ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCES SCHOOL OF PUBLIC HEALTH

OCCUPATIONAL EXPOSURES TO NEEDLESTICK, SHARPS INJURY AND BODY FLUID SPLASH AND DETERMINANTS AMONG HEALTH CARE WORKERS AT SELECTED HOSPITALS IN ADDIS ABABA

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This is to certify that the thesis prepared by Getachew Adugna, *Occupational Exposures to Needlestick and Sharp Injury and Blood/Body Fluid Splash and Determinants Among Health Care Workers At Selected Hospitals In Addis Ababa* and Submitted in partial fulfilment of the requirements for the Degree of Master of Public Health compiles with the regulations of the University and meets the accepted standards with the respect to originality and Quality.

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Dedicated

To my family especially my brother Shemales (Mamush).

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"The LORD is my strength and my shield; my heart trusts in him, and he helps me"

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Acronyms

AAU	Addis Ababa University
AIDS	Acquired Immune Deficiency Syndrome
AOR	Adjusted Odds Ratio
ART	Anti Retroviral Therapy
BBFs	Blood/Body Fluid splash
BSc	Bachelor of Science
CDC	Center for Disease Control
CI	Confidence Interval
COR	Crude Odds Ratio
ENT	Ear, Nose and Throat
EPINet	Exposure Prevention Information Network
ETB	Ethiopian Birr
FMoH	Federal Ministry of Health
HBV	Hepatitis B virus
HCV	Hepatitis C virus
HCWs	Health Care Workers
HIV	Human Immunodeficiency Virus
HO	Health Officer
HCPs	Health Care Professionals
IP	Infection Prevention

IV	Intra Venous
NICU	Neonatal Intensive Care Unit
NSI	Needle Stick Injury
NSSI	Needle Stick Sharp Injury
OR	Odds Ratio
PEP	Post Exposure Prophylaxis
SI	Sharp Injury
SPSS	Statistical Package for the Social Sciences
TAT	Tetanus Anti Toxoid
WHO	World Health Organization

Abstract

Background: Needlestick injuries, sharps injuries, and blood/body fluid splash are hazards to health care professionals in their working area. Around twenty bloodborne pathogens are known to be transmitted through these occupational injuries. This problem alters the health status of health care professionals (HCPs) in different ways, including physically, mentally, and psychologically. Even though HCPs are affected at a high rate, there is a low injury report to a higher level.

Objective: To assess the prevalence of occupational exposure to needlestick injuries, Sharp injuries, and body fluid splash with their determinants among health care professionals of governmental hospitals in Addis Ababa.

Methods: Institution based cross-sectional study was conducted by self-administered questionnaire among health care professionals in six selected hospitals. Data was collected from March 2019 to April 2019, with the study sample size of 438. Six government hospitals selected via simple random sampling (lottery method) from twelve hospitals. Data were gathered using a self-administered questionnaire. SPSS version 25 used for data analysis. The type of analysis was bivariate and multivariate logistic regression with 95% confidence interval.

Results: Overall, one-year burden of occupational exposure to Needle stick injury (NSI), Sharp injury (SI), and Blood and body fluid splashes (BBFs) were 141 (33.3%), 90 (21.2%) and 198 (46.7%) respectively. Maximum occurrence of NSI, SI, or BBFs reported from Emergency 104(36.4%) and Inpatient departments 101(35.3%). Higher exposure of NSI, SI and BBFs were reported by nurses, 58.2%, 62.2%, and 54.6% respectively, while midwifery professionals had twelve times more possible exposure of BBFs (AOR 11.89 95% CI 1.25-112.7) compared to Physicians, Nurses, Health officers, and Laboratory Technicians. Study participants who had not training on infection prevention and safety practice were positively associated to NSI (AOR 3.4, 95% CI 1.5-7.5), SI (AOR 3.02, 95% CI 1.17-7.73) and BBFs (AOR 4.27, 95% CI 1.94-9.41). The likelihood of reporting NSI (AOR 2.6, 95% CI 1.3-5.3) and SI (AOR 3.97, 95% CI 1.86-8.47) significantly increased among single in marital status. Participants who had job-related stress were two times more likely encountered to NSI, SI, and BBFs, (AOR 2.23, 95% CI 1.14-4.35), (AOR 2.07, 95% CI 1.033-4.15) and (AOR 2.18, 95% CI 1.07-4.49), respectively.

Respondents who dissatisfied on their job were nearly three times more likely to sustain NSI and SI (AOR 2.85, 95% CI 1.4-5.8) and (AOR 2.36, 95% CI 1.11- 4.99) respectively. HCPs who worked in shift were twice likely to expose to BBFs (AOR 2.36, 95% CI 1.034-5.4).

Conclusion and recommendation: The burden of needlestick injuries, sharps injuries, and blood/body fluid splash were high. Unsafe practice and not applying universal precautions were also considerably high. Formal training on infection prevention and safety practice and continuous supportive monitoring to health care professionals from the concerned bodies is recommended to prevent prevalent occupational exposures to needlestick, sharps injuries, and blood/body fluid splash.

Keywords: Needlestick injury, Sharps injury, Blood/body fluid splash, Health care professional

1. Introduction

1.1Background

Needlestick injuries, sharps injuries, and blood/body fluid splash are hazards to health care workers in their working area. Around twenty blood borne pathogens are known to transmit through these occupational injuries (1). This problem alters the health status of health care professionals (HCPs) in different ways, including physically, mentally, and psychologically. Even though HCPs are affected at a high rate, there is a low injury report to a higher level (2).

Hospitals and other health facilities, like health centers and private clinics, are expected to provide an environment that expedites the recovery and speedy release of patients. However, several less care, poor sanitation, and various contaminants and infections to the hospital environment are enormous, that delay recovery and may overburden the weakened patient. Therefore, many potential hazards that can pose a threat to employees, patients, and visitors (3,4).

Needlestick injuries as defined by the United States National Institute of Occupational Safety and Health are injuries created by needles, such as hypodermic needles, blood samples needles, intravenous materials, and needles practiced to connect parts of IV delivery systems (5).

Needlestick injuries are common and to an extent, inevitable in health care workers during the provision of services to their client. Percutaneous exposure happens as a result of a break in the skin caused by a needle stick or sharp contaminated with blood or body fluids. Mucocutaneous exposure occurs when body fluid comes into contact with open wounds, non-intact skin, such as looking for in eczema, or mucous membranes, such as mouth and eyes (6).

Health Care Professionals (HCPs) are exposed to a wide range of occupational health and safety hazards. An estimated 20 million work-related injuries and 390, 000 new work-related illnesses occur each year in the United States; however, the number of occupational diseases and injuries reported each year is much more (7). No occupation or work is free from health hazards. People are always under a certain amount of health risk wherever they may be working (8).

1.2 Statement of the problem

Nowadays, workplace injuries, especially needlestick injuries, sharps injuries, and contact of blood and body fluids prevalence, is increasing among health workers (9). Occupational exposure to blood/body fluids in healthcare facilities constitutes a significant risk of transmission of human immune deficiency virus (HIV) and other blood-borne pathogens to healthcare workers (9,10).

It has been estimated by the Center for Disease Control (CDC) that every year more than three million Health Care providers are opened to blood and body fluids, through sharps, plus Mucocutaneous injuries in the United States solely with an annually expected 6 million NSIs (10). Due to NSIs, the possibility of infections ranges from as low as 0.2–0.5% for HIV to as huge as 3–10% for HCV and 40% for HBV (11). Although contaminated needles and other dirty sharps should not be bent, recapped, or removed, a study has revealed that recapping is the most prevalent needlestick injuries among HCWs (12).

Globally, it is estimated that out of the total of 35 million Health Care Workers (HCWs) worldwide, 3 million experience NSIs every year; of those, nurses are at the most considerable risk, with up to 50% of all NSIs being sustained by that group (13). The quantity of HCWs annually exposed to sharps injuries contaminated with hepatitis B virus, hepatitis C virus, and human immunodeficiency virus/AIDS has been reported to be 2.1 million, 926,000, and 327,000, respectively (14,15).

Health care workers in Africa suffer from two to four needle-stick injuries per year on average, with Nigeria, Tanzania, and South Africa reporting 2.10 injuries per HCW on average (16).

Previous studies in Eastern, Southern, and Northern parts of Ethiopia have shown the increased risk of occupational blood exposure (17–19). Needlestick injury was also reported to be about 31 % among HCWs of Hawassa (18).

In Ethiopia, there is no representing national data regarding the prevalence of needlestick and sharps injuries among health care professionals. Even though local studies documented that the prevalence of workplace injuries are high among Nurses, but in other health professionals (i.e., physicians, Midwife, laboratory technician, and Health officer) are limited. Majority of the studies were only confined to a single institution. Besides, determinants contributing to workplace injuries have been given little attention (18,19).

Despite the presence of many possibilities to reduce disease burden, the full consequence of occupational exposure (Needlestick, sharps injuries, and blood/body fluid splash) are not yet recognized. Hence this research will be carried out to determine the prevalence and determinants of needlestick injuries, body fluid splash, and sharp injuries among health professionals of governmental hospitals in Addis Ababa, Ethiopia.

1.3 Significance /Rationale of the study

In developing countries, exposure and health impacts to needle stick and sharp injuries are infrequently watched and much remains to be done to keep HCWs safe from risks that cause infections, disability, and death that may, in turn, impact the quality of health care (15). Even though there are similar studies conducted in some parts of Ethiopia, the applicability of findings and recommendations specific to health care professionals and specific study areas are difficult due to variations about time and existing environmental factors. Besides, the researches done are not enough uniquely, to identify determinants of needlestick and sharps injuries among health care professionals. Therefore, the finding of this study could help primarily Health Care works, in reporting and following universal precaution to minimize the burden. The research finding could assist the management of government hospitals and policymakers in the development of effective preventive strategies and improve occupational health and safety of health care professionals. The outcome of this study will also assist training institutions to give due emphasis and revise their training system regarding infection prevention. The other advantage of this study is that it includes needlestick injuries, body fluid splash, and sharps injuries in a single study. Furthermore, researchers can use this study as a reference to conduct further investigations.

2 Literature Review

Globally, according to an estimation made by the World Health Organization (WHO), HCWs, due to their occupational exposure to percutaneous injuries, sustain about 1,100 deaths and disability each year (15). Half of these deaths occur in Sub-Sahara Africa.

2.1 Prevalence of Needlestick and sharp injuries and blood/ body fluid splash

In a study done in Australia, a total of 640 incidents of work-related sharps injuries and body fluid exposures were reported in the hospital over the 3-year study period, Among those incidents, 370 (58%) were sharps injuries, and 270 (42%) were fluid body exposures (20). Nursing staff reported more than half of all sharps injuries and body fluid exposures (356 of 640), with 183 being body fluid exposures and 173 being sharped injuries, in contrast to the above, in studies done in India (21) and Singapore (22), doctors are profoundly affected by needle stick injuries and body fluid splash.

According to a study done in Singapore, there were 244 needle stick injury cases in 5957 employees in 2014, giving an incidence rate of 4.1/100 healthcare workers (HCWs) per year (22). The incidence rate was the largest for doctors at 21.3%, and 2.7% for nurses; 40.6% of injuries happened in wards, and 32.8% in operating theatres.

A study conducted in Iran shows a total of 128/168 (76%) of the studied nurses reported at least one NSI in their job tenure, and 69 individuals (54%) experienced at least one NSI in the previous year (23).

According to the study done in Kenya, 81 incidents of Percutaneous injuries and Mucocutaneous exposures were reported by healthcare workers within the previous 12 months, the majority of whom were female (66%) (24). But in a study done in Nigeria, Male respondents had an exposure rate of 70% and females 55.9% (25).

In Ethiopia, there is no national data regarding the prevalence of needlestick and sharps injuries among HCWs. In a study conducted in regional hospitals of North East Ethiopia, the prevalence of sharps injuries among HCPs was 32.8% (26).

