

ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
DEPARTMENT OF MEDICAL LABORATORY SCIENCES



MAGNITUDE OF SHARP, BIOLOGICAL SPLASH EXPOSURE AND FACTORS ASSOCIATED AMONG MEDICAL LABORATORY PROFESSIONALS IN PUBLIC HOSPITALS IN ADDIS ABABA ETHIOPIA

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THIS IS TO CERTIFY THAT THE THESIS PREPARED BY DEMEME BEKELE ENTITLED:
A STUDY ON MAGNITUDE OF SHARP INJURY, BIOLOGICAL SPLASH
EXPOSURE AND FACTORS ASSOCIATED AMONG MEDICAL LABORATORY
PROFESSIONALS WORKING IN DDIS ABABA PUBLIC HOSPITALS ETHIOPIA

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List of Abbreviations /Acronyms

AA	Addis Ababa
BBFs	Blood and Body fluids
CHB	Chronic hepatitis B
CI	Confidence Interval
ETB	Ethiopian Birr
HBV	Hepatitis B Virus
HCV	Hepatitis C virus
HCWs	Health Care Workers
HIV	Human Immune Virus
ICN	International Council Nurse
NSI	Needle sticks injuries
NSSI	Needle Stick and Sharp Injuries
PEP	post exposure prophylaxis
PPE	Personal protective equipment
WHO	World Health Organization

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ABSTRACT

Background: Biological splash exposure and sharp injury are the common occupational health -related problems among healthcare workers.

Objective: The present study aimed to assess the magnitude of sharp injury, biological splash exposure and associated factors among medical laboratory professionals at public hospitals in Addis Ababa, Ethiopia.

Methods: Cross sectional study was conducted in 13 public hospitals found in Addis Ababa, from April 2020 to July 2020. Simple random sampling was used to select participants to respond for the developed structured questionnaire, related with magnitude of biological splash exposure and sharp injury, and associated risk factors. Data analysis was done by using SPSS version 20. The strength of association between dependent and independent variables were computed using an odds ratio with a 95% confidence interval and p value less than or equal to 0.05 was considered as statistically significant.

Results: The study was conducted on 294 medical laboratory professionals. The magnitude of sharp injury was 191(65%) and biological splash exposure was 212(72.1%). Sharp injury was 2.97 times more likely to happen among Medical laboratory professionals who had service 5 years and less as compared to those who had 6 years and above(AOR:2.97, 95% CI: 1.18-7.49); Working 40hour/week and below (AOR: 0.51, 95%CI: 0.28-0.92) 0.51 times less likely to be vulnerable to sharp injury as compared to those who were working 40 hours and above 6 ; marital status where being single were 0.48 times less likely to have sharp injury(AOR: 0.48, 95%CI: 0.26-0.90); absence of availability of adequate safety box were 1.95 times more likely to have sharp injury(AOR: 1.95, 95%CI: 1.03-3.69);moreover, attendance seminar or workshop training decrease the risk of sharp injury significantly (AOR: 0.46, 95%CI: 0.24-0.88). On the other hand, biological splash had significant association with: service year of 1-5years (AOR: 3.76, 95%CI: 1.39-10.17); working in comfortable work environment (AOR: 0.41, 95%CI: 0.20-0.85); and attending seminar or workshop training (AOR: 0.37, 95%CI: 0.18-0.75); 0.51 times less likely to biological splash.

Conclusion: The magnitude of sharp injury was 191(65%) and biological splash exposure was 212(72.1%).To decrease occurrence of these incidences, it is recommended to strengthened training, discipline in following safety guideline, supplying an adequate safety box and replacing before it is full, proper supervision, avoiding workload are highly recommended.

Keywords: Sharp injury, biological splash, medical laboratory, public hospital

INTRODUCTION

1.1. Background

Biological splash as well as sharp injuries are incidental risk the Healthcare workers (HCW) in a medical set affected by sharp devices also another associated aspect. The increased number of infection through blood borne pathogens over by job-related exposure to blood and other body fluids. An investigation estimates that needle-stick and sharps injuries harm about 3.5 million professionals on the global level. More than 8 million HCWs in the United States work in hospitals and other healthcare locations. Assessments show that 600,000 to 800,000 injuries occur annually. About half of these injuries go unreported (1, 2)

Mostly health care workers are exposed to a widespread range of targets. Among job-related hazards, needle stick, sharp injuries and others are exposed to blood or other body fluid at workplace founds a major risk of transmission of HIV. The infectious diseases found considered are also cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, and amniotic fluid (3, 4). Sharp injuries lead to wound from a needle, scalpel, or another sharp objects that might result the infectious diseases possibility transmitted by sharp injuries are regularly extensive and a significant source of illness and death (5).

The job-related disease exposure affects the quality of health care services delivered as well as professionals' safety and wellbeing. As a result, exposed workers developed fear; anxiety and emotional distress that hurts and affects mental health of professionals (6). According to World Health Organization reports, yearly several Health Care Workers (HCWs) face job-related exposure to blood-borne viruses. Among these health care professionals around 300,000 exposed to Human Immune Deficiency Virus {HIV}), 900,000 exposed to Hepatitis C virus {HCV}, and around 2, 000,000 health care workers exposed to Hepatitis B Virus {HBV}. And also 90% of the infections that effect from these exposures are in low income countries. The highest occurrences of job-related exposures reported in the underdeveloped countries like sub-Saharan Africa where high prevalence of HIV-infected patients in the world reported (7).

Health care workers (HCWs) are at risk by a sharp device and a needle stick injuries. The syringe needle existed responsible for the majority of incidental injuries. Moreover, a number of shifts per month stayed, heavy workload, and young age job-related hazard potentially leading to infection and blood-borne pathogens (8). The risk for job-related exposure to HIV has been well categorized in the

technologically advanced world, but there is incomplete information or information gap exists about transmission risk in resource-inhibited sets facing the major burden of HIV infection. Additionally, such exposures can cause incredible anxiety, fear and stress among healthcare workers that can have a negative effect on the professionals' and as well their families and colleagues (9)

1.2. Statement of the problem

A large number of the health care workers are exposed to blood borne pathogens by contaminated a needle stick and sharps injuries (NSSIs) in each year. The transmission of viral diseases via blood and body fluids by sharp injuries is assumed to be increasing while their spread through contamination agents decreased. It is a day to day medical hazard in health care professionals: physicians, nurses, midwives, public health workers, laboratory technicians, cleaners and the community. The problem is not only an individual's health, but also human resources, economic impact and social destruction (10, 11).

Health care workers are at risk of several infections in health care set of contacts. The exposure a sharp injury with human blood and body fluids leads them to blood borne infections where the country infrastructure health set up is poor (12). Accidental splash of blood and other body fluids can be transmitted into eyes, face or mouth and broken skin of HCWs. It is a critical problem in health care institutions (13). The body splash of exposure may possibly outcome happening severe health risks psychological suffering, chronic illnesses, in addition even death at the end. On the other hand, a significant risk happening in developing countries shiny the higher occurrence of chronic hepatitis B (CHB), inadequate contact towards HBV vaccination, post exposure prophylaxis (PEP) and a lack of compliance towards standard infection control safety measures (14).

