

# Occupational exposure of health care workers to blood and body fluids in West Shewa Zone, Oromia, Ethiopia, 2019: A cross-sectional study

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## Research Article

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# Abstract

**Background:** Health care workers are at risk of occupational exposure to blood and body fluids even though very few studies were conducted in Ethiopia. Therefore, this study was aimed to investigate the magnitude of exposure to blood and body fluids among health care workers in governmental health facilities in West Shewa Zone, Ethiopia.

**Materials & Methods:** A facility-based cross-sectional study was conducted in June 2018. A total of 381 health care workers were selected by simple random sampling from 31 sampled governmental health facilities using proportional to size allocation. Data were collected through self-administered questionnaires, entered into Epi-info version 7, and analyzed by SPSS version 21. Adjusted Odds Ratio (AOR) with 95% Confidence Interval (CI) computed for variables maintained in the final model of multivariable logistic regression and statistical significance declared at  $P < 0.05$ .

**Results:** A total of 377 (98.9%) health care workers participated. The study had shown that 233 (61.2%) of health care workers were exposed to blood and body fluids in their lifetime. Previous needle stick injury (AOR=0.30; 95%CI: 0.12-0.75), place of work (AOR=0.42; 95%CI: 0.26-0.68), and work experience (AOR=1.47; 95%CI: 1.13-1.93) were significantly associated factors with exposure to blood and body fluids.

**Conclusions:** Exposures to blood and body fluids during patient care were common among health care workers in the study area. Therefore, health care workers should give due attention to their occupation's safety. Vaccination and in-service training on standard precautions should be provided and monitored for newly recruited health care workers by the health facilities.

## Background

Health-care workers (HCWs), whose occupations involve contact with patients and their body fluids, face a risk of exposure to occupational infections with subsequent risk of contracting diseases, disability, and even death. HCWs are continuously at risk of acquiring blood-borne infections such as human immunodeficiency virus (HIV) and hepatitis (1, 2).

Transmission of occupational infections may occur by the inhalation route, ingestion of contaminated material, and accidental inoculation by a needle stick injury (1). Needlestick injuries are among the most common methods for occupational transmission. Any HCW handling sharps such as scalpels and blood-collection devices are also at risk of self-inoculation or a needle stick injury, and subsequent exposure to blood-borne pathogens (3). Occupational exposure to blood can result from percutaneous injury (needle stick or other sharps injury), mucocutaneous (splash of blood or other body fluids into the eyes, nose, or mouth), or contact with non-intact skin (4).

According to this study exposure to blood & body fluids is defined as exposure of HCWs to blood or other body fluids like semen, vaginal secretions, cerebrospinal, pleural, peritoneal, pericardial, and amniotic

fluids via broken (non-intact skin), eyes, mucous membranes, and parenteral(through sharp materials) exposure in government health facilities.

Health care workers face a wide range of hazards on the job; including needlestick injuries, back injuries, latex allergy, violence, and stress. (5). The occupational risk of exposure to BBFs and needle stick injuries not only affects the safety and wellbeing of HCPs but also compromises the quality of health care delivered (6). The risk of infection for HCWs from blood-borne pathogens depends on the prevalence of these pathogens among the patient population and the nature and frequency of exposure (7). Most of these infections, however, can be prevented by practicing standard precautions, immunization against Hepatitis B, provision of personal protective equipment, and the management of exposures (4). The transmission of HBV, HIV, and HCV to patients by infected healthcare workers has also been documented (8).

Standard precautions are based on the principle that all blood, body fluids, secretions, excretions except sweat, non-intact skin, and mucous membranes may contain transmissible infectious agents. Standard precautions include hand hygiene, and depending on the anticipated exposure, use of gloves, gown, mask, eye protection, or face shield. It also includes equipment or items in the patient environment that are likely to have been contaminated with infectious fluid and that must be handled in a manner to prevent transmission of infectious agents (9).

Of 35 million HCWs worldwide, the World Health Organization estimates that approximately 3 million experience percutaneous injuries each year. Of those injured HCWs, 70,000 are likely to be infected with hepatitis B virus as a result of exposure, 15,000 with HCV, and 1,000 with HIV. (10) and 90% of the infections that result from these exposures are borne by developing countries (11).

Needlestick injury exposure in African countries is higher than elsewhere and a significant public health issue due to overworked healthcare workers. Similar studies in Ethiopia show that 32% of the needle stick injuries were reported in the Sidama zone, 31% in northwestern Ethiopia, and 66% in 52 of the health facilities (12).