In another study conducted in Wolaita Zone, Southern Ethiopia, 343(55.1%) HCWs were injured by needle stick and sharps in the previous one year (27). In a study carried out at Jimma University Specialized Hospital, the prevalence of needlestick and sharps injuries among nurses was 61.76% (28).

A study done in Hawassa shows that 46 % were exposed to percutaneous injuries in their professional life, and 28 % faced injury one year before the study (29).

A study conducted in Tigray shows that Needlestick injury was reported in 106 health care workers (17.2%), 348 (56.3%) had the contact of blood and body fluid to their skin and 154 (24.9%) reported exposure to their mucus membrane (2).

A study was done in Eastern Ethiopia, indicated that at least one needle stick or sharps injury among HCWs was 25.7% (17). The self-reported of the one-year prevalence of needlestick- and sharps injury was 17.5% and 13.5% respectively. The self-reported one year risk of splashing of blood and body fluids was 20.2%.

2.2 Determinants of Needlestick, sharp injuries, and Blood/ Body Fluid splash

The most popular circumstances leading to injuries were recapping of needles, 38.0% (19/50) and patient aggression 26.0% (13/50) (17). Among those who had needlestick injuries, more than half experienced injuries once 24.0% (12/50) incur it twice, while only 2.0% (1/50) sustained injuries five times, according to this study almost two-thirds (31/50) of the injuries were not reported to appropriate authorities, the primary reasons stated were that they were not at risk of getting HIV 48.3% (15/31) and thought that it was not essential to report injuries, 38.7% (12/31).

A study conducted in Iran indicated that long work hour is assumed to be the significant determinant of occupational exposure, especially needle stick injury, sharps injury and blood, and body fluids splashes (23). Washing the injury site with soap and running water (70.2%) was the first treatment after injury, followed by pressing the injury site (9.3%).

A study done in Tigray showed that working in the delivery room (80.4%) and gynecological wards (75%) had a higher risk of exposure to the skin (2). Regarding their knowledge to preventive measures, only 254 (41.1%) of all health care workers said that they washed their skin immediately and 318 (51.5%) flash their eyes with clean water or saline if their skin and mucous membrane are exposed.

A study conducted in Hawassa shows that among exposed HCWs, only 24 % took anti-HIV infection prophylaxis (29).

Different reasons were reported for needlestick injuries. Emergency situation (28.6 %), sudden movement of the patient (23.8 %) and sharps collection (18.9 %) were the top three reported judgments for the experience of needlestick injuries, followed by work overload, suturing, waste disposal and needle recapping respectively (29).

According to a study done in Bale (Ethiopia) of those HCWs, who experienced NSSI majority 107 (84.9 %) of them took self-based measures (30). The most common self-based actions taken were washing the injured body part with soap and water (53.3 %), washing with iodine or alcohol solution (42.1 %), and HIV testing (40.2 %). However, 19 (15.1 %) of HCWs did not take any action for their injuries. Nearly six out of ten (58.7 %) study participants did not report the accident of their injury to concerned bodies. The primary reasons for not reporting the injury were: time constraints (35.1 %), sharps made injury were not used on any client (27.0 %), it was used on patient, but the patient did not seem to have disease of concern (20.3 %) and lack of knowledge that it should be reported (14.9 %) (30).

The data from EPINET shows that needle stick injuries occur most frequently in the operating and inpatient rooms and most of the exposures to blood and other potentially infectious materials occur due to unsafe needle devices and improper handling and disposal of needles and other sharps (31).

In a systematic review conducted using published articles from January 1998 to May 2015, the highest incidence of needlestick injuries was seen in nurses and that the associated determinants were age, educational status, number of shifts per month and training on infection prevention (32).

In a study conducted among HCWs at public tertiary hospitals in an urban community of Mongolia revealed that NSSI were almost 2.5 times more likely to occur among HCWs who worked more than 35 hours per week, and those HCWs who followed universal precautions were 66% less likely to encounter NSSI than those who did not adhere to this recommendation (33).

In a study conducted among HCWs in Ondo State, Nigeria, NSI was associated with HCWs age group 25 years and below, male workers were highly likely to encounter NSI than their counterparts and doctors and nurses were more likely to sustain NSI than health attendants (34).

Previous studies conducted in different parts of Ethiopia reported factors associated with NSSI, including lack of occupational training, working department, needle recapping, satisfaction with working environment (35), work experience (36), monthly income ≥1,000 ETB, working in the emergency unit(37), sex of HCWs, application of universal precautions and needle recapping(38).

A cross-sectional study was the preferred study design to conduct this assessment. The cross-sectional study design is less time consuming, less expensive compared to case-control or cohort studies, and it allows to study the burden of occupational exposure to NSI, SI and BBFs (39). It is also useful for estimation of prevalence, to identify determinants, health planning, and priority setting of health problems.

Since this study determines the prevalence of needle stick, sharps injury and Blood/ body fluid splash and associated factors and based on the findings it may help in the planning of preventive measures aimed at alleviating occupational hazard, it can be best studied using cross-sectional study design.

The problem with the proposed study is since exposure and outcomes are assessed at the same time using cross-sectional study, it is challenging to state which comes first, it is possible for measurement errors and liable for survivor bias (people who died of the disease are missed) (40).

After reviewing different articles, the conceptual framework had been modified and developed. As shown in figure 1, the sociodemographic factors, work environment factors, and behavioral factors are interrelated to affect one another and have a link with occupational exposure to needlestick, sharps injuries, and body fluid splash.

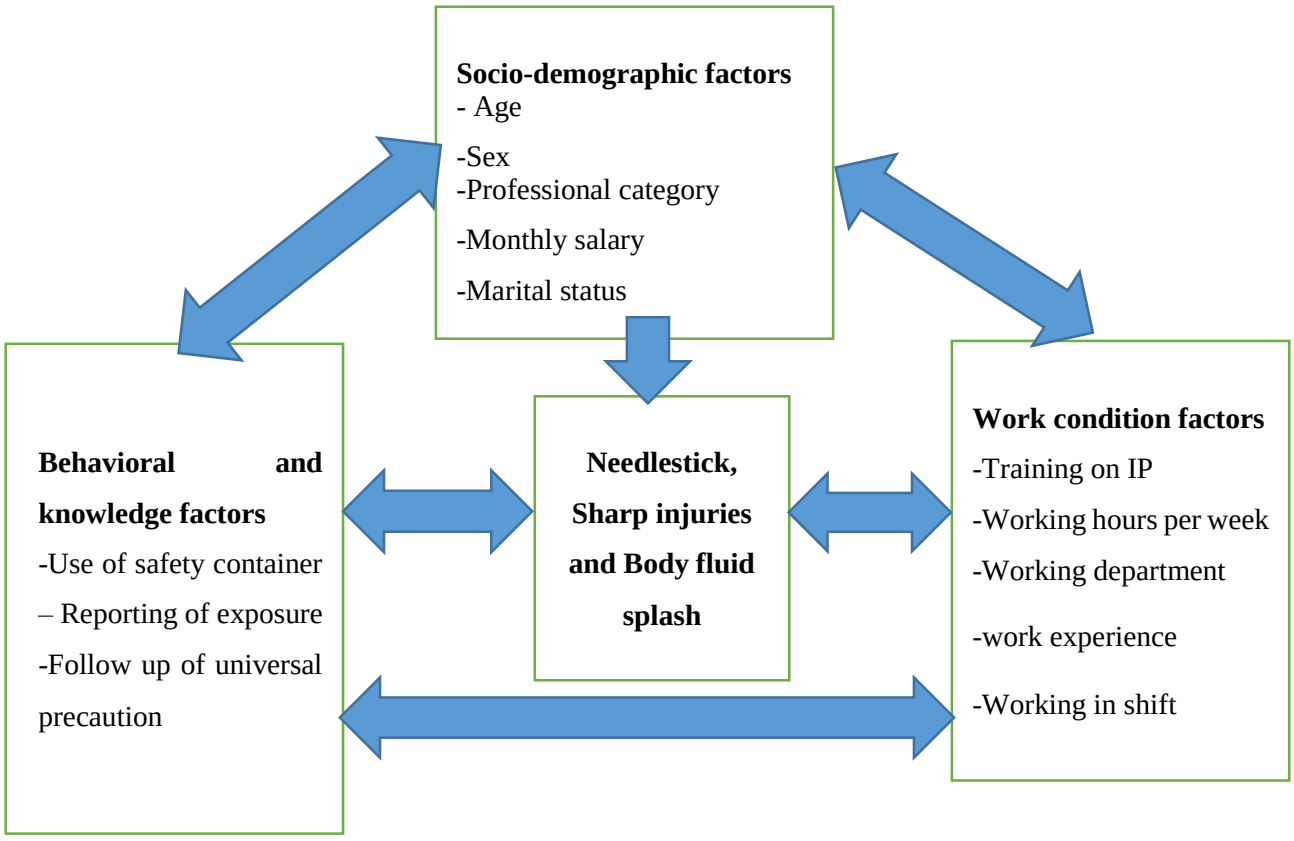


Figure 1- Conceptual framework for occupational needlestick, sharp injuries and Blood/body fluid splash (26, 28, 36, 37, 38)

3 Objectives of the study

3.1 General objective

To assess the prevalence of occupational exposure to needlestick injuries, sharp injuries, and body fluid splash with their determinants among health care professionals of governmental hospitals in Addis Ababa.

3.2 Specific objective

- To determine the prevalence of occupational exposures to needlestick injuries, Sharp injuries and body fluid splash among health professionals of governmental hospitals in Addis Ababa
- To assess potential determinants of occupational exposure among health professionals of governmental hospitals in Addis Ababa

4. Methods and Materials

4.1 Study Design

The institution-based cross-sectional study design was used to determine the prevalence and potential determinants of needlestick injury, sharps injury, and blood/body fluid splash.

4.2 Study Area and Period

The study was conducted in selected governmental hospitals in Addis Ababa, Ethiopia. Addis Ababa was established in 1886 by Emperor Menelik II. The City has an approximated population of 4.6 million, according to the 2016 Ethiopian Statistics Agency population projection (41). It comprises 10 sub-cities. Addis Ababa is located in the center of the country with an area of about 540 km2. Addis Ababa lies between 2200 and 2500 meters above sea level with the lowest and highest annual average temperature between 9.89 and 24.64 °c. In the City, there are 12 governmental hospitals. Among them, Zewditu Memorial Hospital, Yekatit 12 Hospital, Menelik II Hospital, Ras Desta Hospital, St. Peter Hospital and St Paulo's Hospital were included in the study by simple random sampling. Those hospitals give services for Medical, Surgical, Gynecological/Obstetrics, and Pediatrics (42). Health professionals were asked about their exposure to Needlestick, sharps injuries, and Blood/Body fluid splash and potential determinants were enquired for the period of March to April 2019.

4.3. Study Population

4.3.1. Source Population

The source population for this study was all health professionals working in governmental hospitals of Addis Ababa during data gathering period.

4.3.2. Study Population

The study population was all health care workers who were working in six hospitals, two hospitals from the Federal and four hospitals from the Addis Ababa City Administration (St. Peter, St. Paul, Minilik, Zawuditu, Ras Desta and Yekatit Hospitals) who were working at least for one year.

4.3.2.1. Inclusion Criteria

- All health care professionals in all selected study hospitals Physicians, HO, Nurses, Midwife, and Lab technicians.
- Who had worked for at least one year in selected hospital.
- Those who had contact with client's blood/body fluid, needlestick and sharp were included in the study.

4.3.2.2. Exclusion Criteria

All health care professionals who were on annual leave, maternity leave, and those who were critically ill during data collection were excluded from the study.