A according to World Health Organization estimates 3 million percutaneous exposures occur yearly among 35 million healthcare workers; globally; over 90% occurring in underdeveloped countries arise the risk of sustaining an injury with a contaminated sharp object every year. Globally, it is valued that 1 in 10 healthcare workers, experience a sharp injury every year (9, 15). HIV transmission individual exists is a major risk happening at work place due to the serious significances that affected worker every year. In Nigeria, Tanzania also South Africa reporting 2.1 injuries for each healthcare personnel proceeding in average. Health-care workers in Africa who are suffering by needle-stick injuries 2-4 per year in average (16). Healthcare workers that are working in developing countries face predominantly by blood-borne pathogens because of the high prevalence in their communities as well as lack of basic personal protective equipment (15). This is mostly widespread in sub Saharan African countries because of low income and information gap among professionals. Even if the incidence exists a national guideline on infection prevention, little occurs identified around the risk of exposure plus protective actions (17). The risk used for possible exposure to BBF appears high happening HCWs, and even if incidents exist not reported. PCI raises toward every percutaneous damage caused by means of a needle sticks or other sharp instruments

contaminated with blood, tissue, or other body fluids that exist potentially infectious (18). The accidents needle sticks and sharp injury takings place through blood-taking activities and medical settlements regularly done, particular the objective people included all hospital health care personnel who had a high exposed to contact. Additionally, the amount of blood elaborates, and virus in the patient's blood next to the dated of contact (19).

Sub-Saharan countries in Africa have heavy burden of HIV/AIDS and other blood borne infectious diseases (20). Work-related exposure to blood through mouth, nose or eyes is a serious health concern among HCWs in developing countries. Public healthcare workers have serious social and economic consequence if not solved in time (21, 22) Health care workers in sub-Saharan Africa are at high risk of blood borne diseases. There is relatively poor vaccination, shortage of knowledge and inadequate standard-based practices to diminish the magnitude of the problem in developing countries because of serious socioeconomic challenges, (23).

According to the research conducted in Hawassa among health care workers, there are a high magnitude of the blood and body fluids (BBFs) splash to mouth, eyes or ears. Over one fifth (21%) of HCWs experienced BBFs exposure in a year before the study conducted, but around two-third (28 %)of HCWs experienced at least one splash exposure during their entire carrier (24). The report of the study done at hospitals in Addis Ababa on determinants of occupational exposure to blood borne and body fluids in 2017 shows that health care workers' injuries were 39.0% and 19.9% respectively in a year (25). The other research conducted in Dessie in 2018 revealed that the prevalence of needle sticks and sharp object injuries were 43% among nurses (26).

According to the study conducted in Bale zone in 2015 on factors associated with job-related needle stick and sharp injuries among hospital health care workers showed that, the prevalence of life time needle stick and sharp injury were 37.1% and 26.6%. Similarly, the research conducted in Dire Dawa among health care workers resulted (27, 28) respectively. Finally, the research conducted in Mekelle special zone workers who experienced standard precautions practice among health care workers in public health facilities most of them were exposed to sharp or needle stick injury 107(22.2 %) last year. (29).

The Ethiopian government is currently expanding health institutions in all parts of the country and as well several health professionals are employed in them to provide health care services. The health professionals working environment must be safe and free from occupational risk especially from sharp injuries and biological splash. The morbidity and mortality of healthcare workers related to occupational exposures like sharp injury and biological splash have negative impact on the workforce. As far as the researcher

knowledge, there is no research done that indicates the magnitude of the problem and its determinant factors among laboratory professionals in Public Hospitals in Addis Ababa. There are no studies done in this country among laboratory professionals. So there is an information gap on risk factors of sharp injuries magnitude and biological splash and immediate measurement taken after the injuries.

1.3 Significance of the study

This research is proposed to generate information on the magnitude of occupational sharp in-jury and biological splash, and action taken after injury and its risk factor among laboratory professionals.

As far as the knowledge of researcher is concerned, there are a limited number of studies on assessing the magnitude of sharp injury, biological splash exposure and associated factors among medical laboratory professionals. So this study has been contributing to filling the information gap in the concerned area of study.

Moreover, this study has been used as a baseline for the coming researcher who wants to conduct their study on the magnitude of sharp injury, biological splash exposure and associated factors among medical laboratory professionals.

Additionally, this study will help health minister to make conducive environment for health workers to participate on seminar and workshop training during clinical practices

2. LITERATURE REVIEW

2.1. Magnitude of sharp injuries

Worldwide around two million health care workers suffer from accidental needle stick injury in worldwide each year (30). The research in the United Kingdom displayed that at some stage throughout their career among health care workers about 29 % of a needle stick injuries reported (31). According to research conducted in German among 720 of health care workers, 31.4% of participants had at least one needle stick injury in one year. About 70.4% of needle stick injuries occurred when gloves were used. (32). Study done in general hospital in Sarajevo, Bosnia and Herzegovina showed that the total respondents 66.1% of needle stick injuries reported (19).and also the study done in, Southern Ethiopia, 2016, Egypt in 2009, Malaysia in 2005 and Al Asha region, Saudi Arabia in 2019 showed that 42.1 %, 74.57 % 24.6%, 48 % of sharp and needle stick injuries reported respectively among the health care worker (33,34, 35,36).

As the cross sectional study revealed in Tanzania in 2015 shows that out of the study participants who reported needle-stick injuries within one year, 65% of respondents mentioned incidents of needle-stick injuries alone. This prevalence was higher among female health care professionals, those who had work experience greater than five years and among those were not trained on infection prevention. Concerning the time of exposure greater than three fourth (92.55%) was occurred during the day time (37). The study conducted on the prevalence, factors associated with percutaneous injuries and splash exposures among health-care workers in a regional hospital in Kenya in 2010 among 305 of health professionals' risked majority of them happened females shows that 19% of the study participants had percutaneous injuries (38).

Study done, in Bahir-Dar Town showed that among the total participants 29 % of health care professionals exposed to needle stick injuries in one year (39). Another study conducted in Gandhi Memorial Hospital among 244 health care professionals showed that, 38.1% of the respondents reported needle stick injuries. As it was indicated in this study 54.84% of the sharp injuries exposure was superficial without bleeding, 35.48% been located moderate injuries with some bleeding and 9.68% were severe injuries with profuse bleeding (40).