Few studies conducted in Ethiopia to assess the status of exposure to blood and body fluids among health care workers and factors in health facilities showed the risk of exposure to BBF especially needle stick injuries were common (13), (14). The proportions of exposure to patients' body fluid among the different professionals differ significantly (14).

Therefore, this study was aimed to assess the magnitude of exposure to blood and body fluids among health care workers in governmental health facilities of West Shewa Zone, Ethiopia which provides information for program managers and decision-makers to design and focus on appropriate interventions; moreover, it helps the healthcare workers to know the severity and prevalence, to minimize its impact, and to be safe in their working environment.

## Methods

## Study setting

West Shewa Zone is found in Oromia Regional State. It is located 112 km far away from Addis Ababa, the capital city of Ethiopia, in the western direction. It has 22 woredas and one administrative town. It has one referral, three general and three primary hospitals, and 91 health centers. According to the information obtained from West Shewa Zonal Health Department (15), there are 1,959 health professionals and 821 supportive staff among health facilities in the zone.

## Study design and period

A cross-sectional study design was used to assess the extent of occupational exposure to BBFs and determine associated factors among sampled HCWs in selected governmental health care facilities of West Shewa Zone. The government-employed health professionals like pharmacists, environmental health professionals, and other support staff in the selected governmental health facilities were excluded because they were less likely exposed to blood and body fluids. The data were collected from May 19, 2018, to June 25, 2018.

## Variables of the study

Dependent variable: Exposure to blood & body fluids (Yes/No)

Independent variables were as follows:

Socio-demographic variables: Age, Sex, Religion, Ethnicity, Educational Status, Current Profession, Work Experience

Working Environment: Supply of Personal Protective Equipment (PPE), Guidelines/ protocols, Training, Number of patients attended daily

Behavioral factors: Use of PPE, Recapping needles, knowledge on occupational exposure

## Sample size determination

The sample size was determined by using single population proportion formula with the assumptions of 95% confidence level, the margin of error of 5%, and the prevalence of occupational exposure to BBFs (65.7%) (6). Considering a 10% non-response rate, the final sample size was 381.

## Sampling procedure

A total of 99 governmental health care institutions were stratified into hospitals and health centers. Twenty-eight health centers (30%) out of ninety-one and three hospitals (33%) out of nine were selected randomly. Then sampled numbers of health care workers were proportionally allocated according to the total number of health care providers in each selected health care institution. Registration of health care

workers in selected governmental health facilities was used as a sampling frame. Finally, a simple random sampling method was used to select health care workers.

#### Data collection tools and procedures

The data were collected via a self-administered questionnaire which was adapted from previous tools that were applied in different studies related to exposure to blood & body fluids (6, 16-18). The questions and statements of the questionnaire were grouped and arranged according to the particular objective that they can address. The questionnaire was originally prepared in English and translated into the local language, Afan Oromo. To check for consistency, the questionnaires were further translated from Afan Oromo to English by another person. The questionnaires were self-administered. In each Hospital one supervisor (BSC) was employed and for health centers, four BSc supervisors (one supervisor: seven health centers) were employed.

#### Data quality assurance

Data collectors were provided with one-day training about the objective, process of data collection, and field ethics. Each questionnaire was checked daily by the supervisors and the principal investigator. Pretest was conducted at Holeta health center by taking 38(5%) of the study population. Necessary modifications were made to the questionnaire based on the identified gaps during the pre-test. At the end of each day, the questionnaire was checked for completeness, accuracy, and consistency by the supervisors and investigator, and discussion was undertaken with all data collectors and supervisors.

#### Data processing and analysis

The collected data were cleaned and coded manually, and entered into EPI Info version 7, and was exported to SPSS version 21 for analysis. Univariate analysis like measures of central tendency and measures of dispersion for continuous variables was computed. Frequency distribution was done for categorical data. Bivariate analysis was done to select candidate variables with  $P < 0.25$ . Then entered into multivariable analysis to identify independent predictor variables and control for confounders. In multivariable logistic regression, Adjusted Odds Ratio (AOR) with its 95% Confidence Interval (CI) was computed for variables maintained in the final model, and statistical significance at  $P < 0.05$  was declared by the CI.

#### Operational definition

A health care worker in this study was operationalized as those people who do have contact with syringes, needles, other sharp materials, blood, and body fluids by the virtue of their duties. So, nurses, laboratory technicians, physicians, dentists, health officers, x-ray technicians, cleaners, and laundry workers working in government health facilities were sampled.

## Results

## Socio-demographic characteristics

A total of 377 health care workers participated in the study, yielding a response rate of 98.9%. The highest proportion of the respondents 300 (79.6%) were in the age group 25–34 years and more than half of the participants 225 (59.2%) were nurses by occupation (Table 1).