4.4 Sample size determination

The sample size for specific objective one was determined using a single population proportion formula based on the following assumptions,

- The twelve months' prevalence of needlestick and sharps injuries among health care workers taken from a study done at Wolaita Zone in February 2016 was, 55.1% (27),

$$n = \frac{(Z_{\alpha/2})^2 * P(1-P)}{d^2} = \frac{(1.96)^2 * (0.551 * 0.449)}{(0.05)^2}$$

$$= \mathbf{381,}$$

Where, n- is the sample size to be determined,

$Z_{\alpha/2}$- for standard normal distribution at a 95% confidence interval, is 1.96

p- Prevalence of needlestick injuries from previous study 55.1%,

d- Is margin of error assumed to be 5%

q- Is 1-p= .449

Assuming the study population is less than 10,000 or finite population, (N=4,076, based on the data from selected hospitals of the human resource unit, using the following correction formula,

$$N\ final = \frac{n}{1+\frac{n-1}{N}} = \frac{381}{1+\frac{380}{4{,}076}} = 349$$

Adding a 10 % non-response rate, the final sample size was **384**

The sample size for specific objective 2: were calculated by using double population proportion formula. P1=57.6% (27) and P2=71.5% (27).

$$n1=\frac{\left[Z\alpha/2\sqrt{\left(1+\frac{1}{r}\right)P(1-P)}+Z\beta\sqrt{P1(1-P1)+\frac{P2(1-P2)}{r}}\right]^2}{(P1-P2)^2}$$

Where n1= Number of sample, P1= proportion of noncompliance to standard precaution among unexposed, P2= proportion of noncompliance to standard precaution among exposed, $Z\alpha/2$ = 0.05 the probability of committing error (1.96), β= the probability of rejecting a true difference 20%. OR = odds ratio (1.85) using Epi info (**Table1).**

Table 1- Sample size calculation for specific objective two

Factors	CI	Power (1-β)	Ratio	the proportion of outcome among unexposed	the proportion of outcome among exposed	OR	Sample size	
							n	Sample size including 10% NR
Needle recapping, Awi Zone (38).	95%	80%	1:1	9.7%	44.9%	7.5	60	66
Job satisfaction, Bahir Dar (37)	95%	80%	1:1	45.0%	26.6%	0.44	232	256
No compliance with standard precaution, Wolaita Zone (27)	95%	80%	1:1	57.6%	71.5%	1.85	398	**438**

The sample size for specific objective 2 was calculated using the statcalc for sample size and power for cohort and cross-sectional studies of Epi info version 7.2.2.6, assuming the above criteria. Therefore, from the calculation of sample sizes for both objectives, the maximum size of **438** participants was included in the study.

4.5 Sampling procedure

Proportional stratified sampling method was used. Six governmental hospitals were selected by simple random sampling (lottery method) from 12 governmental hospitals in Addis Ababa.

From the selected hospital's proportionate allocation method was used for each selected type of professions. Study participants who fulfilled the inclusion criteria were selected by simple random sampling technique.

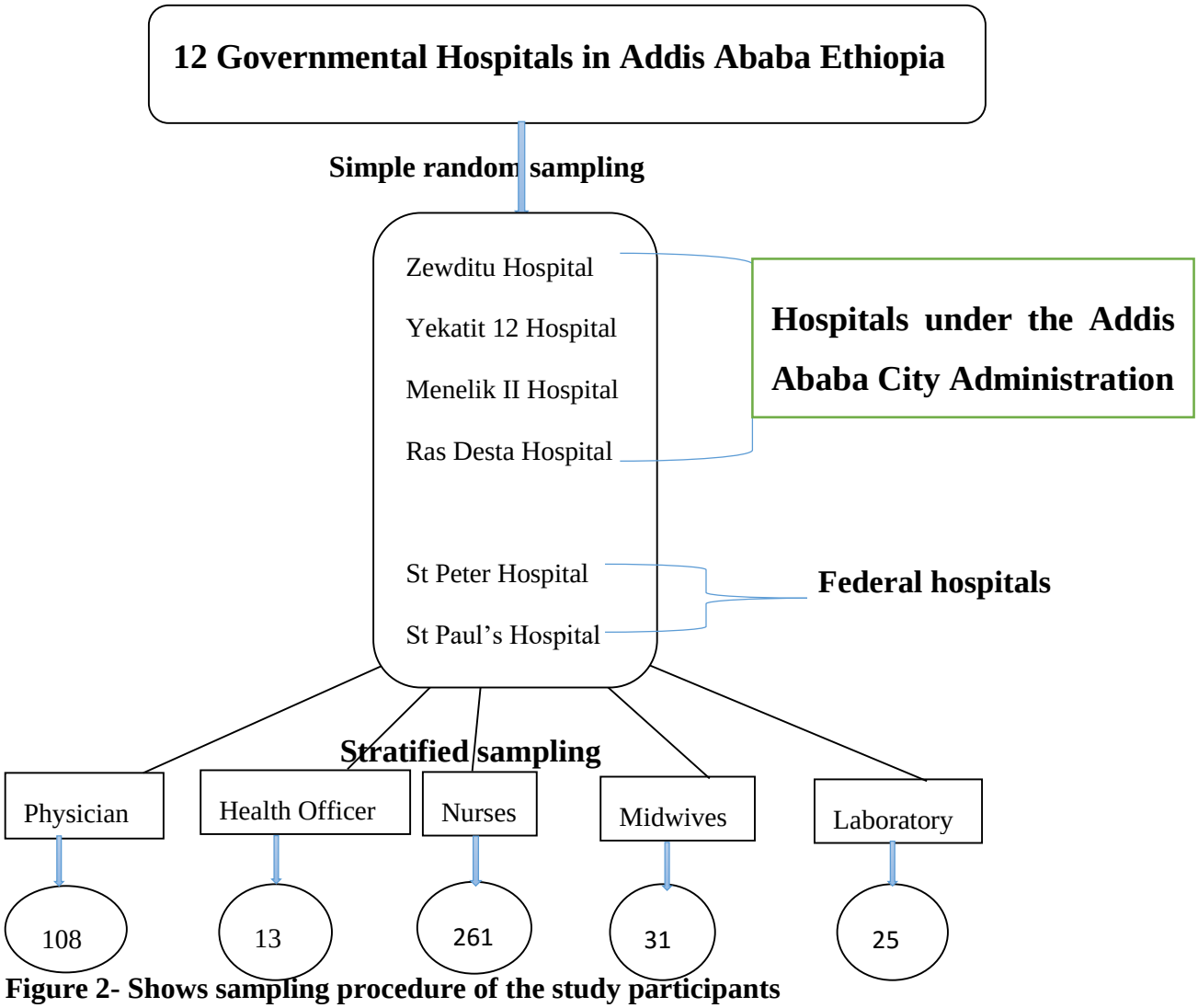


Figure 2- Shows sampling procedure of the study participants

The registers of all the healthcare workers was obtained from the administration of the Hospital. They were stratified into Doctors, Nurses, Midwives, Lab technicians and Health officers. A quota proportionate to size was allocated to each group. Their names were being numbered and participants were selected using simple random technique until the required number is obtained. Any unwilling or unavailable selected participant was replaced by the very next person on the list who had not been already selected to participate.

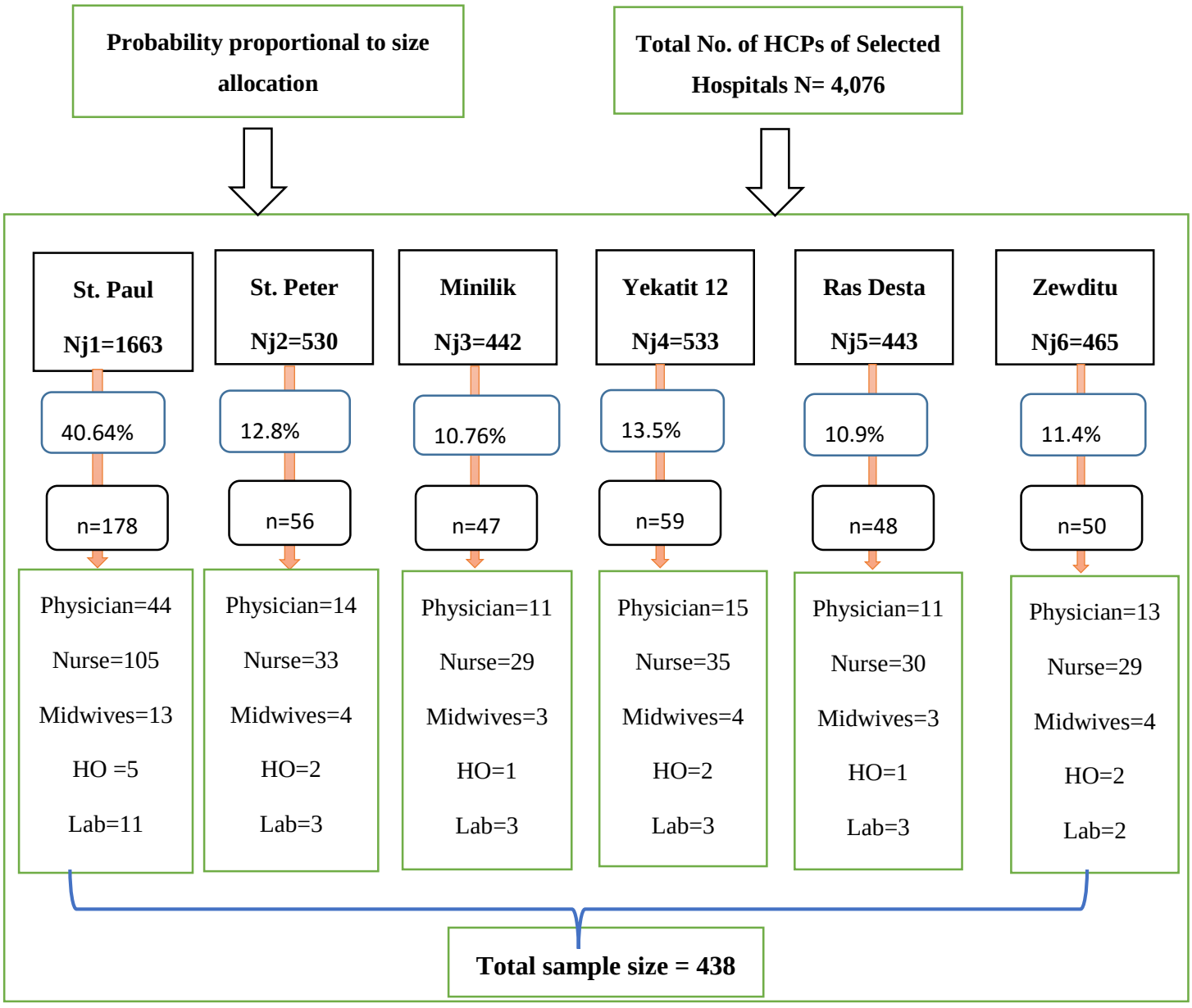


Figure 3- Sampling procedure to select health care professionals among health care professionals of selected hospitals in Addis Ababa

All health care workers were expected to be frequently and equally exposed to needlestick, sharps injuries, and blood/body fluid splash. So this study included five categories of

health care professionals. Accordingly, the number of each professional was Nurses 261 (59.82%), Physicians 108 (24.65%), Midwives 31 (7.07%), Laboratory technicians 25 (5.5%) and Health officers 13 (2.96%). From the previous figure, Nurses and Physicians had got the highest number in the study.

4.6 Variables of the study

4.6.1 Dependent variables

Exposure of needlesticks injuries among health care profesional,

Exposure of sharp injuries among health care professional, and

Exposure of blood/body fluid splash among health care professionals.

4.6.2 Independent variables

- Socio-demographic factors: - Age, Sex, Marital status, Qualifications of health professionals, Monthly income,
- Work related factors: - Training on IP, Department (work area), Year of service,
- Behavioral factors: - Job satisfaction, Reporting the exposure, Using protective method

4.7 Data collection methods

Data collected by facilitator guided structured self-administered questionnaire. Facilitators took training by the principal investigator. The qualification of facilitators were holders of Diploma and above in health-related professions. The principal investigator supervised the data collection process. Both open and closed-ended questions were used inorder to collect data on socio-demographic, work-related history, behavioral factors, and infection prevention techniques of health professionals in governmental hospitals in Addis Ababa.