2.2. Factors associated of sharp injuries

The systematic literature review on needle stick, injury and active safety-engineered devices for hypodermic injection show, previous studies in different countries have revealed that the prevalence of Needle Stick and Sharp Injuries (NSSIs) vary among HCWs. This type of injury can result in substantial health consequences such as psychological stress among different HCWs and their families. NSSIs incidents are associated with many different factors, including heavy workload, working in surgical or intensive care units, insufficient work experience and young age (41). Needle stick and sharp injuries usually cause some risks such as, bleeding, minor surface scratches and minor visible skin injuries; although the main risk transmission of viral infections scalpel-caused wounds need more attention in comparison with needle stick injuries (42)

The activities associated with the majority of NSI include withdrawing blood, recapping of needles, administering injections, inappropriate disposal of needles, and missing the target while attempting to transfer blood or other body fluids from syringes to specimen tubes or culture bottles. Following an NSI with infected blood, transmission of the 3 principal viruses, HIV, HCV and HBV occurs in 0.3, 3 and 30% of cases, respectively (43). Blood borne virus (BBV) are viruses that are passed in blood of various individuals and they are possible for causing severe disease in certain people and limited or no symptoms. For example, blood, semen, vaginal secretions. Blood borne virus found major job-related hazard for healthcare workers (HCW), mainly in extremely resource constrained in the country (44).

Needle stick injuries are a common event in the health-care environment and these injuries may not occur only with freshly contaminated sharps, but also with needles that carry dry blood (45). The most common causes of needle stick and sharp injury in various studies stayed high workload, working quickly, weakness and a crowded work environment, lack of reporting system and lack of post exposure prophylaxis. Similarly, it is caused by inadequate disposal, recapping and congested room, supported that despite the great attention given to the safe use of sharps, dangerous needles still find their way into the waste sacks instead of sharps bin (46).

The highest rates of sharp injuries and needle sticks occur during activities such as blood sampling, injections, intravenous (IV) catheter insertion, and disposal of contaminated needles, needle recapping and washing contaminated instruments, continue to occur the hand and leg (47). A cross sectional study conducted in India showed that, almost 80.1% of the needle stick injuries reported in one year was related to administering of injections (50% injecting a patient and 60 % putting up an intravenous line). These

procedures were followed by the process of disposing used needles, which caused about 60 % of the injuries. Recapping of used needles, cutting, especially during episiotomies, and cleaning after patient care were related to about 55% of the injuries each (48).

2.3. Magnitude of biological splash

The study done in General Hospital, China, 66.3 % per year and 7.5 per person per year in the past year, among health care workers exposure towards blood plus body fluids (18). Study has done in a general hospital in Sarajevo, Bosnia and Herzegovina the professionals' exposure to blood and body fluids result 63.3% (19). Study conducted in Tanzania in 2015 showed that among the total participants of the study , 27.4 % of them reported previous history of splash exposures alone while the remaining around 7.5% of the respondents mentioned having had splash exposures (37).According to cross sectional study carried out in Kenya on prevalence and factors associated with percutaneous injuries and splash exposures among health care workers in a provincial hospital shows among the respondents whereas 7.2% of reported splash to mucous membrane (38).

As the studies done in South Ethiopia, Awassa showed, the experience of at least one body Splash in one year were, 28% of among health-care workers and accidental body splash reported that sustained a common occupational hazard and a public health issue in health-care settings (24) Cross sectional study done in Bahir-Dar Town showed that among the total participants in the one year, 209 (65.9%) participants had been exposed to blood and body fluids and 45.7% of participants had been exposed to blood and body fluids (BBFs)in half year (39).

The study done in University of Gondar Hospital, Northwest Ethiopia 58.5% of the study participants had been exposed to body splash (4) Working in Public hospitals; southwest in Jimma zone Ethiopia, blood/body fluid exposure incidents were reported by 62.6 % of respondents (12). Among health care workers and medical students in University of Gondar Hospital, Northwest of Ethiopia. The one-year prevalence's of occupational exposure to blood and body fluids 62.9% (13).

2.4. Factors associated of biological splash

Splash or BBFs exposure might be the result in serious health risks like psychological distress, chronic diseases, and even death. Worldwide occupational exposure the blood and body fluids is a major health-care related problem (14, 49). Other studies done in North Gondar and Tanzania also shown that job-related exposure to blood through mouth, nose or eyes is a serious health issue among HCWs in developing

countries (21, 22). This exposure is more dangerous in those developing countries because, work-related blood- borne pathogens are more prevalent in low income countries of the world, specifically endemic in sub Saharan African countries. (23).

The study Gandhi Memorial Hospital showed, 34.4 % of the health care personnel indicated that they had been exposed toward biological splashes within one year. For those participating in the study, the blood and body fluids exposure mainly affected the hand 48(57.14%), followed by face 13 (15.48%), 10 neck and chest (11.9%) and 7 (8.33%) feet (40) .Blood contamination may be high risk if there has been direct contact with virus in the laboratory, or via a deep injury with bleeding; Middle risk from contact with contaminated medical devices plus contagious blood, skin exposition, or else conjunctiva injured through biological fluids; of low risk in cases of contact through a superficial injury without bleeding, or bites and injuries during the phase of healing. There is also an increased risk in cases of contamination of the entire skin. The biological equipment's, and patient's body fluids like blood, urine, feces, sputum, the skin and mucous membrane lesions as well as due to accidental injuries through contaminated objects (50).

Harmful transportation contamination of health care personnel during transfer of biological samples to the laboratory, dependent proceeding whether the shipment contains natural or genetically modified pathogens or infectious fluids. These tissues are submitted to particular packaging, labeling, and quantity restrictions as well as documentation requirements (51). Globally, high number of victims was not wearing gloves at the time of the exposure. No eye shield or face shield was worn during execution of procedures at the time splash exposures occurred in 84.1 % of cases (52). The studied were showed in health care institutions not only because of the high prevalence of such pathogens but also the risk of professional transmission of BBPs is also increased that materials of protective equipment were grossly inadequate and adherence to safety practices was poor. These were happened due to the reuse of non-sterile needles, capping needles, and the unregulated disposal of hazardous waste through excessive hold of contaminated materials (53)