## Environmental factors of exposure to blood and body fluid

Among 377 participants, 135(35.8%) knew about the availability of written guidelines of standard precautions. More than half of the respondents, 201(53.3%), were received HIV post-exposure prophylaxis whereas only 276(73.2%) respondents were received the hepatitis B vaccine. Of the respondents, only 49(13%) participated in infection prevention or standard precaution training in the last year. Of the total participants, 268(71.1%) were mentioned there was a shortage of Personal Protective Equipment in their respective health facility.

Out of the total respondents, 208(55.2%) were reported the availability of handwashing facilities in their respective health facilities. However, only 78(20.7%) respondents practiced hand washing after examining a patient. Hand washing before conducting any procedure was commonly practiced by Midwifery 11(47.8%), followed by Nurses 43(37.4%).

Among the total participants, 162(43%) were consistently using personal protective equipment. Among PPEs, utility glove was the most commonly used 329(87.3%) followed by gown and examination glove, 316(83.8%), and 219(58.1%) respectively.

## Behavioral factors and history of exposure to blood and body fluids

About 230(61.0%) and 195(51.7%) of health care workers were exposed to blood and body fluids and encountered a needle stick injury in their lifetime respectively. Out of 230 exposed health care workers in their lifetime, 174(46.2%) were exposed to blood at least once during the last year and 81(21.5%) had exposure to blood in the last six months respectively. The second common fluid to which the workers were exposed was amniotic fluid 71(18.8%) followed by human breast milk 27(7.2%). Of the exposed HCWS, the majority 34(85%) were Midwifery in the profession. Lack of PPE was the commonest mentioned reason for exposure to blood and body fluid, 23(88.5%) (Table 2).

## Factors associated with exposure to blood and body fluids

Multivariable analysis was carried out to determine independent predictors of exposure to blood and body fluids. Those candidate variables with P-value <0.25 in bivariate logistic regression were included in multivariable logistic regression and considered as significant in the model if the P-value less than 0.05.

Health care workers who had less than or equal to two years' work experience were 47% times more likely exposed to blood and body fluids than those who had ten-year work experience (AOR=1.47; 95% CI:1.13-1.93).

Health care workers working in health centers were 58% less likely to be exposed to blood and body fluids as compared to those who work in hospitals (AOR=0.42; 95% CI:0.26-0.68).

Health care providers who were ever exposed to needle stick injury during the procedure were 70% less likely to be exposed to blood and body fluids as compared to those who were never exposed to needle stick injury (AOR=0.30; 95%CI; 0.12-0.75).

Hand washing before and after any procedure was found to be an independent predictor of exposure to blood and body fluids. Health care workers who wash their hands before and after any procedure 85% less likely exposed to blood and body fluids than HCWs who do not wash their hands (AOR=0.15; 95% CI: 0.07-0.31).

HCW's perception of whether they were at risk of body fluid and blood-borne infection or not was found to be an associated factor of exposure to blood and body fluids. HCWs who perceived at risk were 85% times less likely to have had occupational exposure to blood and body fluids than those HCWs who perceived not at risk (AOR=0.16; 95%CI: 0.09-0.98) (Table 3).

## Discussion

This study was conducted to assess the magnitude of exposure to blood and body fluids among health care workers in the West Shewa Zone. The study involved 381 health care workers among which 377 responded making the response rate 98.9%.

This study revealed the magnitude of exposure to blood and body fluids among health care workers in their lifetime at governmental health facilities was very high, 230 (61.2%) which was above the reports from Harari and Dire Dawa Town (28.8%)(13), Georgia 53% (10) and Lebanon (30%)(19) and lower than a report from Wolaita (73.8%) and University of Gondar Hospital (70.2%) (11, 16). This indicates that the exposure of health care workers to blood and body fluids might due to different routes of exposure and lack of PPEs at their health facilities, which in turn, expose them to various blood and body fluids.

In this study, 81(21.5%) of study participants had exposure to blood and body fluids in the past six months which is lower than a study done in Wolaita 386(62%) (11) and Bahir Dar Town 145(45.7%)(20). This difference may be due to the presence of safety signs in health care institutions and on-job training delivered to HCWs.

About 195(51.7%) of study subjects were injured by needle stick in their life as indicated by this study, which is higher than a study in Harari and Dire Dawa town 145(30.5%)(13) and less than with a finding from Nigeria 92(53.5%)(21). This indicates that HCWs are at increased risk of acquiring occupational infection due to blood and body fluids unless effective measures are implemented.