4.8 Data entry and analysis

The collected data were checked and reviewed for completeness, accuracy, and consistency. Data were coded and entered into EPI INFO version 7.2.2.6 then exported to SPSS version 25 for data analysis. The results were presented in text, percentage, frequency distributions, tables, and figures.

Descriptive statistics were used to determine the frequency of different variables. Association between dependent and independent variables were examined using bivariable and multivariable logistic regression models.

Those variables which were (P-value < 0.25) on bi-variate analysis were entered to multivariable logistic regression analysis and reported as unadjusted odds ratio (OR) and adjusted odds ratios (AOR) with 95 % confidence interval (CI). P-value (≤0.05) was used to examine statistical significance.

4.9 Data quality control

The questionnaire was developed by reviewing different kinds of literature. The questionnaire was prepared in English. To evaluate the understandability and the applicability of the instruments, two weeks prior to data collection, the questionnaire was pretested in Gandi Memorial Hospital with thirty questioners which accounted for 7% of sample size. Which help to check the clarity, sequence, consistency and time required to fill the entire questionnaire. Based on the findings, some amendment and arrangements on the particular questions were made. Measurements and responses were cross-checked for missed values, irregularities, inconsistencies, and corrective measures were taken.

4.10 Operational definitions

Occupational needlestick and sharp injuries: are occupational accidental puncture of any part of the body to health care professionals at least once in the last one year due to a needle or sharp material during medical intervention (1)

Blood/Body fluid includes - blood, vomits, urine, sputum, saliva, amniotic fluid, exudative fluids from burns/lesions, and cerebrospinal fluid (31).

Health care professionals: for this study, HCPs are defined as those health workers working in a health institution and have contact with blood and other body fluids, syringes, needles and other sharps by virtue of their duties. These include physicians, Health officers, Nurses, Midwives, and Laboratory Technicians (9).

Contaminated Needles and sharps: include waste directly associated with blood, body fluids secretions, excretions to needles, and sharps (31).

Physicians: for this study, physicians mean General Practitioners, Gynecologists, Surgeons, Pediatricians, Internists, and any Medical doctors, etc. who have contact with patients, blood, and body fluid.

Personal protective equipment. Those are barriers and filters between the worker and the hazard. Examples include eye goggles, face shields, gloves, masks, and gowns (1).

Universal Precautions; An approach to infection control that treats all human blood and other possibly infectious materials as if they were infectious for HIV and HBV or other blood-borne pathogens (1).

Deep injuries: Sharps or needles that can cause intramuscular penetration (1).

Superficial injuries: Sharps or needles that can cause penetrated through skin, wound bled (1).

Slight skin penetration: Sharps or needles that can cause scratch, no or little blood (1).

4.11 Ethical consideration

Study participants were informed verbally, and written consent about the purpose and benefit of the study as well as the confidentiality of the study was accepted by excluding the names of respondents. They were ensured that their response would only be utilized for the research purpose. For those who were not comfortable to participate in the study, their right was respected. Ethical clearances were obtained from institutional review boards (IRB) of Addis Ababa University, and Addis Ababa Regional Health Bureau since the research was undertaken in Addis Ababa. A formal letter was submitted to selected hospitals, and written consent was obtained.

4.12 Dissemination of findings

The result of this study will be presented to the Addis Ababa University School of Public Health, and its copy shall be submitted to the Federal Ministry of Health, Addis Ababa Regional Health Bureau, St.Paul, St. Peter, Zawditu, Yekatit 12, Menelik II and Ras Desta hospitals. Finally, further effort will be made to publish the findings of this study on national and international journals. The submitted work in the form of MPH Thesis shall be defended in the presence of external examiners.

5. Results

5.1 Socio-demographic characteristics

A total of 424 questionnaires were filled by the respondents yielding a response rate of 97%. **(Table 2)** The age distribution of the respondents ranges from 20-56 years, with a mean age of 30.11 years (SD ± 5.37) and 219(51.7%) were within the age ranges of 25-29 years. Nearly two-third of participants, 258 (60.8%) were males. Among participants, unmarried accounted for 253(59.7%). In this study majority, four hundred and ten (96.7%) participants were the holders of degree and above. Regarding the professional category of HCPs, more than half of the respondents, 247(58.3%) were nurses and 13(3%) were Health officers. More than four out of five, earned monthly salary of ≤8000 Ethiopian birr (ETB). Two-third, 295 (69.6%), had one to five years' work experience **(Table 2).**

Table 2 - Socio-demographic characteristics of study participants in Addis Ababa government Hospitals, Addis Ababa, Ethiopia, 2019

Variables	Category	Number	%
Age	20-24	35	8.3
	25-29	219	51.7
	30-34	87	20.5
	35-39	55	12.9
	≥40	28	6.6
Gender	Male	258	60.8
	Female	166	39.2
Marital status	Ever married	171	40.3
	Single	253	59.7
Educational status	Diploma	14	3.3
	Degree and above	410	96.7
Professional category	Physician	108	25.5
	Nurses	247	58.2
	Midwives	31	7.3
	Health officer	13	3
	Laboratory technicians	25	5.9
Monthly salary	≤5000	165	38.9
	5001-8000	179	42.2
	≥8001	80	18.9
Year of services	1-5 years	295	69.6
	6-10 years	103	24.3
	≥11	26	6.1

5.2 Prevalence of needlestick injury, sharp injury and blood/body fluid splashes

A total of 424 HCPs who worked in the hospitals reported that they had occurrence of work-related needlestick injury, sharps injury and blood/body fluid exposures in the preceding one-year period was 33.3%, 21.2%, and 46.7%, respectively **(Table3).** Health-care professionals of the age-group 25 to 29 had the highest prevalence of NSI 81(57.4%), SI 55 (61.1%) and BBFs 115 (58.1%) compared with other age groups. Male study participants had more exposure of NSI 126(89.4%), SI 79 (87.8%) and BBFs 163 (84.8) than female participants. Among participants those who were single had the higher burden of NSI, SI and BBFs which were 117 (83%), 79 (87.8%) and 148 (74.7%) respectively than that of ever married. Study participants who had a degree and above educational status had more extensive exposure of NSI, SI and BBFs, 138 (97.9%), 88 (97.8%) and 191 (96.5%), respectively than diploma holders. Nurses suffered maximum 82(58.2%) NSI, 56(62.2%) SI and hundred and eight (54.6%) BBFs compared with Physician, Midwives, Health officer, and Laboratory Technicians. Study participants who had ≤5000 Ethiopia birr monthly salary were frequently reported NSI 60(42.6%), SI 46 (51.1%) and BBFs 88 (44.4%) than those who had a more monthly salary. Among respondents who had 1-5 years of work experience were experienced more NSI, SI and BBFs, 112 (79.4%), 74 (82.3%) and 153 (77.3%) as compared to those who had more experience **(Table3).**

Table 3- Prevalence of NSI, SI, and BBFs among healthcare professionals at Addis Ababa government Hospitals, Addis Ababa, Ethiopia, 2019

N=424	NSI=141 (33.3%)		SI= 90 (21.2%)		BBFs= 198 (46.7%)	
Variables	**N**	**%**	**N**	**%**	**N**	**%**
Age						
20-24	9	6.4	9	10	16	8.1
25-29	81	57.4	55	61.1	115	58.1
30-34	28	19.8	18	20	39	19.7
35-39	14	10	5	5.6	19	9.6
≥ 40	9	6.4	3	3.3	9	4.5
Gender						
Male	126	89.4	79	87.8	163	84.8
Female	15	10.6	11	12.2	35	15.2
Marital status						
Single	117	83	79	87.8	148	74.7
Married	24	17	11	12.2	50	25.3
Educational status						
Diploma	3	2.1	2	2.2	7	3.5
Degree and above	138	97.9	88	97.8	191	96.5
Professional category						
Physician	44	31.2	21	23.3	59	29.8
Nurse	82	58.2	56	62.2	108	54.6
Midwifery	8	5.6	9	10	22	11.1
Health officer	1	0.7	-	-	3	1.5
Lab technician	6	4.3	4	4.4	6	3
Monthly salary						
≤ 5000 birr	60	42.6	46	51.1	88	44.4
5001-8000 birr	55	39	37	41.1	72	36.4
≥8001 birr	26	18.4	7	7.8	38	19.2
Year of service						
1-5 years	112	79.4	74	82.3	153	77.3
6-10 years	26	18.5	12	13.3	38	19.2
≥ 11 years	3	2.1	4	4.4	7	3.5

5.3 Reasons and frequency of needlestick injury

Out of NSI, 30(21.3%) sustained deep injuries, 61(43.3%) had slight skin penetration, and 60(42.6%) sustained superficial injuries **(Table 4).** Majority 124(87.9%) of participants had sustained one to two times NSI exposure, only three participants reported that they had five or more times NSI exposure. Among those exposed to NSI more than half 84(52.5%) of participants said a sudden movement of a patient during injection was the main reason why they sustained to NSI.

Table 4- Types, frequency and Reason of Needlestick injury among study participants, at Addis Ababa government hospitals, Addis Ababa, Ethiopia 2019

Variables	Category	Number	%
Types of injury	Deep injuries	30	21.3
	Slight skin penetration	61	43.3
	Superficial injuries	60	42.6
Frequency of NSI	1-2	124	87.9
	3-4	14	9.9
	≥5	3	2.1
How did NSI occur			
	During recapping	47	33.8
	By a sudden movement of a patient during injection	84	60.4
	During needle collection	18	12.9
	When needle showed up in unexpected places like bed sheets or other places	11	7.9

5.4 Reasons and frequency of sharps injuries

Ninety (21.2%) of respondents reported that they had exposure to sharp material. Out of SI exposed participants reported, near to half, 46(51.1%) sustained slight skin penetration, 43(47.8%) had exposed to superficial types of injury, nine (10%) had deep sharp injuries (**Table 5**). Majority of SI exposed participants in last one year, 80(88.9%) were reported that they had a frequency of one to two, seven (7.8%) had a time of three to four while three (3.3%) had a rate of five or more exposure of SI. In the last one year, the essential causes for occurrences of SI happened during working procedure 75(83.3%).

Table 5- Types, frequency, and Reason of sharp injury among health care professionals, at Addis Ababa government hospitals, Addis Ababa, Ethiopia 2019

Variables	Category	Frequency	Percentage
Types of injury	Deep injury	9	10
	Slight skin penetration	46	51.1
	Superficial injury	43	47.8
Frequency of SI	1-2	80	88.9
	3-4	7	7.8
	≥5	3	3.3
How did SI occur *			
	During the working procedure	75	83.3
	During cleaning instrument	10	11.1
	During sharp collection	8	8.9
	When sharp shown up in unexpected places like bed sheets or other places	6	6.7

*------ Indicates multiple response

Among those who had at least one exposure to NSI or sharp injury reported the source status that, 73(43.2%) were known HIV/AIDS negative, 67(39.6%) were unknown status, 18(10.7%) were reported as known HIV/AIDS positive, 10(5.9%) were clinically suspected HIV/AIDS and only one source patient reported hepatitis B positive **(figure 4).**

