23 (6.4)
Other	46 (12.7)
Work experience	
< or=2 years	186 (51.5)
3-5 years	99 (27.4)
>or=6 Years	76 (21.1)

**Table 2:** Socio-demographic characteristics of health care professionals in Arada Sub City, Addis Ababa Ethiopia.

### Magnitude of occupational exposure

Out of 361 study participants, 47.4 % (95% CI 42.1-52.1%) had been exposed to BBFs in their career. In the last 12 months, 41.3% (95% CI

42.1-52.1%) HCPs had exposed to BBFs. In this study, needle stick injuries over their professional career and in the past 12 months were reported by 26.3%, 18.3% of HCPs, correspondingly (Table 3).

Variable	No (%) of subjects (n=361)
Lifetime occupational exposure to blood and body fluids	

Yes	171 (47.4)
No	190 (52.6)
Lifetime needle stick injury	
Yes	95 (26.3)
No	266 (73.7)
Past one year Occupational exposure to blood and body fluids	
Yes	145 (40.2)
No	216 (59.8)
Past one year Needle stick injury in the past year	
Yes	66 (18.3)
No	295 (81.7)

**Table 3:** Occupational exposure to blood and body fluids among health care professionals in Arada Sub city, Addis Ababa.

In the past 12 months from exposed health care professionals, the majority were nurses (40.7%) and the rest were midwives (29%), health officers (17.9%), and laboratory technologists (12.4%).

#### Factors associated with occupational exposure

Most of the study participants had used gloves during health care procedure (73.1%) and 48 (13.3%) had training on infection

prevention in the last 12 months. In the last 12 months, 58.2% of study participants had reported there were adequate PPE available. Almost half of the participants (52.4%) noticed posted safety signs in their health care facility. A total of 255 (70.6%) study participants know that there was an IP committee in the healthcare facility, although 189 (52.4%) reported that the workplace was not safe for the prevention of OE to BBFs (Table 4).

Variable	No (%) of subjects (N=361)
Wearing of gloves during health care procedure n=359	
Yes	264 (73.1)
No	95 (26)
Last one year Training on prevention of occupational infection	
Yes	48 (13.3)
No	313 (86.7)
Availability of PPE throughout the last year	
Yes	136 (37.7)
No	225 (62.3)
Presence of safety signs in health care institution	
Yes	189 (52.4)
No	172 (47.6)
Presence of an infection prevention committee in health care institution	
Yes	255 (70.6)
No	106 (29.4)
Workplace availability of guideline for prevention of occupational exposure to blood and body fluids	
Yes	198 (54.8)

No	163 (45.2)
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**Table 4:** Individual and institutional factors affecting prevention of occupational exposure to blood and body fluids among health care professionals in Arada Sub City, Addis Ababa Ethiopia 2017.

The materials in which most injuries occurred by surgical blade 43%, Solid needle 33%, hollow needle 20% and scissors 4% in the past year.

Measures taken after OE to blood and body fluid products were applying pressure, 36.13%, applying and washing with iodine 25.72%, get tested for HIV, 22.25%, seeking PEP 8.38%, Take tetanus anti-toxoid (TAT) 3.9% and squeezing on the exposed parts of the body 3.3%.

Shortage of PPE in the last 12 months was one of the factors that contribute to the exposure of BBFs to HCPs. Health care professional who did not have training on IP in their career more likely to expose than who had have and also use of PPE for every clinical procedure

and Profession of HCWs showed statistically significant associations with OE to BBFs in the past 12 months at a  $p < 0.05$ . The experience of the HCPs, department of work age of the HCPs these also considered as the factors that contribute to OE to BBFs.

In multivariate analysis profession, the department, inadequate availability of PPE in the past 12 months, use of PPE on procedure and lifetime training on IP were significantly associated with OE to BBFs in the past 12 months. Those HCPs who had no prior training on IP were 8.18 [adjusted OR (AOR) 7.08, 95% CI 3.57-14.03] times more likely to be exposed to BBFs than those who had training on their carrier lifetime. Moreover, nurses were 50% less likely to have occupational exposure to BBFs than health officers were (Table 5).