In this study, 134 (35.5%) HCWs were injured by needle stick in the past year which is much higher than a finding from Awi Zone 36(18.7%), Bahir Dar Town 92(29.0%) but lower than a finding from Bale Zone

126(37.1%) (20, 22, 23). This difference could be due to the socio-demographic and economic differences in the study areas and the experience of HCWs to adhere to standard precautions.

In this study, health care providers who were exposed to needle stick injury were found 70% times less likely to be exposed to blood and body fluids as compared to their counterparts. This could be because those health care workers who were previously exposed practically to needle stick injury care off because they faced the problem.

This research revealed the place in the level of health care system matters for the occupational exposure to blood and body fluid. Health care workers working in the health center were 58% times less likely to be exposed to blood and body fluids as compared to those who work in the Hospital. This might be since health care providers working in Hospitals have an increased chance of coming in contact with blood and body fluids from patients, more involved in patient care activities, and also more contact with sharp instruments.

HCW's perception of whether they were at or not was found to be an associated factor of exposure to blood and body fluids. HCWs who were perceived as being at risk of body fluid and blood-borne infection were 85% times less likely to have had occupational exposure to blood and body fluids than those HCWs who perceived not at risk. There was no similar or dissimilar finding discovered from the literature reviewed yet. However, it seems due to increased self-care using personal protective equipment.

The service year in the health system was also found to play a role in the occurrence of BBFs exposure. In this study, health care workers who had less than or equal to 2 years' service experience were 47% times more likely exposed to blood and body fluids than those health care workers who had 10 and above years of work experience. This might be that the junior HCWs might be with less chance of being trained on infection prevention due to less stay in the system.

Health care workers who practice hand washing before and after any procedure were found 85% less likely to be exposed to blood and body fluid than their counterparts. This might be HCWs who washed their hands were more knowledgeable than those who didn't wash their hands. Since hand washing is a component of personal protection practice, these workers might be those who usually take care of themselves.

### Limitation

The study relies on self-report rather than having a record review of healthcare workers. Therefore, recall bias likely occurred as the information was obtained retrospectively.

## Conclusions

Exposure to blood and body fluids during patient care was common among health care workers in the study area. During their lifetime, 195(51.7%) and 230(61%) of the workers encountered needle stick injury and exposure to blood and body fluids respectively. History



of previous needle stick injury, place of work, and handwashing were protective factors whereas long work experience was a risk factor associated with blood and body fluid exposure.

## Recommendations

The hospitals and health centers should provide appropriate infection prevention materials and disseminate information on the risk of health institutions acquired infection to all health care workers. The health facilities should avail infection prevention protocols to each department to reach each health care worker at their routine activities. Regular and comprehensive in-service training on standard precautions should be provided and monitored for newly recruited health care workers by health centers and hospitals.

## Acronyms

AOR: Adjusted Odds Ratio; BBF: Blood and Body Fluid; CI: Confidence Interval; HCW: Health Care Workers; HBV: Hepatitis B Virus; HCV: Hepatitis C Virus; HIV: Human Immunodeficiency Virus; PPE: Personal Protective Equipment

## Declarations

### Ethical approval and consent to participate

Ethical clearance was obtained from the Ethical Review Committee of Arsi University. A formal letter of permission was produced from West Shewa Zonal Health Department to the respective governmental health facilities. Oral consent was obtained from each study participant during data collection time after the objective of the study was explained to the participants by data collectors. Confidentiality was assured for the information provided.

### Consent for publication

The study participants were informed that the finding of the study would be published. Identifying images or clinical details of participants that compromise anonymity was not applicable in this manuscript.

### Availability of data and materials

The data supporting our findings are found at, kept in confidentiality, and stored at both authors. If someone wants our data, we are voluntary to share it and one of the authors should be contacted through the email address on the cover page.

### Conflict of interest

We declare that the study has no competing interests.

## Funding

We received no funds from any organizations.

## Authors' Contributions

DL developed the proposal, carried out data collection, conducted the analysis, was involved in reviewing the manuscript, and had full access to all the data in the study. TS provided general guidance on overall study progress, participated in reviewing the proposal, reviewing the analysis, participated in the final study document development, and had final responsibility for the decision to submit for publication. Both authors read and approved the final manuscript.