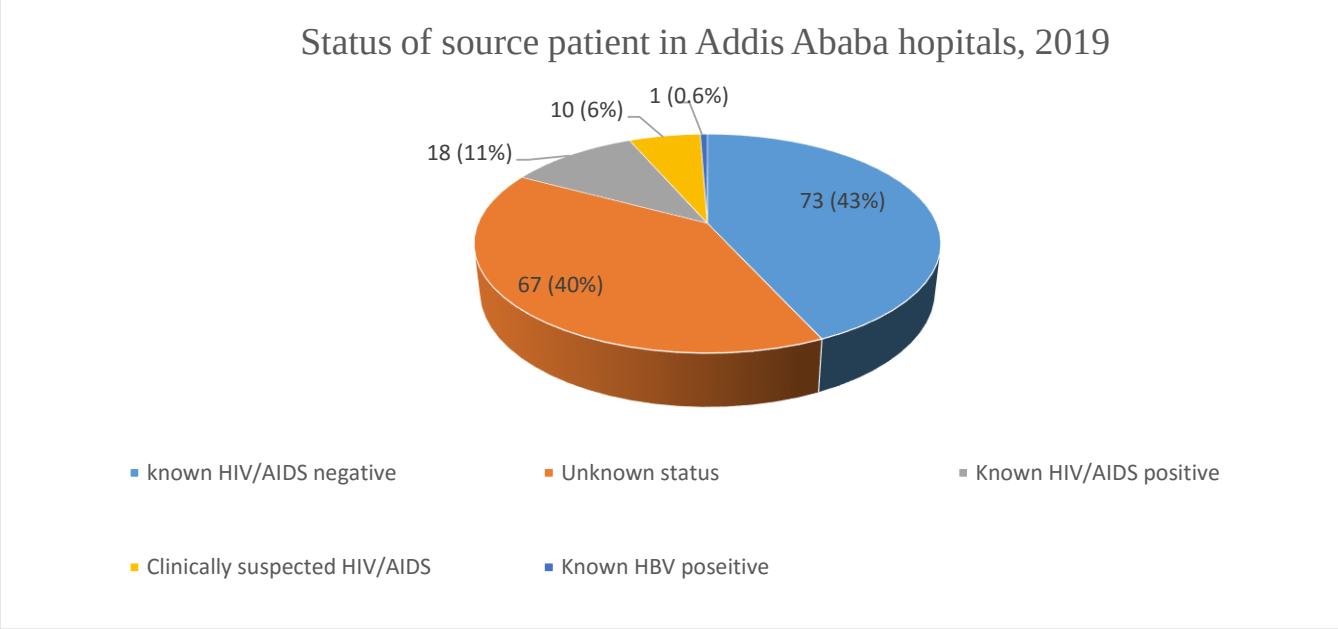


Figure 4- Status of source patients for human immunodeficiency virus infection and hepatitis B virus, among participants who were exposed to NSI or SI in Addis Ababa government hospitals, Addis Ababa, 2019.

5.5 Frequency, body part encountered and status of sources patient for Blood/ body fluid splash

One-Year prevalence of occupational exposure to blood/body fluid splash at least once was 198(46.7%) (**Table 6)**. Among exposed for BBFs in the last one year, 163(82.3%) of them encountered one to two times and 14 (7.1%) of faced five and more times. Of the total of BBFs exposed HCPs, the status of source patients was unknown, 79(39.5%) whereas, 25(12.5%) were known HIV/AIDS positive, 16(8%) were clinically suspected HIV/AIDS positive, however, 77(38.5%) known HIV/AIDS negative. Only, 3(1.5%) reported to have hepatitis B positive status.

Of BBFs in last one year, 138(60.8%) exposure was encountered to skin. The splash to the broken membrane of skin 18(7.9%), eyes 58(25.6%), and to face and mouth 13(5.7%) were reported to occur (**Figure 5**).

Table 6- distribution of frequency and source status of blood /body fluid splash among HCP in Addis Ababa government Hospital, Addis Ababa, Ethiopia, 2019

Variables	Categories	Frequency	Percentage
Frequency of BBFs	1-2	163	82.3
	3-4	21	10.6
	≥5	14	7.1
Status of the source patient	Known HIV/AIDS positive	25	12.5
	Clinically suspected HIV/AIDS positive	16	8
	Unknown status	79	39.5
	Known HIV/AIDS negative	77	38.5
	Others	3	1.5

Others: - Hepatitis B positive

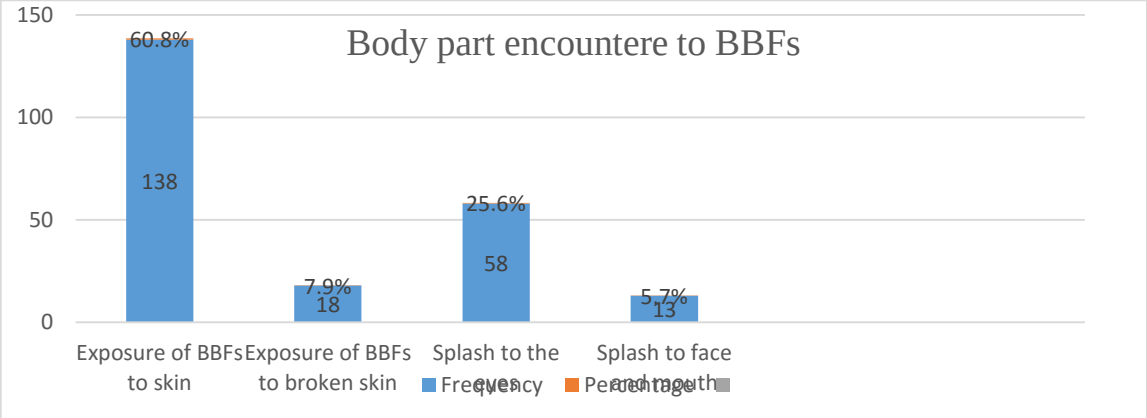


Figure 5- Frequency and percentage of body part encountered to BBFs among study participants in Addis Ababa government Hospitals, Addis Ababa, Ethiopia, 2019

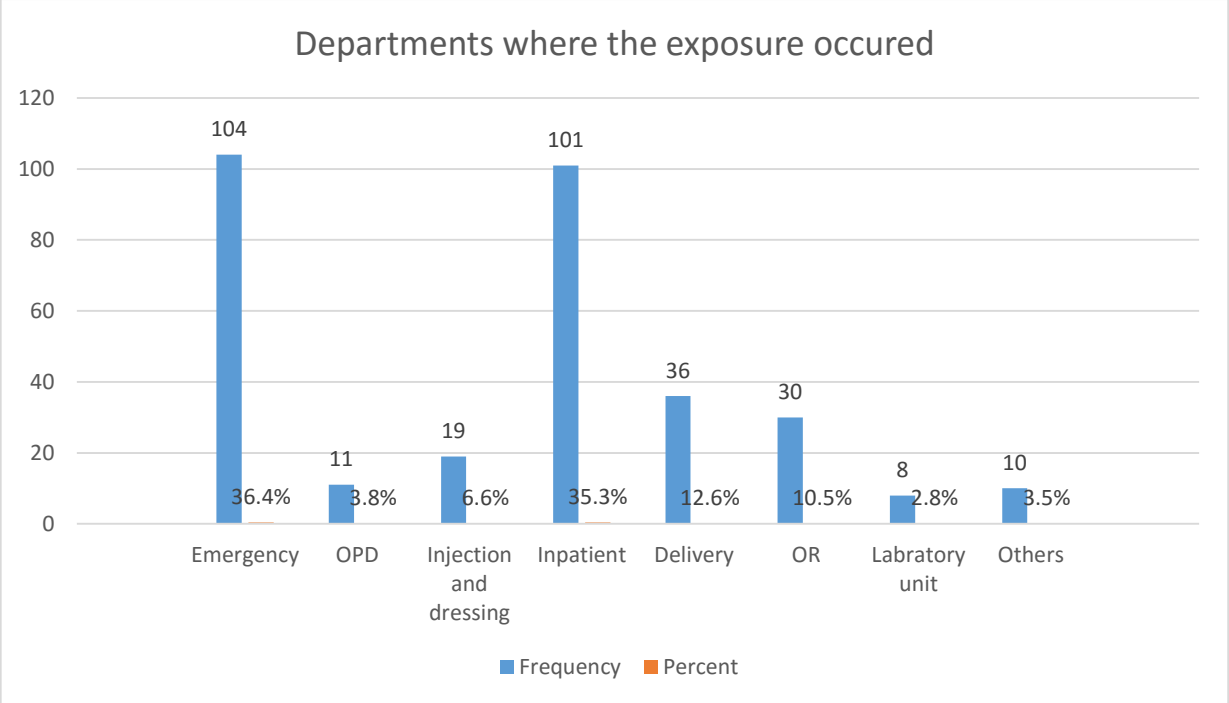
5.6 Work environment-related conditions

Result of this study revealed that 346(81.6%) of the respondents had worked in a shift, of those half of the participants, 171(49.4%) worked at night shift **(Table 7)**. More than fifty percent of study participants, 238(56.1%) had worked forty hours plus per week. Among study participants, half of them got training on infection prevention (IP) and safety practice in the last-one year. Among studied health care professionals, more than half 242(57.1%) reported that they didn't know the presence of infection prevention committee in their hospitals.

Table 7- Work environment and related characteristics of health care professionals (n=424) in Addis Ababa hospitals, Addis Ababa, Ethiopia, 2019

Variables	Categories	Frequency	Percentage
Work in shift	Yes	346	81.6
	No	78	18.4
Which shift did you work	Day	175	50.6
	Night	171	49.4
Work of hours per week	≤39	186	43.9
	≥40	238	56.1
Is there an IP committee in your hospital	Yes	182	42.9
	No	242	57.1
Receive IP and safety training	Yes	211	49.8
	No	213	50.2

Maximum occurrence of NSI, SI, or BBFs reported by respondents were Emergency and inpatient, 104(36.4%), 101(35.3%), respectively **(Figure 6).**



Others: - Family planning, ART, Burn ward, NICU

Figure 6- Department where the exposure of NSI, SI, or BBFs occurred to study participants in Addis Ababa government Hospitals, Addis Ababa, Ethiopia 2019.

5.7 Behavior, knowledge, and practice of health care professionals

Out of the respondents, less than half, 191(45%) responded that they had followed universal precautions regularly, and 187(44.1%) usually use safety box (**Table 8).** Among exposed participant to NSI, SI or BBFs, majority, 224(93.1%) took action by oneself after exposure but eighteen (6.9%) exposed participants did not take any action. Out of participants who took action by themselves after experienced at least one exposure of needle stick, sharp injury or blood/body fluid splash, 218(89.3%) gave response by washing with soap and water, washing with iodine or alcohol solution, got tested for HIV, took post-exposure prophylaxis (PEP), took tetanus anti-toxoid (TAT), squeezing to extract more blood and applying pressure to stop bleeding reported, 29(11.9%), 96(39.3%), 42(17.2%), 2(0.8%), 17(7%), and 5(2%) respectively. Concerning disease transmitted through contaminated needles and sharps, 347 (81.8%) knew that HIV/AIDs could be transmitted. Almost nighty percent 381 and only two hundred nine (49.3%) health care professional responded that hepatitis B and hepatitis C could be transmitted through contaminated needle and sharps respectively. Nine study participants responded that they didn't know the disease that may be transmitted through dirty needle and sharps.

Concerning the protection of oneself and patient from infection, 362(85.4%) of respondents indicated that they wear gloves appropriately while 301(71%) of the respondents answered that by proper hand washing. The wearing of gowns and aprons had responded by 300(70.8%). Overall, 276(65.1%) practiced wearing eye goggles, masks, and shields to protect themselves and their patient from infection at the workplace.

Among study participants, near to half 192(46%) had responded that they had job-related stress, and two hundred forty-six (58%) answered that they were dissatisfied to their job. Majority 385(90.8%) and 351(79.8%) responded that they had tested for HIV and hepatitis B or C, respectively. Moreover, in the last one-year, participants who had at least one exposure to Needlestick Injury (NSI), Sharp Injury (SI) or Blood/body Fluid splash (BBFs), only 160(61%) reported their exposure to the concerned body.

Among respondents, 294(69.3%) of participants reported that they had always washed off their hands immediately after handling contaminated objects while. Two hundred forty-eight (58.5%) had said that they always wash their hands before putting and handling gloves. Three hundred forty-seven (81.8%) reported that they washed their hands always after contact with blood or mucous membrane. Among study participants, available antiseptic hand rub was ever used by 142(33.5%) of the respondents before and after contact with each patient. Near to half, 191(46.7%) of respondents reported they always use protective barriers appropriately (**Table 8**).