2.5. Conceptual frame work

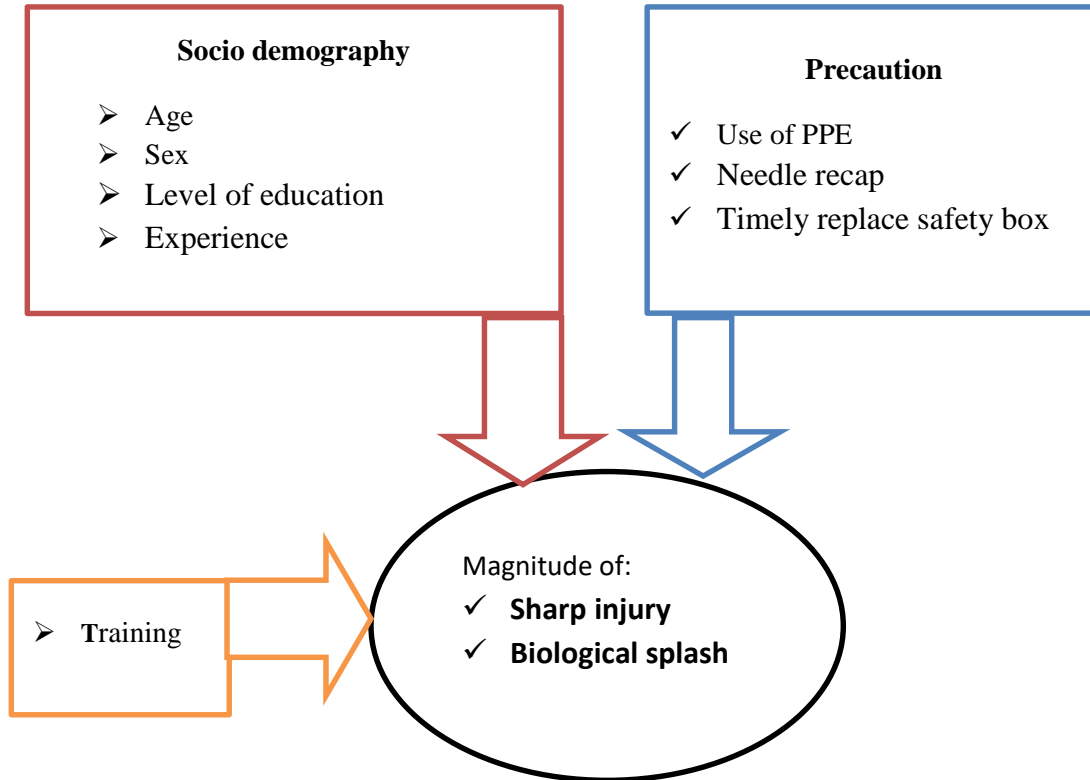


Figure 1 Conceptual frame work for assessment of magnitude of sharp injury, biological splash exposure and associated factors among medical laboratory professionals in Addis Ababa public hospitals, Ethiopia

3. OBJECTIVE OF THE STUDY

3.1 General objective

- To assess the magnitude of sharp injury, biological splash exposure and associated factors among medical laboratory professionals working in Addis Ababa public hospitals, Ethiopia from April 2020 to July 2020

3.2 Specific objective

1. To assess the magnitude of sharp injury among medical laboratory professionals working in Addis Ababa public hospitals.
2. To assess the magnitude of biological splash exposure among medical laboratory professionals working in Addis Ababa public hospitals,
3. To identify risk factors associated with sharp injury and biological splash exposure among medical laboratory professionals working in Addis Ababa public hospitals,

;

4. MATERIALS AND METHODS

4.1 Study Area

This study was conducted in Public Hospitals in Addis Ababa the capital city of Ethiopia. It is the largest city in Ethiopia, established in 1887 by emperor Menilik II. Addis Ababa city Ethiopia in 2021 population is estimated at 5,005,524(54). It has eleven sub-cities and 117 Woredas. In the city there are 13 public hospitals. Six hospitals are under Addis Ababa health bureau while 4 of them are under the Federal Ministry of health and 1 referral and teaching hospital is under Addis Ababa University (56). There are also two federal uniformed hospitals in the city. The first Ethiopian hospital was established in 1897 the name is Menelik Hospital. It was only during Emperor Menelik's time 1889-1913 that the first foreign-trained Ethiopian medical doctor, Zewditu Hospital is Ethiopia's leading hospital in the treatment of ART patients and currently treats over 6,000 each month. The largest HIV clinic in Ethiopia, with 14,000 patients, Yekatit 12 hospital the study was conducted in burn unit of Yekatit 12 Hospital, Addis Ababa. It has 9 departments and 6 units and has 265 beds. The burn unit has 19 beds, 12 of them for adults and 7 for pediatrics, Ras Desta Memorial Hospital in Addis Ababa, Gandhi Memorial hospital is a governmental hospital that specializes in maternity services. The hospital was established in 1954 EC and it has 383 staff including supportive staff, Alert specialized Leprosy research hospital in 1970 E.C established. And there are 240 beds including Dermatology, Ophthalmology, Surgical department and orthopedic work shop, Amanuel mental specialized hospital provides treatment on mental illnesses and related problems and mental health rehabilitation services. Amanuel Mental Hospital, in contrary, has over 270 beds for both women and men patients. St. Paul's Hospital Millennium Medical College in Addis Ababa is the second largest hospital in Ethiopia. The hospital has 350 beds sees an annual average of 300,000. The hospital has 1200 clinical and non-clinical staff; St. Peter's Hospital is one of the great tuberculosis hospitals in Africa. It has 400 beds and a wide range of acute care services, including an Accident & Emergency department. Federal Police Commission Referral Hospital is located in Addis Ababa, Trunesh Belijign hospital is one of a modern referral hospital named after the renowned Olympic gold medalist Tirunesh Dibaba here in the metropolis. Mayor of the Addis Ababa city, Tikur-Anbessa Specialized hospital is the largest referral hospital which is giving health services approximately 400,000 for patients in a year. has 800 beds with 169 specialists 65 non-teaching doctors and Torhailoch armed Forces General hospital existed give new name after 1974 revolution. Now the hospital has 718 beds including two wards such as medical and surgical ward etc.

4. 2. Study design and Period

A cross-sectional study design was conducted to assess the magnitude of sharp injury, biological splash exposure and associated factors among medical laboratory professionals working in Addis Ababa public hospitals, from April 2020 to July 2020.

4.3. Source population

All laboratory professionals who have been working at different public hospitals in Addis Ababa, Ethiopia

4.4. Study population

The study population was laboratory professionals who have been working in all public hospitals during the data collection period and fulfilling inclusion criteria.

4.5 Eligibility criteria

4.5.1 Inclusion criteria

- Laboratory professionals who were working in public hospitals and willing to participate in the study for 3 month
- Laboratory professionals who were available during the study
- Laboratory professionals who have six months or more experience in their profession.

4.6 Study variables

4.6.1. The dependent (main outcome variable) in this study is:

- Magnitude of Sharp injury
- Magnitude of Biological splashing exposure

4.6.2. The independent variables

- **Socio demography variable:** - Age, sex, level of education, work experience and marital status
- **Standard operating procedure related factors:** PPE uses, needle recapping, availability of safety box, appropriate use of safety box, availability of safety guideline, available reporting protocol for NSSI and biological splash in working place

- **Organizational factors:** working hour, availability safety officer, condition of working environment, occupational hazard or infection prevention training

4.7. Sample Size and Sampling Technique

4.7.1 Sample size determination

Sample size was determined by single population proportion method. To determine the initial sample size, the following assumption was considered: assuming 5% as marginal error (d), 95% confidence level ($\alpha = 0.05$). The study conducted on standard precautions practice among health care workers in public health facilities of Mekelle special zone, northern Ethiopia shows that, the magnitude of sharp and needle stick injury was 22.2% (29)

Considering these, the required sample size was calculated as:

$$n = \frac{\left(Z \frac{\alpha}{2}\right)^2 x P x (1 - P)}{d^2}$$

n = the required sample size

$Z_{(\alpha/2)}$ = the critical value at 95% level of significance from normal distribution = 1.96

P = magnitude of sharp injuries = 22.2%

d = marginal error = 0.05

$$n = \frac{1.96^2 x 0.222 x 0.778}{0.05^2} = 265$$

By considering 5% non-response rate, the final sample was $265 + 5\% * 265 = 278$