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## Tables

Table 1: Socio-demographic characteristics of health workers to blood and body fluid, West Shewa, Oromia, Ethiopia, June 2018 (n=377)

Variables	Category	Frequency	Percent
Sex	Male	186	49.3
	Female	191	50.7
Age in years	$\leq 24$	35	9.3
	25-34	300	79.6
	35-44	38	10.1
	$\geq 45$	4	1.1
Educational Status	Certificate	6	1.6
	Diploma	145	38.5
	Degree	223	59.2
	Specialist	3	0.8
Current profession	Nurse	225	59.7
	Laboratory	34	9
	Health Officer	36	9.5
	Medical Doctor	18	4.8
	Midwife	40	10.6
	Emergency & critical care nurse	24	6.4
Department of Work	Out-patient department	90	23.9
	Injection and dressing room	39	10.3
	Surgical ward	20	5.3
	Pediatrics ward	23	6.1
	Gynecology ward	30	8
	Medical ward	20	5.3
	Laboratory	35	9.3
	Maternal and Child Health	120	31.8
Religion	Orthodox	167	44.3
	Protestant	153	40.6
	Catholic	3	0.8
	Muslim	30	8
	Waqeffata	24	6.4
Marital Status	Single	145	38.5
	Married	226	59.9
	Separated	6	1.6

Work Experience	$\leq 2$ years	82	21.8
	3-5 years	147	39
	6-9 years	107	28.4
	$\geq 10$ years	41	10.9
Place of work	Health Center	193	51.2
	Hospital	184	48.8

Table 2: Patterns of exposure to blood and body fluids among health care workers in West Shewa Zone, Oromia, Ethiopia; June 2018

Characteristics	Category	Exposure to blood and body fluids	
		Yes	No
Professional category	Nurse	145 (64.4%)	80 (35.6%)
	Laboratory	14 (41.2%)	20 (58.8%)
	Health officer	18 (50%)	18 (50%)
	Midwifery	34 (85%)	6 (15%)
	Medical doctor	9 (50%)	9 (50%)
	Others	10 (41%)	14 (58.3%)
The most common departments for occupational exposure	Inpatient	26 (53.1%)	23 (46.9%)
	Labor and delivery	193 (63.7%)	110 (36.3%)
	Laboratory	63 (61.8%)	39 (38.2%)
	Emergency	205 (62.3%)	124 (37.7%)
	Operating theatre	74 (50%)	74 (50%)
	Injection and dressing room	182 (64.5%)	100 (35.5%)
	Maternal and child health	1 (50%)	1 (50%)
	Multiple procedures simultaneously	199 (62%)	122 (38%)
Reasons for exposure	Sudden movement of the patient	54 (55.2%)	44 (44.9%)
	As a result of recapping of needle	102 (67.1%)	50 (32.9%)
	Lack of PPE	23 (88.5%)	39 (11.5%)
	During waste collection	46 (80.7%)	11 (19.3%)
	During delivery	19 (82.6%)	4 (17.4%)
	Not enough training on the issue	66 (63.5%)	38 (36.5%)
	Not following correct protocol	84 (59.2%)	58 (40.8%)

Other

2 (100%)

0 (0%)

Table 3: Independent predictors of occupational exposure to blood and body fluids among health care workers in West Shewa Zone, Oromia, Ethiopia, 2018

Characteristics	Category	Exposure to blood and body fluids		Crude OR (95% CI)	Adjusted OR (95% CI)
		Yes, # (%)	No, # (%)		
Work Experience (in years)	≤ 2	35(42.7%)	47(57.3%)	0.15(0.06- 0.39)	1.47(1.13- 1.93)*
	3 – 5	86(58.5%)	61(41.5%)	0.29(0.12- 0.69)	0.29(0.12- 0.69)
	6 – 9	75(70.1%)	32(29.9%)	0.48(0.19- 1.20)	0.48(0.19- 1.20)
	≥ 10	34(82.9%)	7(17.1%)	1	1
Place of Work	HC	143(74.1%)	50(25.9%)	3.19(2.07- 4.92)	0.42(0.26- 0.68)*
	Hospital	87(47.3%)	97(52.7%)	1	1
Perceptive at risk of BBF borne infection	Yes	223(64.8%)	121(35.2%)	6.85(2.89- 16.23)*	0.16(0.03- 0.98)*
	No	7(21.2 %)	26(78.8%)	1	1
Ever injury of needlestick	Yes	154(79%)	41(21%)	5.24(3.33- 8.24)	0.30(0.12- 0.75)*
	No	76(41.8%)	106(58.2%)	1	1
Washing of hands	Yes	32(41%)	46(59%)	0.29(0.16- 0.52)	0.15(0.07- 0.31)*
	No	93(70.5%)	39(29.5%)	1	1

**Key:**

Note: \*P < 0.05 (Indicates statistically significant association)