Table 8 - Behavior, knowledge, and practice related characteristics of study participants (n=424) in Addis Ababa hospitals, Addis Ababa, Ethiopia, 2019

Variables	Categories	Frequency	%
Regularly applying universal precautions	Yes	191	45
	No	233	55
Using safety containers regularly	Yes	187	44.1
	No	237	55.9
Reported exposure to the concerned body	Yes	160	63
	No	102	39
Taking action by oneself after exposure	Yes	244	93.1
	No	18	6.9
Immediate actions were undertaken by HCPs following exposure	Washing with soap and water	218	89.3
	Washing with iodine or alcohol solution	29	11.9
	Got tested for HIV	96	39.3
	Took post-exposure prophylaxis (PEP)	42	17.2
	Took tetanus anti-toxoid (TAT)	2	0.8
	Squeezing to extract more blood	17	7
	Applying pressure to stop bleeding	5	2
Diseases that can be transmitted through contaminated needles/sharps	HIV/AIDs	347	81.8
	HBV	381	89.9
	HCV	209	49.3
	I don't know	9	2.1
How do you protect yourself and your patient from infections in the workplace	Wear gloves appropriately	362	85.4
	Proper hand washing	301	71
	Wearing of gowns and aprons	300	70.8
	Wearing of eye goggles, masks, and shields	276	65.1
Job-related stress	Yes	192	46
	No	229	54
Are you satisfied with your job	Satisfied	176	42
	Dissatisfied	246	58
Ever had tested HIV/AIDS	Yes	385	90.8
	No	39	9.2
Ever had tested HBV or HCV	Yes	351	79.8
	No	73	20.2
	Always	150	35.4

Variables	Categories	Frequency	%
Do you wash your hands appropriately before handling and putting on gloves?	Sometimes	248	58.5
	Never	26	6.1
Do you wash your hand after handling objects that might be contaminated?	Always	294	69.3
	Sometimes	125	29.5
	Never	5	1.2
Do you wash your hand after contact with blood or mucous membrane?	Always	347	81.8
	Sometimes	69	16.3
	Never	8	1.9
Do you use antiseptic hand rub available before and after contact with each patient?	Always	142	33.5
	Sometimes	257	60.6
	Never	25	5.9
Do you use antiseptics to remove or kill microorganisms on the instrument or other items?	Always	198	46.7
	Sometimes	205	48.3
	Never	21	5
Do you use protective barriers appropriately?	Always	191	46.7
	Sometimes	223	52.6
	Never	10	2.4

5.8 Bivariate and multivariate logistic regression analysis of potential determinants associated with needlestick injuries

Based on bivariate analysis, determinants that were turned to be significant with NSIs, include being male, single, worked in shift, worked ≥40 hours per week, presence of IP committee in hospital, not receiving IP and safety training in last 1 year, not use of safety containers regularly, not regularly applying universal precaution, presence of job related stress, work experience 1-5 years and job dissatisfaction were statistically associated with needle stick injury with p-value ≤0.05 at 95% confidence interval **(Table 9).**

Post bivariate analysis, those variables which were statistically related ($p < 0.25$) were analyzed for further multivariable analysis. The result of the multivariable analysis showed that determinants statistically associated with needle stick injury were males (AOR 2.5, 95% CI 1.2-5.4). Male HCPs were 2.5 times likely to be exposed to NSI than female HCPs. Single HCPs was also associated with exposure to needle stick injury (AOR 2.6, 95% CL 1.3-5.3). Those HCPs who were single, 2.6 times more likely to sustain needle stick injury. Respondents who worked long hours per week were positively associated with NSI (AOR 2.18, 95% CI 1.04-4.6). Knowing the presence of IP committee in the hospital were negatively associated with NSI (AOR 0.27, 95% CI 0.1-0.74). Study participants who did not receive training on IP and safety were three times more likely to incur NSI (AOR 3.4, 95% CI 1.5-7.5) compared to those who received training. Health care professionals who did not use safety containers regularly and had job-related stress were positively associated to NSI (AOR 3.4, 95% CI 1.134-10.25) and (AOR 2.23, 95% CI 1.14-4.35) respectively. HCPs who dissatisfied with their job were three times more likely to experience needle stick injury (AOR 2.85, 95% CI 1.4-5.8) than those who were satisfied. Professional category, working in a shift, regularly applying universal precaution, and year of service was not statistically significant **(Table 9).**

Table 9- Bivariate and multivariate logistic regression analysis of potential determinants for Needlestick injuries among health professionals of governmental hospitals in Addis Ababa, Ethiopia 2019.

Variables	Needlestick injuries		COR(95% CI)	AOR(95% Cl)
	Yes=141	No=283		
Gender				
Male	126(89.4%)	132(46.6%)	9.6(5.4-17.2)***	**2.5(1.2-5.4)***
Female	15(10.6%)	151(53.4%)	Reference	Reference
Marital status				
Ever married	24(17%)	147(52%)	Reference	Reference
Single	117(83%)	136(48%)	5.3(3.2-8.7)***	**2.6(1.3-5.3)****
Professional category				
Physician	44(31.2%)	64(22.6%)	2.2(0.805-5.9)	
Nurses	82(58.2%)	165(58.3%)	1.6(0.605-4.091)	
Midwifes	8(5.6%)	23(8.1%)	1.1(0.325-3.7)	
Health officer	1(0.7%)	12(4.2%)	0.264(0.028-2.471)	
Lab technicians	6(4.3%)	19(6.7%)	Reference	
Did you worked in shift				
Yes	125(88.6%)	221(78%)	2.2(1.2-3.9)**	
No	16(11.4%)	62(22%)	Reference	
Work hours per week				
≥40 hours	119(84.4%)	119(42%)	7.5(4.5-12.4)***	**2.18(1.04-4.6)***
≤39 hours	22(15.6%)	164(58%)	Reference	Reference
Presence of the IP committee in the hospital				
Yes	8(5.7%)	174(61.5%)	0.038(0.018-0.08)***	**0.27(0.1-0.74)***
No	133(94.3%)	109(38.5%)	Reference	Reference
Receiving IP and safety training in the last year				
Yes	14(9.9%)	197(69.6%)	Reference	Reference
No	127(90.1%)	86(30.4%)	20.8(11.3-38.1)***	**3.4(1.5-7.5)****
Use of safety containers regularly				
Yes	7(5%)	180(63.6%)	Reference	Reference
No	134(95%)	103(36.4%)	33.4(15.07-74.3)***	**3.4(1.134-10.25)***
Regularly applying universal precaution				
Yes	13(9.2%)	178(62.9%)	Reference	
No	128(90.8%)	105(37.1%)	16.7(8.9-31.01)***	
Job-related stress				
Yes	111(78.7%)	84(29.7%)	8.8(5.4-12.1)***	**2.23(1.14-4.35)***
No	30(21.3%)	199(70.3%)	Reference	Reference
Year of service				
1-5 years	112(79.4%)	183(64.7%)	4.7(1.4-15.9)*	
6-10 years	26(18.5%)	77(27.2%)	2.6(0.72-9.3)	
≥ 10 years	3(2.1%)	23(8.1%)	Reference	
Job satisfaction				
Satisfied	20(14.2%)	158(55.8%)	Reference	Reference
Dis satisfied	121(85.8%)	125(44.2%	7.6(4.5-12.9)***	**2.85(1.4-5.8)****

*p≤0.05; **p≤0.01; COR, crude odds ratio; AOD, adjusted odds ratio CI, confidence interval, IP, infection preventio

5.9. Bivariate and multivariate logistic regression analysis of potential determinants associated with sharp injuries

Based on bivariate analysis, determinants that were found to be statistically significant with NSIs included being male, single, worked in shift, worked ≥40 hours per week, presence of IP committee in hospital, not receiving IP and safety training in last 1 year, not use of safety containers regularly, not regularly applying universal precaution, presence of job-related stress, monthly salary and job dissatisfaction were statistically associated with sharp injury with p-value ≤0.05 and 95% confidence interval **(Table 10).**

Post bivariate analysis, only those variables which were statistically associated ($p < 0.25$) were considered for further multivariable analysis. After controlling confounders, multivariable logistic regression indicated that health care professionals who were single participants had four times more likely to sustain sharps injuries (AOR 3.97, 95% CI 1.86-8.47) than ever married HCPs. Those who have not received infection prevention and safety practice were about three times more likely to be exposed to sharps injuries (AOR 3.02, 95% CI 1.17-7.73) than those who received training. Respondents who had job-related stress were positively associated with sharps injuries (AOR 2.07, 95% CI 1.033-4.15).

Those who were dissatisfied with their job were two times likelihood to sustain sharps injuries (AOR 2.36, 95% CI 1.114-4.99) than those who were satisfied with their job. Moreover, health care professionals whose monthly salary was ≤5000 and 5001-8000 Ethiopian birr were about 4 times more at risk to sustain sharp injury (AOR 4.15, 95% CI 1,54 – 11.14) and (AOR 4.19, 95% CI 1.56 – 11.25) respectively than those whose average monthly salary was higher than 8000 Ethiopian Birr. Gender, working in a shift, work hour per week, presences of infection prevention committee in hospital, use of safety containers regularly, regularly applying universal precaution, and year of service was not statistically significant. **(Table 10).**

Table 10 - Bivariate and multivariate logistic regression analysis of potential determinants for Sharp injuries among health professionals of governmental hospitals in Addis Ababa, Ethiopia 2019.

Variables	Sharp injury		COR(95% CI)	AOR(95% Cl)
	Yes=90	No=334		
Gender				
Male	79(87.8%)	179(53.4%)	6.2(3.2-12.1)***	
Female	11(12.2%)	155(46.6%)	Reference	
Marital status				
Ever married	11(12.2%)	160(48%)	Reference	Reference
Single	79(87.8%)	174(52%)	6.6(3.4-12.8)***	**3.97(1.86-8.47)*** **
Did you worked in shift				
Yes	83(92.2%)	263(78.7%)	3.2(1.4-7.2)**	
No	7(7.8%	71(21.3%)	Reference	
Work hours per week				
≥40 hours	72(80%)	166(49.7%)	4.04(2.3-7.08)***	
≤39 hours	18(20%)	168(50.3%)	Reference	
Presence of the IP committee in the hospital				
Yes	10(11.1%)	172(51.5%)	0.118(0.059-0.235)***	
No	80(88.9%)	162(48.5%	Reference	
Receiving IP and safety training in the last year				
Yes	11(12.2%)	200(60%)	Reference	Reference
No	79(87.8%)	134(40%)	10.7(5.5-20.8)***	**3.02(1.17-7.73)***
Use of safety containers regularly				
Yes	10(11.1%)	177(53%)	Reference	
No	80(88.9%)	157(47%)	9.5(4.7-18.9)***	
Regularly applying universal precaution				
Yes	10(11.1)	181(54.2%)	0.106(0.053-0.211)***	
No	80(88.9)	153(45.8%)	Reference	
Job-related stress				
Yes	72(80%)	123(36.8%)	6.8(3.9-12)***	**2.07(1.033-4.15)***
No	18(20%)	211(63.2%)	Reference	Reference
Year of service				
1-5 years	74(82.2%)	221(66.2%)	1.8(0.6-5.5)	
6-10 years	12(13.3%)	91(27.2%)	0.7(0.2-2.5)	
≥ 10 years	4(4.4%)	22(6.6%)	Reference	
Monthly salary category				
≤5000 birr	46(51.1%)	119(35.6%)	4(1.7-9.4)**	**4.15((1.54-11.14)** **
5001-8000 birr	37(41.1%)	142(42.5%)	2.7(1.2-6.4)*	**4.19(1.56-11.25)** **
≥8001 birr	7(7.8%)	73(21.9%)	Reference	Reference
Job satisfaction				
Satisfied	12(13.3%	166(49.7%)	Reference	Reference
Dis satisfied	78(86.7%)	168(50.3%)	6.4(3.4-12.2)***	**2.36-1.114-4.99)***

*p≤0.05; **p≤0.01; ***p≤0.001; COR, crude odds ratio; AO, adjusted odds ratio CI, confidence interval, IP, infection prevention

5.10 Bivariate and multivariate logistic regression analysis of potential determinants associated with Blood/body fluid splash

According to bivariate analysis, determinants that were found to be significant with BBFs included being male, professional category(Physician and Midwives), single, worked in shift, worked ≥40 hours per week, presence of infection prevention (IP) committee in hospital, not receiving infection prevention (IP) and safety training in last 1 year, not use of safety containers regularly, not regularly applying universal precaution, presence of job-related stress, year of service, monthly salary and job dissatisfaction were statistically associated with blood/body fluid splash with p-value ≤0.05 at 95% confidence interval **(Table 11)**.