The second sample size for the splash was as follows: -

To determine the initial sample size for biological splashing exposure, the following assumption was made: assuming 5% as marginal error (d), 95% confidence level ($\alpha = 0.05$). The study conducted occupational exposure to blood and body fluids among health care professionals in Bahir Dar Town, shows that, about 141 (76%) study participants had been exposed to BBFs in their lifetime (39). Taking this assumption in to consideration the sample size by using single population proportion formulae was:

$$n = \frac{\left(Z \frac{\alpha}{2}\right)^2 x P x (1 - P)}{d^2}$$

Where,

n= sample size

$Z_{(\alpha/2)}$ = the critical value at 95% level of significance (1.96) from normal distribution

P= prevalence of blood and body fluid splash which was 0.76

d= marginal error = 0.05

$$n = \frac{1.96^2 \times 0.76 \times 0.24}{0.05^2} = 280$$

By considering 5% non-response rate, the final sample was $280 + 280 \times 5\% = 294$

By comparing the sample size of sharp injury and blood and body fluid, the maximum sample size was the one which was calculated for blood and body fluid. This maximum sample size can address both objectives.

Therefore, 294 was used for this study as final sample size

4.7.2 Sampling technique

Addis Ababa was selected using purposive sampling technique. And then the lists of all hospitals were obtained from Addis Ababa city health regional bureau, a Federal Uniformed Hospital, Federal Ministry of Health and Addis Ababa University Teaching Hospital. The study was conducted on Zedwuditu Memorial Hospital, Minlik Memorial Hospital, Ghandi Memorial Hospital, Ras Desta Damtew Memorial Hospital, Yekatit 12 Medical College Hospital, Terunesh-Beijing Hospital, Tikur Anbesa Specialized Teaching Hospital, Alert Hospital, Saint Paul Specialized Hospital, Amanuel Mental Specialized Hospital, Saint Peter Specialize Hospital, Police Republic Hospital and Torhailoch Hospital. The required sample size (294) was proportionally allocated to hospitals based on their population size. And the study participants from each hospital were selected by using simple random sampling method.

All Public Hospital of Addis Ababa=360 Laboratory Professionals													
Federal Ministry of health=4 hospitals				Federal uniformed hospitals=2 hospitals		AAUTH	Addis Ababa city health regional bureau=6 hospitals						
Amanuel	Pawlos	Saint Peter	Alert	Police	Torhayiloch	AAUTH	Minilik	Yekatit	Ghandi	Zewditu	Rasdesta	Tirunesh	
N=24	N=45	N=17	N=26	N=18	N=31	N=49	N=24	N=24	N=19	N=25	N=30	N=22	
Proportionally allocation of sample size based on population size of each hospital													
n=20	n=37	n=14	n=22	n=15	n=26	n=40	n=20	n=20	n=16	n=21	n=25	n=18	

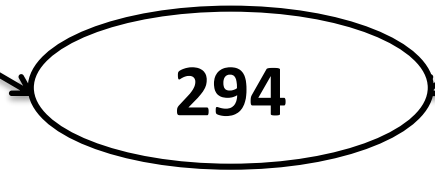


Figure 2 Schematic presentation of sampling procedure

4.8. Data collection procedures

Data was collected through developed by structured questionnaire which were adapted from different similar studies and the WHO / ICN tool kit injection safety and modified and prepared in English. The English version self-administered questionnaires were to collect the data using a. The tools contain information about socio demographic variable, laboratory standard operating procedure variable, organizational factors of the laboratory professionals, sharp injury and biological splash incidents variable. The questioner was pretested on 5% of the same source population other than the sample population in public hospitals. Based on the pre-test the questioner was revised, edited and modified. The data was collected by three laboratory professionals' and they were supervised by 1 laboratory professional. In addition, supervision during data collection was also done by principal investigator to see how data collectors were conducted. The completeness and consistency of the collected data was checked by supervisor and principal investigator on daily base.

4.9. Data quality assurance

In order to maintain the quality of the data an objective based, logically sequenced, free of scientific terms and a non-leading structured questionnaire was prepared. A pre-test was undertaken on the questionnaire in different areas that were not included in the final data before actual data collection started and amendments were made as necessary. Data collection and supervision is another area of focus to keep the quality of the data. The data collectors were trained. The data was checked by investigator daily for any incompleteness and/or inconsistency.

4.10 Data analysis

Data was analyzed by using Statistical Package for Social Science (SPSS) version 20. The frequency of variable was determined and descriptive finding were presented using tables and graphs. Crude odds ratio (COR) and adjusted odds ratio (AOR) were calculated. The strength of association between dependent and independent variables using odds ratio with 95% confidence interval (CI). All independent variables were tested whether they have a significant association with the outcome variable using binary logistic regression model.

4.11. Ethical considerations

Ethical clearance was obtained from Departmental Research and Ethical Review Committee (DRERC) of the department of medical laboratory science, Addis Ababa University and Addis Ababa health bureau. An information sheet was prepared for the eligible participants to obtain informed verbal consent. Participation was voluntary and every laboratory professional has the right to participate or refuse to participate in the study. On agreement of the participant, autonomy was insured by explaining the aims and objectives of the study after obtaining verbal consent from each participant by assuring confidentiality throughout the study period.

4.12. Dissemination of results

The result of this study will be presented to medical laboratory science department, Addis Ababa University as partial fulfilment of a master's degree. Furthermore, the result document will be disseminated and utilized by all responsible bodies in the study area. In addition, the findings will also be presented at annual conferences of professional societies. The manuscript will be submitted to peer-reviewed journals for publication.

4.13. Operational definition

Needle stick injuries: a percutaneous piercing wound typically set by a needle point, but possibly also by other sharp instruments or objects.

Body fluids: liquids from inside the bodies of living humans and play a vital role in our bodies

Percutaneous injury: when blood or body fluid splashes into the eyes, nose or mouth or broken skin.

Sharp injury: an exposure event occurring when any sharp object penetrates the skin. This term is interchangeable with "percutaneous injury."

Biological Splash: involves accidental spraying of blood and body fluid on to an exposed mucocutaneous surface

Hallow-bore needle: Needle (e.g.' hypodermic needle, phlebotomy needle) with a lumen though which material (E.g. blood) can flow.