Variables	Occupational Exposure	Crude (95%CI)	OR	Adjusted (95%CI)	OR
	Yes	No			
Sex					
Female	86	132	1		
Male	63	80	1.21 (0.79-1.85)		
Age Group(Y)					
<24	54	64	1		
25-29	67	96	0.83 (0.51-1.33)		
>= 30	28	52	0.64 (0.36-1.45)		
Working experience (Y)					
<2	82	104	1		
05-Mar	35	64	0.69 (0.42-1.15)		
>=6	17	15	0.92 (0.54-1.58)		
Profession					
Health officer	26	40	1		
Nurse	59	119	0.76 (0.43-1.37)	0.50 (0.26-0.98)*	
Midwife	42	16	4.04 (1.89-8.62)***	1.49 (0.62-3.55)	
Lab professional	18	15	1.85 (0.79-4.29)	0.86 (0.33-2.26)	
Shortage of PPE in the past year					
No	72	138	1.99 (1.30-3.06)***	1.86 (1.11-3.11)*	
Yes	77	74	1		
Ever had training on IP					
Yes	13	93	1		
No	136	119	8.18 (4.35-15.36)***	7.08 (3.57-14.03)***	

Use of PPE				
Yes	88	161	1	
No	61	51	2.19 (1.39-3.44)***	2.25 (1.3-3.89)**
Note: The P value >0.05 were not included in multivariate analysis.				
*P<0.05, **P<0.01, ***P<0.005				
Personal protective equipment's: Glove, Goggles, Boots, Apron Infection prevention				

**Table 5:** Factors associated with occupational exposure to blood and body fluids among HCPs of Arada sub city.

The reasons for OE to BBFs were during childbirth (35%); the abrupt motion of a patient during blood draw or during the intramuscular or venous injection of drugs (31%); during the handling and collection of waste (10%) and during needle recapping (16%).

## Discussion

In this study, 47.4% (95% CI 42.1-52.1%) HCPs were exposed to BBFs in their lifetime and 41.3% (95% CI 42.1-52.1%) of healthcare professionals were exposed to BBFs within last one year.

The main factors for the exposure to BBFs were the profession of the HCW, which had a significant impact; shortage of PPE in the last one year had places HCPs 1.8 times more risk of exposure of BBFs. Besides the shortage of PPE, not using PPE for every procedure had also an impact on the exposure of HCPs to BBFs and HCPs who had no training on IP had also a significant association between exposure of BBFs.

Half of the study participants (47.4 % (95% CI 42.1-52.1%)) had exposed to BBFs in their professional career, which is lower than findings from China (66%), Serbia (66%), Iran (74%), Turkey (64%), India (73%), Nigeria (68.9), Mali (64.1) and Kenya (71%). This difference was occurring because of the facility's which are selected in this study were only from Health centers (primary health care units) but in the case of the other studies, HCP was selected from hospitals [12-16].

In the last one year, 41.3% (95% CI 42.1-52.1%) of healthcare workers had exposed to BBFs in this study, which is lower than the findings from Bahir Dar and Tanzania study, which is 65.9% and 47.9 respectively, but it was higher than study from Uganda (33.87%) and it was much higher than study in Kenya which is 25%. This discrepancy may occur due to the difference between the study area which is in this study the study participants were selected from only from urban health centers, but in the case of Bahir Dar study HCPs were selected from both urban and rural health centers [10,17-19].

Out of HCP which are exposed to BBFs, most of them are nurses (40%), which is the same as findings from the study in Taiwan but it is lower than the findings in Nigeria (50%). According to this study, there is no statistically significant difference across the HCPs, except for Nurses. However, in this study Nurses were 50% safer than health officers were. This discrepancy may be due to the difference in their number and the type of their department [20,21].

Fifty-one percent of the study participants are aware of the availability of PPE throughout the last 12 months, which is equivalent to the Bahir Dar study (51%) [10].

This study also revealed that 69% HCPs have used PPE in the last health care procedure which is lower than studies from Dire Dawa (85%) and better than a study from Bahir Dar (54%) this discrepancy may occur due to shortage of PPE and attitudes of HCP towards using PPE for every procedure. HCPs who did not use PPE for all health care procedure were 2.19 (AOR 2.29, 95% CI 1.33-3.95) times more likely to be occupationally exposed to BBFs than those who were using PPE during a health care procedure in the last one year [8,10].

Only 29.4% of the respondents reported that they had had training on IP in this study, which less compared to study, finding from eastern Ethiopia (39%), Tanzania (73.1%) and Kenya (50.81%) this variation could be due to attention is given by healthcare administrator [8,17,19]. The lack of Regular infection prevention training may be the reason behind this variation.

The main factors for the OE to BBFs that identified in this study were a profession, inadequate training on infection prevention, department of work and persistent use of PPE most of the factors were comparable with the studies in Bahir Dar and Dire Dawa [8,10].

This study found a high number of OE to BBFs among HCPs in Arada sub city health centers. The main reasons, which identified in this study for the high number of exposures to BBFs, are the availability of PPE in the facilities, the consistent use of PPE, and training on IP. Therefore, providing training on IP to HCPs and always availing PPE may reduce the number of exposures.

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