Following bivariate analysis, variables which were statistically related ($p < 0.25$) were entered for further multivariable analysis. The output of multivariable logistic regression found that Midwives professional were 12 times more likely to be exposed to blood/body fluid splash (AOR 11.89, 95% CI 1.25-112.7) than others (laboratory technicians, Nurses, Physician, and Health officers). The odds ratio was two times higher for those working in shift (AOR 2.36, 95% CI 1.034-5.4) than not. Participants who did not receive infection prevention and safety practice training were four times more likely to have blood/body fluid splash (AOR 4.27, 95% CI 1.94 - 9.41) than those who did receive training. Health care professionals who did not regularly apply universal precautions were 18 times more likely to have blood/body fluid splash (AOR 18, 95% CI 6.55 - 51.8) than those who regularly applied universal precautions. The odds of exposure to BBFs were two times increased for those who had job-related stress (AOR 2.18, 95% CI 1.07-4.49) than their counterpart. Respondents who had to get the average monthly salary of 5001-8000 Ethiopian birr were 70% less likely to be exposed to blood/body fluid splash (AOR 0.305, 95% CI 0.105 - 0.88) than those had gained more than 8000 Ethiopian birrs. Gender, marital status, working in a shift, presences of infection prevention committee in hospital, use of safety containers regularly, year of service, and job satisfaction were not statistically significant **(Table 11).**

Table 11 - Bivariate and multivariate logistic regression analysis of potential determinants for BBFs among health professionals of governmental hospitals in Addis Ababa, Ethiopia 2019.

Variables	BBFs		COR(95% CI)	AOR(95% CI)
	Yes=198	No=226		
Gender				
Male	163(84.8%)	95(42%)	6.4(4.1-10.1)***	
Female	35(15.2%)	131(58%)	Reference	
Marital status				
Married	50(25.3%)	121(53.5%)	Reference	
Unmarried	148(74.7%)	105(46.5%)	3.4(2.3-5.2)***	
Professional category				
Physician	59(29.8%)	49(21.7%)	3.8(1.4-10.3)**	
Nurses	108(54.5%)	139(61.5%)	2.46(0.95-6.37)	
Midwifes	22(11.1%)	9(4%)	7.7(2.3-25.7)***	**11.89(1.25-112.7)***
Health officer	3(1.5%)	10(4.4%)	0.95(0.195-4.6)	
Lab technicians	6(3%)	19(8.4%)	Reference	Reference
Did you worked in shift				
Yes	173(87.4%)	173(76.5%)	2.1(1.26-3.6)**	**2.36(1.034-5.4)***
No	25(12.6)	53(23.5%)	Reference	Reference
Work hours per week				
≥40 hours	158(79.8%)	80(35.4%)	7.2(4.6-11.2)***	
≤39 hours	40(20.2%)	146(64.6%)	Reference	
Presence of the IP committee in the hospital				
Yes	20(10.1%)	162(71.7%)	0.044(0.026-0.077)***	
No	178(89.9%)	64(28.3%)	Reference	
Receiving IP and safety training in the last year				
Yes	27(13.6%)	184(81.4%)	Reference	Reference
No	171(86.4%)	42(18.6%)	27.7(16.4-46.9)***	**4.27(1.94-9.41)*** **
Use of safety containers regularly				
Yes	16(8.1%)	171(75.6%)	Reference	
No	182(91.9%)	55(24.4%)	35.4(19.5-64.1)***	
Regularly applying universal precautions				
Yes	11(5.6%)	180(79.6%)	Reference	Reference
No	187(94.4%)	46(20.4%)	66.5(33.4-132.5)***	**18.43(6.55-51.8)*** **
Job-related stress				
Yes	151(76.3%)	44(19.5%)	13.3(8.4-21.1)***	**2.18(1.07-4.49)***
No	47(23.7%)	182(80.5%)	Reference	Reference
Year of service				
1-5 years	153(77.3%)	142(62.8%)	2.9(1.2-7.2)*	
6-10 years	38(19.2%)	65(28.8%)	1.6(0.6-4.1)	
≥ 10 years	7(3.5%)	19(8.4%)	Reference	
Monthly salary category				
≤5000 birr	88(44.4%)	77(34%)	1.26(0.74-2.2)	
5001-8000 birr	72(36.4%)	107(47.3%)	0.74(0.437-1.3)	**0.305(0.105-0.88)***
≥8001 birr	38(19.2%)	42(18.7%)	Reference	Reference
Job satisfaction				
Satisfied	46(23.2%)	132(58.4%)	Reference	
Dis satisfied	152(76.8%)	94(41.6%)	4.6(3-7.1)***	

*p≤0.05; **p≤0.01; ***p≤0.001; COR, crude odds ratio; AOR, adjusted odds ratio CI, confidence interval; BBFs, blood/body fluid splash; IP, infection prevention

6. Discussions

Occupational exposure to needlestick injuries, sharps injuries, and blood/body fluid splash are frequent among all health care professionals (11, 21, 24, 25, 34). Those exposures increase the chance of acquiring blood-borne diseases which are profoundly hidden problems of HCPs (2, 14, 15, 21, 25, 32). In this study, findings indicate that the prevalence of needlestick injuries among HCPs during previous one year was 33.3%, which was nearly in line with the studies reported in Germany, 31.4%(14) and Ethiopia (31-35%) (18, 37, 38). In contrast, findings from different studies, Ethiopia (17.2- 21.4%) (2, 17, 26), Kenya 19% (24) and Singapore 4.1% (22) revealed lower prevalence of NSI compared to our study. This inconsistency may be due to the difference in the study population, various work cultures and environment and variation in the availability of resources. In this study, the prevalence of NSI was higher in Nurse Professionals compared to Physicians, Midwifery, Health officers, and Laboratory Technicians. This finding is in agreement with studies, in Australia (20), Kenya (24), Bale Zone Ethiopia (30), the reason might, since Nurse HCPs are engaged more in patient care.

Among HCPs working in the study hospitals, the overall prevalence of sharps injuries was 21.2%. In contrast, in studies done in different parts of Ethiopia, the prevalence ranged from (13.5-19.1%) (2, 17, 30, 38) and, 10.9% of prevalence in Cameron Referral Hospital is relatively lower than this study (43). This variation could be explained by the fact that this study included only HCPs while the other studies have included non-medical staffs, with institutional, cultural and study period difference (20, 21).

Hundred and ninety-eight (46.7%) HCPs reported having been exposed to blood and body fluid splashes at least once in the past one year preceding the study. In this study, the prevalence of BBFs (46.7%) exposure is significantly higher than that of some findings in Eastern Ethiopia (20.2% and 36.1%) (17, 44) and 42% in Australia (20). The reason for this difference could be methodological differences and variation in study recall periods. In contrast, this proportion remains low compared to the 62.9% found in Gonder (19), and 56.3% in Tigray (2). A possible reason could be the knowledge gap and under-reporting in this study.

In this study, Exposures were most commonly reported from inpatient (36.4%) and emergency (35.3%). Similar to this study, in India, exposures were most widely reported from emergency ward (48.1%) (21).

A study in Singapore reported that majority of NSI cases occurred in the hospital wards (40%) (22). The rationale could be that in Emergency wards and situations, HCPs perform their duties in a hurry and stress to enhance quick patient care.

In this study, HCPs who had exposure to at least one of NSI, SI, or BBFs reported their exposure to responsible bodies were less than two-thirds (63%). The main reasons for not reporting might be due to low awareness of acquiring blood-borne pathogen, and time constraint (17)

In this study, male HCPs were three times more likely reported NSI (AOR 2.5 95% CI 1.2 - 5.4) than females, this is relatively in line with the study done in Northwest Ethiopia (AOR 10 95% CI 1.5 - 6.6) (38) and Nigeria (AOR 1.987, 95% CI 1.061–3.721) (34), where male HCPs were more likely to experience NSI than their female counterparts.

Health care professionals who were single in marital status were more likely to be exposed to NSI (AOR 2.6, 95% CI 1.3-5.3) and SI (AOR 3.97, 95% CI 1.86-8.47) than those who were ever married. However, a study in Debre Birhan showed that there was no association between marital status and occupation exposure to NSI and SI (26). The possible reason in this study could be that ever married were more responsible and mature.

In this study, midwifery professionals had twelve times more possible exposure of BBFs (AOR 11.89 95% CI 1.25-112.7) compared to Physicians, Nurses, Health officers, and Laboratory Technicians. The finding is in line with a study done in Debre Birhan (26), where the prevalence of BBFs was highest in midwifery professionals. In contrast, several studies (20, 24, 43) concluded that occupational exposure was most elevated among Nurse professionals. The more likely explanation should be the methodological differences, participants included in the study and notably the duration of the study.

In this study, HCPs who worked in shifts were twice more likely to be exposed to BBFs (AOR 2.36, 95% CI 1.034-5.4) than those who did not work in shift. This study is nearly similar to the research done in Germany (14), and Ondo state, Nigeria (34), where working in shift is a significant factor for occupational exposure. Since shift work has high clinical activity schedule, and with full of workload; as a result, there might be a high chance exposure to the injuries or body fluids.

Also, HCPs who worked long hours were more positively associated with the occurrence of needlestick injury (AOR 2.18, 95% CI 1.04-4.6) than those who worked less than forty hours. This is in line with a study done in Iran (23) and Mongolia (33). However, this result is not

consistent with the survey conducted in Gamogofa Zone (OR 0.6, 95% CI 0.3-1.1) (35). The reason for this difference could be variation in workload, or there might be higher patient flow in this study area.

On the other hand, in this study, those who knew the presences of infection prevention committee in hospitals were 73% less likely to sustain needle stick injury (AOR 0.27, 95% CI 0.1-0.74) than those who did not know about the presence of IP committee in their hospitals. A possible explanation could be that HCPs who knew the existence of IP committee in their institutions may follow universal precaution, and use available resources properly and assist themselves not to be exposed to injuries (14).

The result of the study indicates that lack of training on IP and safety practice in the last one year was significant determinant to needle stick injury (AOR 3.4, 95% CI 1.5-7.5), sharps injuries (AOR 3.02, 95% CI 1.17-7.73) and BBFs (AOR 4.27, 95% CI 1.94-9.41). Similarly, a study carried out in Debre Birhan revealed that the absence of onsite training on IP and safety practice was the main contributor to occupational exposure (26). According to a study done in Kenya (24), previous training on IP was protective.

This study found out that those who had not used safety containers regularly were three times more likely to experience NSI (AOR 3.4, 95% CI 1.134-10.25) compared to those who regularly used. A study done in Germany (14), confirms that the best way to protect against needle stick injury is the use of safety devices.

The most potential determinant associated with BBFs was not regularly applying universal precaution (AOR 18.43, 95% CI 6.55-51.8). This is consistent with study done in Mongolia (33), which revealed that those who did not adhere to universal precaution were more likely to incur occupational exposure. Additionally, a study done in Northwest Ethiopia (38) showed that those who follow universal precaution were 99% less likely to be exposed to occupational exposure (AOR 0.01 95% CI 0.002 - 0.1) compared to those who did not support universal precaution.

Moreover, respondents who had job-related stress were two times more likely to be exposed to NSI, SI and BBFs (AOR 2.23, 95% CI 1.14-4.35), (AOR 2.07, 95% CI 1.033-4.15) and (AOR 2.18, 95% CI 1.07-4.49) respectively than those who did not have. This is in agreement with the study done in Northwest Ethiopia (AOR 7.3, 95% CI 1.6, 33.2) (38).