5. RESULTS

5.1. Socio –demographic characteristics of study participants

A total 294 respondents were included in this study. The majority of the study participants 175 (59.5%) were under 30 years old. More than half, 169, (57.5%) of the respondents were male. Majority, 212 (72.1%) of the respondents were first-degree holder, and about 251 (85.4 %) of the respondents have 1-5 years of service. The majority of the study participants has been working more than 40 hours per week 201 (68.4%). With regard to marital status, more than half 156 (53.1%) were single. The details are depicted in table 1

Table 1 Socio –demographic characteristics of respondents in selected public hospital, Addis Ababa, 2021

Variables	Categories	Frequency	Percent
Age group	Under 30 years old	175	59.5
	30 years and above	119	40.5
Sex	Male	169	57.5
	Female	125	42.5
Level of education	Diploma	46	15.6
	Degree	212	72.1
	MSc	36	12.2
Years of service	≤ 5 years	251	85.4
	> 5 years	43	14.6
Working hours	> 40 hr.	201	68.4
	≤ 40 hr.	93	31.6
Marital status	Single	156	53.1
	Married	138	46.9

5.2. Magnitude of sharp injury and incidents in the work place

It was found that, majority, 191 (65%) of the respondents encountered sharp injury while at work. Furthermore, it was found that 148 (50.3 %) of the respondents had one times a sharp injury in the past 12 months. Those who experienced sharp injury 2 times are 37 (12.6%) of the total respondents and 3 or more times had experienced sharp injury 6 (2.1%)

Most injuries were encountered during the morning session, according to 100 (34%) of the respondents. Fifty (17%) of the respondents were encountered injury during the night shift; while 39(13.3%) had experienced an injury in the evening times.

The causes of injury were different. Mainly, 60 (20.4%) of the respondents attributed high patients' movement during when sample collection. Followed by two handed recap of needles 42(14.3%). Other causes such as device or equipment blood expose, handling of sample, when disposes a sharp devices and carelessness were identified to cause injury in 7.5% to 12.2% respondents.

The equipment that caused the sharp injury was a needle -hallow bore which was attributed by the majority 106 (36.1%) of the respondents. Other equipment was found to cause sharp injury by only at most 6.5% of the respondents each. The details are depicted in table 2.

Table 2 Magnitude of sharp injury and incidents among medical laboratory professional in Addis Ababa public hospitals, 2021 (n=294)

Variable	Category	Frequency	Percent
Sharp injury past 12 months	Yes	191	65.0
	No	103	35.0
Frequency of the exposure	One time	148	50.3
	Two times	37	12.6
	Three times	4	1.4
	Four and above	2	0.7
	Working shift time	Morning	100
	Evening	39	13.3
	Night	50	17.0
	Morning, Evening	2	0.7

	and Night		
Causes for sharp injury	High patients movement	60	20.4
	Two handed recapping	42	14.3
	Device or equipment	23	7.8
	Handling sample	36	12.2
	When dispose sharps	37	12.6
	Due to carelessness	22	7.5
	Due to other factors	20	6.8
Sharp instruments caused	No	103	35.0
	Needle -hallow bore	106	36.1
	Glasses item	18	6.1
	Scalpel blade	7	2.4
	Prick lancet	6	2.0
	Other	19	6.5
	Both needle-hallow and glasses	35	11.9

5.3. Magnitude of biological splash and incidents in the work place

This section describes the incidents of biological splash along with the magnitude and caused of injury. It was found that, 212 (72.1%) of the respondents encountered biological splash while at work., Where the relative majority 110(37.4%) had encountered one-time biological splash, while 18%, 11.6% and 5.1% of respondents respectively reported that they had twice, three times, four or above times biological splash, reported. For most of the respondents, 120(40.8%), the splash was encountered during morning session. And 18.4% encountered during the night session, while 12.2% of the respondents encountered splash in the evening session. Incidents to biological splash were during draw of blood sampling from skin (17%) or during emergencies (17%). Handling and pipetting blood samples also found to have caused biological splash according to 51(17.3%) of the respondents. Other considerable causes are excess clients (14.6%) and accidental splash by a colleague (15.6%). Lack of training was also attributed to biological splash as reported by 34(11.6%) of the respondents. During inserting needle in to skin, 10.2% of the respondents had encountered splash. The details are depicted in table 3.

Table 3 Magnitude of biological splash and incidents among medical laboratory professional in Addis Ababa public hospitals, 2021 (n=294).

Variable	Categories	Frequency	Percent
Biological splash	Yes	212	72.1
	No	82	27.9
Frequency of the exposure	One time	110	37.4
	Two times	53	18.0
	Three times	34	11.6
	Four times and above	15	5.1
Working shift time	Morning	120	40.8
	Evening	36	12.2
	Night	54	18.4
	Morning and evening	2	0.7
Cause of biological splash	During insert-needle in to the skin	30	10.2
	Shaking specimens	24	8.2
	Accidental splash by a colleagues	46	15.6
	When draw sample	50	17.0
	Excess clients	43	14.6
	Shortage of glove	9	3.1
	Emergency Situation	50	17.0
	Diagnosis sample	13	4.4
	Handling of sample	51	17.3
	Lack of training	34	11.6
	Other part(Centrifuging)	27	9.2

5.4. Laboratory standard operating procedure related factors

Different personal protective equipment was used in health facilities. It was found that glove was used by 265 (90.1) of the respondents: and usage of a gown was common among, 255 (86.7%) of the respondents. Usage of masks was adhered to by, 149(50.7%) of the respondents. Relatively few respondents, 50(17%) were using eye shield.

About 73.8 % of the respondents believed that there're adequate safety box available at the work place; while 26% respondents were found to respond to the lack of adequate safety box. The replacement to safety boxes was done while the boxes filled with 75% of their capacity. About 240(81.6 %) The replacement to safety boxes. Only 136 (46.3%) were found to recapped use needles. Concerning safety issues in the work place, about, 255 (86.7%) of respondents assured that their safety guideline is available at work place. In addition, 266 (90.5%) of the respondents ascertained that there are safety officers in the institution. Nearly two-thirds of the respondents believed that the availability of incidents or occurrence injury reporting protocol occur in the work place (67.7%) and comfortable work environment (65. 3%). Training on infection prevention was one of the factors that would minimize incidents of sharp injury and biological splash. A large majority of respondents, 207 (70.4%) responded that they had attended a seminar, training or workshop on infection prevention. The depicted in table 4.

Table 4 Laboratory standard operating procedure related factors among medical laboratory professional in Addis Ababa public hospitals, 2021 (n=294)

Variable	Category	Frequency	Percentage
Eyewear, Eye shield	Yes	50	17
	No	244	83
Glove	Yes	265	90.1
	No	29	9.9
Gown	Yes	255	87
	No	39	13.3
Mask	Yes	149	50.7
	No	145	49.3

Recapping needle	Yes	136	46.3
	No	158	53.7
Safety box available	Yes	217	73.8
	No	77	26.2
Time of replacing safety box	When it is full completely	44	15
	When it is full at 3/4 th	240	81.6
	When it is full at ½	10	3.4
Availability of safety guideline	Yes	255	86.7
	No	39	13.3
Reporting protocol	Yes	199	67.7
	No	95	32.3
Safety officer in the institution	Yes	266	90.5
	No	28	9.5
Comfortable work environment	Yes	192	65.3
	No	102	34.7
Training infection prevention	Yes	207	70.4
	No	87	29.6

5.5. Risks of biological splash exposure and sharp injury

The status of the source patient was mostly tested negative results for HIV, HBV and HCV. However, there were cases where the source patient was positive to HIV test result as reported by 3.4% of the respondents. Positive test results for HBV and HCV were encountered by 17 (5.8%) and 14 (4.8%) of the respondents, respectively. 184(62.6%) of the respondents wore gloves during the injury. The details are depicted in table 5

Table 5 Risks of biological splash exposure and sharp injury among medical laboratory professional in public hospitals Addis Ababa Ethiopia, 2021 (n=294)

Variable	Response	Frequency	Percent
Body part exposed (Eye)	Yes	54	18.4
	No	240	81.6
Body part exposed (Face)	Yes	67	22.8
	No	227	77.2
Body part exposed (Chest)	Yes	40	13.6
	No	254	86.4
Body part exposed (Hand)	Yes	128	43.5
	No	166	56.5
Body part exposed (Feet)	Yes	20	6.8
	No	273	92.9
Other exposed	Yes	2	0.7
	No	292	99.3
Follow the status of the source patient	Yes	123	41.8
	No	171	58.2
Sero -status of the source patient	HIV	10	3.4
	HBV	17	5.8
	HCV	14	4.8
	Other (Negative)	82	27.9
Have you worn gloves during the injury?	Yes	184	62.6
	No	110	37.4

5.6. Factors Associated with sharp injury

The current study shows that those who had service year of 1-5(AOR: 2.97, 95% CI: 1.18-7.49) were 2.97 times more likely to have sharp injury as compared to those who had 6 years and above. Similarly, education was also significantly associated with sharp injury. Having higher education was exposed to sharp injury due to the fact that, they participate in various activities related with needle stick or sharp devices. Moreover, those workers who were working 40hour/week and below (AOR: 0.51, 95%CI: 0.28-0.92) 0.51 times less likely to be vulnerable to sharp injury as compared to those who were working 40 hours and above. Being single was significantly (AOR: 0.48, 95%CI: 0.26-0.90) protective for sharp injury as compared to married due to different family responsibility the married one. Availability of reporting protocol have been significantly increase the risk of having sharp injury by 1.98 (AOR: 1.98, 95%CI: 1.04-3.76). obviously, if reporting protocol is available the chance of observing the risk of sharp injury is high. Absence of adequate safety box (AOR: 1.95, 95%CI: 1.03-3.69) increase the risk of sharp injury by 1.95. Moreover, attendance infection prevention training decrease the risk of sharp injury significantly (AOR: 0.46, 95%CI: 0.24-0.88). On the contrary age, sex, use of PPE during clinical practices, recapping needle after use, safety guideline availability and comfortable work environment were not significantly affecting the risk of having sharp injury (Table 6).

Table 6 Factors associated with having sharp injury among medical laboratory professionals in public hospitals in Addis Ababa, Ethiopia, 2021 (n=294)

Variables	Had sharp injury		COR(95% CI)	AOR(95% CI)	P
	Yes (%)	No (%)			
Age					
20-30 years old	111(58.1)	64(62.1)	0.85 (0.52-1.38)	0.67(0.35-1.28)	0.23
≥ 31 years old	80(41.9)	39(37.9)	1	1	
Sex					
Male	110(57.6)	59(57.3)	1.01(0.62-1.64)	0.97(0.55-1.73)	0.92
Female	81(42.4)	44(42.7)	1	1	
Education					
Diploma	34(17.8)	12(11.7)	0.81(0.29-2.26)	0.59(0.19-1.90)	0.38

Degree	129(67.5)	83(80.6)	0.44(0.19-1.02)	0.33(0.13-0.86)	0.02
Masters and above	28(14.7)	8(7.8)	1	1	
Service year					
1-5 years	169(88.5)	82(79.6)	1.97(1.02-3.78)	2.97(1.18-7.49)	0.02
≥ 6 years	22(11.5)	21(20.4)	1	1	
Working hours					
≤ 40 hours per Week	53(27.7)	40(38.8)	0.60(0.36-1.00)	0.51(0.28-0.92)	0.03
> 40 hours per Week	138(72.3)	63(61.2)	1	1	
Marital status					
Single	97(50.8)	59(57.3)	0.77(0.47-1.25)	0.48(0.26-0.90)	0.02
Married	94(49.2)	44(42.7)	1	1	
Not use of PPE during clinical practices					
Yes	177(92.7)	98(95.1)	0.65(0.23-1.84)	0.41(0.13-1.36)	0.14
No	14(7.3)	5(4.9)	1	1	
Do you recap needle after use?					
Yes	92(48.2)	44(42.7)	1.25(0.77-2.02)	1.19(0.67-2.13)	0.55
No	99(51.8)	59(57.3)	1	1	
Absence of safety box availability					
Yes	149(78.0)	68(66.0)	1.83(1.07-3.11)	1.95(1.03-3.69)	0.04
No	42(22.0)	35(34.0)	1	1	
Time to replace safety box					
When it is full completely	24(12.6)	20(19.4)	1.80(0.45-7.28)	1.65(0.30-8.98)	0.56
When it is full at 3/4 th	163(85.3)	77(74.8)	3.18(0.87-11.58)	3.58(0.73-17.60)	0.12
When it is full at 1/2	4(2.1)	6(5.8)	1	1	

Absence safety guideline availability					
Yes	173(90.6)	82(79.6)	2.46(1.24-4.87)	1.26(0.49-3.28)	0.63
No	18(9.4)	21(20.4)	1	1	
Reporting protocol availability					
Yes	141(73.8)	58(56.3)	2.19(1.32-3.63)	1.98(1.04-3.76)	0.04
No	50(26.2)	45(43.7)	1	1	
Absence of safety officer availability					
Yes	181(94.8)	85(82.5)	3.83(1.69-6.65)	3.51(1.33-9.31)	0.01
No	10(5.2)	18(17.5)	1	1	
Non comfortable work environment					
Yes	123(64.4)	69(67.0)	0.89(0.54-1.48)	0.65(0.34-1.25)	0.20
No	68(35.6)	34(33.0)	1	1	
Attendance seminar or workshop training					
Yes	127(66.5)	80(77.7)	0.57(0.33-0.99)	0.46(0.24-0.88)	0.02
No	64(33.5)	23(22.3)	1	1	
<hr/>					
Total	191(100)	103(100)			

5.7. Factors associated with having biological splashing

The current study shows that having higher service year was protective of biological splashing. Those who had service year of 1-5(AOR: 3.76, 95%95%CI: 1.39-10.17) were 3.76 times more likely to have biological splash as compared to those who had 6 years and above service year. Similarly, education was also another significant factor for biological splashing. Those who have degree (AOR: 0.18, 95% CI: 0.05-0.70) and diploma (AOR: 0.12, 95% CI: 0.03-0.53) were 0.18 and 0.12 times less likely to develop biological splash as compared to those who have masters. Masters education level was more vulnerable to biological splashing as compared to diploma and first degree. Moreover, working in comfortable work environment was significantly (AOR: 0.41, 95%CI: 0.20-0.85) decrease having biological splash by 59 %. Likewise, attending infection prevention training was significantly (AOR: 0.37, 95%CI: 0.18-0.75) decrease the risk of biological splash by 63%. Not using PPE during clinical practice 4.05 times increase the risk of biological splash (AOR: 4.05, 95%CI: 1.32-12.47). Absence of safety guideline (AOR: 3.11, 95%CI: 1.11-8.67) has been increase the risk of biological splash. But the current study shows that, age, sex, working hour, marital status, recapping needle after use, adequate safety box availability, time to replace safety box, time to replace safety box, reporting protocol availability and Safety Officer Availability were not significantly affecting the risk of having biological splashing. (Table 7)