This is a fact that those who had job-related stress could not focus on their jobs and may be predisposed to sustain NSI, SI or BBFs.

Health care professionals who earned monthly salary of ≤5000 ETB had the highest prevalence of SI (51.1%). Monthly salary of ≤5000 and 5001-8000 Ethiopian birr were statistically associated with SI (AOR 4.15, 95% CI 1.54 – 11.14) and (AOR 4.19, 95% CI 1.56 – 11.25) respectively, which is consistent with the study done in Bahr Dar (37).

On the other hand, respondents who earned monthly salary of 5000-8000 birr were 70% less likely to be exposed to BBFs (AOR 0.30, 95% CI 0.105-0.88) when compared to respondents who got the monthly salary of ≤5000 and >8000. Possibly maybe due to their dissatisfaction with their monthly salary, they might not be involved seriously in various hospital activities.

Health care professionals who were dissatisfied on their job were nearly three times more likely to sustain NSI and SI (AOR 2.85, 95% CI 1.4-5.8) and (AOR 2.36, 95% CI 1.11- 4.99) respectively compared to those who were satisfied on their job. Inversely, a study done in Bahir Dar found that HCWs who were satisfied on their job were three times more likely to incur needle stick and sharp injury (AOR 2.78, 95% CI 1.01-7.63) than those who were dissatisfied on their jobs (37).

7. Strength and limitation of the study

7.1 Strength of study

This study provides information about the burden of occupational exposure related to NSI, SI, and BBFs. High response rate and including of all HCPs who are supposed to have direct contact with patient adds to the strength of the study. Use of contextually adopted questionnaire could also be regarded among the strengths of the study. The study findings could serve as a baseline for future studies.

7.2 Limitation of study

Information related to needle stick, sharps injury, or blood/body fluid splash was obtained by asking the respondents to recall whether they had faced it in the last one year. This may incur recall bias that may underestimate the prevalence of NSI, SI, and BBFs.

Because of the cross-sectional study design used, the study could not answer the direction of causality between independent factors and NSI, SI, and BBFs.

All information were gathered by questionnaires, and because of resource and time shortage qualitative study could be limited.

8. Conclusion and recommendation

8.1 Conclusion

This study aimed to assess the burden of occupational exposure and associated potential determinants. The prevalence of needle injuries were 33.3%, sharps injuries 21.2%, and blood/body fluid splash were 46.7%. Participants age 25-29 were victims of NSI, SI, and BBFs compared to other age groups, and males were more affected than females. The study demonstrated that the highest prevalence of NSI, SI, and BBFs were among nurse professions.

The highest proportion of needlestick injury and sharps injuries among health care professional were related to 60.4% sudden patient movement and 83.3% during the working procedure, respectively. Half of the study participants did not have training on infection prevention and safety practice while more than half of study participants did not regularly apply universal precaution and did not use safety containers daily. Less than half of the study participants used protective barriers appropriately. Concerning report exposure, more than one third did not report their exposure.

The statistically significant potential factors for needle stick injuries, sharp injuries or blood/body fluid splash were gender, marital status, professional category, long working hours per week, lack of training on IP and safety training, not regularly applying universal precaution, not using safety containers daily, presence of job-related stress, dissatisfaction on job, working in shift and low monthly salary.

8.2 Recommendation

The following recommendations are forwarded to the Federal Ministry of Health Ethiopia, Addis Ababa City Administration, Hospital managers, and health care professionals.

- Reducing the working hour is advantageous to minimize occupational exposure of health care professionals through increasing the number of staff.
- Formal training on infection prevention by FMoH, Addis Ababa Health Bureau, and Hospital managers will be quite crucial.
- Health care professionals should have to apply universal precaution and safety practice at their workplace during every working procedure.
- Patient education and consent provision at work place before doing procedure to reduce occupational exposure to NSI due to sudden patient movement.

- Qualitative study is needed to determine the reason for unsafe practices, not apply universal precaution, and not report the exposure.
- Furthermore, the national level survey may be needed to determine the actual burden of needlestick and sharps injuries as well as splash exposure to blood and body fluids.

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10. Annexes

10.1. English Version questionnaire

Addis Ababa University, School of Public Health English version questionnaire

A questionnaire prepared to collect data on the prevalence and associated factors of needle stick, sharps injury, and blood/ body fluid splash among health professionals of governmental hospitals in Addis Ababa, Ethiopia, 2018.

Research information

Hello: Sir/Madam my name is …….I am a trained data collection facilitator for the research, in title prevalence and determinants of needle stick, sharps injury and blood/ body fluid splash among health professionals of governmental hospitals in Addis Ababa, Ethiopia, 2018. This study is being conducted by Getachew Adugna, who is studying for Master of Public Health in the Addis Ababa University. I am going to ask you questions, and you are randomly selected, and also your name will not appear on this questionnaire. All information you provide to me will be strictly confidential, you are not obliged to answer any questions that you don't want to answer, and you can put an end to this interview at any time if you wish to do so. Your participation in the study doesn't involve any direct risk or benefit for you, but it is very useful since your answer as well as those of other participants answer will help to improve the intended goal. Responding to the questionnaire will take you about 30 minutes. Filling the questionnaire will start when you express your will only, and participation is based on voluntarily.

We thank you in advance.

Consent form

I have read and understood the information provided to me. Therefore, my signature below indicates that I have decided to participate in the study voluntarily.

Participant's signature…… Date …….

Investigator's /data collector's signature ……..Date ……..

If you have any question, you can contact the principal investigator at any time using the following address.

Name of the principal investigator: Getachew Adugna

Mobile Phone number: 0910006600, E-mail getch1983@yahoo.com

Questionnaire for health care workers

Read the questions carefully and **circle** the number among the choices and **write an answer** to open questions in the space provided. You can select **one option**, select **more than one option**, or **give the word/words or numbers** according to the particular questions.

Name of the health institution _____

Date _____

Code no of the questionnaire_____

Instruction: circle or make a thick the one you choose from the alternatives from the right side options for the related questions which are placed on the left side.

Section one: Socio-demographic			**Skip to**
101	Age		
102	Gender	1 Male 2 Female	
103	What is your current marital status?	1. Married 2. Single 3. Separated 4. Divorced 5. Widowed	
104	Educational status	1. Diploma 2. Degree and above	
105	Profession	1. Physician (pediatrician, Internist, surgeon,oby/Gynecologist, others_____ 2. Nurse (diploma, B.Sc) 3. Midwife nurse (diploma, advanced diploma, B.Sc) 4. Health officer 5. Lab (diploma, degree)	
106	What is your average monthly salary?	_____ETB	

107	Year of service after graduation	_____-	
Section 2. Work-related history			
201	Did you work in shifts?	1. Yes 2. No	If No skip to 203
202	If yes to Q #201, which shift?	1. Day 2. Night	
203	On average, how many hours did you worked per week?	1. ≤39 hours 2. ≥40 hours	
204	Is there any infection prevention committee in your Hospital?	1. Yes 2. No	
205	Did you receive training on IP in the last one year?	1. Yes 2. No	
206	Do you use safety containers regularly?	1. Yes 2. No	
207	Do you regularly apply universal precautions?	1. Yes 2. No	
208	In the last one year have you had any needle stick injury?	1. Yes 2. No	If no skip to 212
209	If the answer is yes, what type of injury did you sustain? (two or more response is possible)	1. Deep injury 2. Slight skin penetration 3. Superficial injury 4. Other (specify) _____	
210	How many times did you sustain needle stick injury ?	_____time/s	
211	How did you sustain the injury? (two or more response is possible)	1. During recapping 2. By a sudden movement of a patient during injection	

		3. During needle collection 4. When needle showed up in unexpected places like bed sheets or other places 5.Other (specify)_____	
212	In the last year have you had any injury by sharps? (scissors, blade, etc...)	1. Yes 2. No	If no skip to 216
213	If the answer is yes, what type of injury you sustained? (two or more response possible)	1. Deep injury 2. Slight skin penetration 3. Superficial injury 4. Other (specify) _____	
214	How many times did you sustain sharps injuries?	_____time/s	
215	How did you sustain the injury? (two or more response is possible)	1. During the working procedure 2. During cleaning equipment 3. During sharp collection 4. When sharps show up in unexpected places, like bed sheets or other places 5. Other (specify) _____	
216	If you sustain needlestick injuries or sharps injuries, how was the health status of the source patient in relation to HIV/AIDS?	1. Known HIV/AIDS positive 2. Clinically suspected HIV/AIDS 3. Unknown status 4. Known HIV/AIDS negative 5. Other (specify) _____	
217	In last one year have you been exposed to any blood /body fluid? (Without sharps or needles).	1. Yes 2. No	If no skip to 221
218	What type of exposure (blood/body fluid) did you have? (two or more response is possible	1. Exposure of blood and body fluids to intact skin 2. Exposure of blood and body fluid to the mucous membrane of broken skin 3. Splash to the eyes	

		4. Splash to face and mouth	
219	How many times such exposure did you have?	_____time/s	
220	If you had blood and body fluid exposure how was the health status of the source patient in relation to HIV/AIDS	1. Known HIV/AIDs positive 2. Clinically suspected HIV/AIDS 3. Unknown status 4. Known HIV/AIDS negative 5. Other (specify) _____	
221	If you sustained needlestick/ sharp injuries or exposure of blood and body fluids have you ever reported the injuries to concerning bodies?	1.yes 2.no	
222	Where did the exposure occur?	1. Emergency 2. Inpatient 3. OPD 4. Injection and dressing 5. U5/Pediatric 6. Delivery 7. Family planning 8. EPI 9. IMNCI 10. ANC 11. eMTCT 12. VCT 13. ART 14. Laboratory unit 15. TB and Leprosy 16. Others, Specify_____	
223	Have you taken any action by yourself after the injury?	1. Yes 2. No	If no skip to 225

224	If yes to Q#223, What did you do immediately after the exposure? (circle that all apply)	1. Washing with soap and water 2. Wash with iodine or alcohol solution 3. Get tested for HIV 4. Take post-exposure prophylaxis (PEP) 5. Take tetanus anti-toxoid (TAT) 6. Squeezing to extract more blood 7. Applying pressure to stop bleeding 8. Other specify _____	
225	What is the most common disease that may be transmitted through contaminated needle and sharps? (two or more response is possible)	1.HIV/AIDS 2.HBV(hepatitis B virus) 3.HCV(hepatitis c virus) 4. I don't know 5. other_____	
226	How do you protect yourself and your patient from infections in the workplace? (two or more response is possible)	1. Proper hand washing. 2.appropriatly wearing gloves 3.wearing of eye goggles, masks, and shields 4.wearing gowns and aprons 5.other_____	
227	Have you ever had tested for HIV?	1.yes 2.no	
228	Have you ever had tested for HBV or HCV?	1.yes 2.no	
Section 3. Aseptic technique, using of protective barrier and infection prevention			
301	Do you wash your hands thoroughly before handling and putting on gloves?	1. Always 2. Sometimes 3. Never	
302	Do you wash your hand after handling objects that might be contaminated?	1.always 2.sometimes 3.never	

303	Do you wash your hand after contact with blood or mucous membrane?	1.always 2.sometimes 3.never	
304	Do you use antiseptic hand rub available before and after contact with each patient?	1.always 2.sometimes 3.never	
305	Do you use antiseptics (e.g., alcohol, savlon, iodine) to remove or kill microorganisms on the instrument or other items?	1.always 2.sometimes 3.never	
306	Do you use protective barriers appropriately?	1.always 2.sometimes 3.never	
307	Are you satisfied with your job?	1.Satisfied 2.dis satisfied	
308	Do you have job-related stress?	1.Yes 2.No	

That is the end of my questionnaire

Thank you very much for taking the time to answer the questions. I appreciate your help, and wish you the best!