Table 7 Factors associated with having biological splashing among medical laboratory professional public hospitals in Addis Ababa Ethiopia, 2021 (n=294)

Variable	Had biological splashing		COR(95% CI)	AOR(95% CI)	P
	Yes (%)	No (%)			
Age					
20-30 years old	120(56.6)	55(67.1)	0.64(0.38-1.10)	0.59(0.29-1.21)	0.15
≥ 31 years old	92(43.4)	27(32.9)	1	1	
Sex					
Male	123(58.0)	46(56.1)	1.08(0.65-1.81)	1.07(0.58-1.98)	0.82
Female	89(42.0)	36(43.9)	1	1	
Education					
Diploma	31(14.6)	15(18.3)	0.19(0.05-0.71)	0.12(0.03-0.53)	0.01
Degree	148(69.8)	64(78.0)	0.21(0.06-0.71)	0.18(0.05-0.70)	0.01
Masters and above	33(15.6)	3(3.7)	1	1	

Service year					
1-5 years	185(87.3)	66(80.5)	1.66(0.84-3.28)	3.76(1.39-10.17)	0.01
≥ 6 years	27(12.7)	16(19.5)	1	1	
Working hours					
≤ 40 hours per Week	61(28.8)	32(39.0)	0.63(0.37-1.08)	0.61(0.33-1.13)	0.12
> 40 hours per Week	151(71.2)	50(61.0)	1	1	
Marital status					
Single	109(51.4)	47(57.3)	0.79(0.47-1.32)	0.54(0.27-1.07)	0.08
Married	103(48.6)	35(42.7)	1	1	
Not ,use of PPE during clinical practices					
Yes	203(95.8)	72(87.8)	3.13(1.22-8.02)	4.05(1.32-12.47)	0.02
No	9(4.2)	10(12.2)	1	1	
Do you recap needle after use?					
Yes	101(47.6)	35(42.7)	1.22(0.73-2.04)	1.47(0.79-2.76)	0.23
No	111(52.4)	47(57.3)	1	1	
Absence of safety box availability					
Yes	156(73.6)	61(74.4)	0.96(0.54-1.72)	0.72(0.35-1.51)	0.39
No	56(26.4)	21(25.6)	1	1	
Time to replace safety box					
When it is full completely	33(15.6)	11(13.4)	0.75(0.14-4.08)	0.39(0.05-3.21)	0.38
When it is full at 3/4	171(80.7)	69(84.1)	0.62(0.13-2.99)	0.28(0.04-2.05)	0.21
When it is full at ½	8(3.8)	2(2.4)	1	1	

Absence guideline availability					
Yes	191(90.1)	64(78.0)	2.56(1.28-5.10)	3.11(1.11-8.67)	0.03
No	21(9.9)	18(22.0)	1	1	
Absence of Reporting protocol					
Yes	148(69.8)	51(62.2)	1.41(0.82-2.40)	1.48(0.73-3.01)	0.28
No	64(30.2)	31(37.8)	1	1	
Absence of safety officer					
Yes	199(93.9)	67(81.7)	3.43(1.55-7.57)	2.14(0.81-5.68)	0.13
No	13(6.1)	15(18.3)	1	1	
Non comfortable work environment					
Yes	132(62.3)	60(73.2)	0.61(0.34-1.06)	0.41(0.20-0.85)	0.02
No	80(37.7)	22(26.8)	1	1	
No attendance infectionprevention training					
Yes	140(66.0)	67(81.7)	0.44(0.23-0.82)	0.37(0.18-0.75)	0.01
No	72(34.0)	15(18.3)	1	1	
Total	212(100)	82(100)			

6. DISCUSSIONS

The result shows that the magnitude of sharp injury was 191(65%). Which is comparable with similar studies have done at tertiary care hospital in north-western Tanzania shows that the needle-stick injuries rate revealed 65 %. (37). On the other hand, this study is not supported by study done in Bahir Dar Town, which showed 29.0 % and Gandhi Memorial hospital 38.1% health care professionals were exposed to needle stick injuries (39, 40). The possible explanation for this may be varying having different level of health education and different in sample size.

However, it is not comparable with study done in many other aspects. For example, in this study, the magnitude of sharp injury is higher than a study conducted in Kenya, indicated that 19% of the study participants had percutaneous injuries (38). Al Asha region, Saudi Arabia 48 % of sharp and needle stick injuries reported among the health care worker (36). This may be due to the difference of study area and also the safety related procedures in Kenya and Saudi Arabia may good as compared to Ethiopia.

However, the magnitude of sharp injury was lower than other studies done in, Egypt, was indicated that the reported needle stick and sharp injuries among the health care workers were 74.57 % and among health care workers in General Hospital Sarajevo, Bosnia and Herzegovina the total result needle stick injuries 66.1% of respectively (34, 19). This difference may be due to conducting the study in health facility located in other country area and this difference may be due to the difference of health education level as compared to the current study.

In this study, the magnitude of biological splash was 72.1%. However, this study is not supported by other stud conducted. This may be probably due to smaller number of patients served at study area other hospital and. As the number patients per hospital increase per hospital the chance of facing biological splash will be high.

In the current study, the magnitude of biological splash is higher than a study conducted in Hwassa indicated that 28 % of the study participants had body-splash and in Sarajevo, Bosnia and Herzegovina hospital through their occupation health care worker re-ported result experiences to blood and body fluids were 63.3%. Study done in Bahir-Dar Town among the total participant's result showed that, 65.9% in 2014. The General Hospital, in China professional work risk result showed that, 66.3 %, of the perspective (24, 19, 39 and 18). Participants had been exposed to blood and body fluids this may be due to the difference of study area and safety related procedures.

However, the magnitude of biological splash was lower than other study done in South West of Ethiopia indicated that the reported blood and body fluid among the health care workers were 74% of (49). This difference may be due to conducting the study in health facility located area.

Factors were assessed with occurrence of sharp injury and significantly associated variables were selected. The current study shows that; professional experience (service years) was a significant factor for having a sharp injury.

Having more experience service years was protective factor from sharp injury. Having higher service year was protective from sharp injury. Those who had service years of 1-5 service years were 2.97 times more likely to have sharp injury as compared to those who had 6 years and above service year. Similarly, other studies in north-western Tanzania, Gandhi Memorial Hospital, and Tigray, northern Ethiopia also indicated that years of experience (more service years) has significantly decreasing the chance of experiencing sharp injuries (37, 40, and 45).

Similarly, education was also significantly associated with sharp injury in Iran, Gandhi Memorial Hospital and Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia (8, 40, and 54). Moreover, those workers who were working 40hour/week and below times less likely to be vulnerable to sharp injury as compared to those who were working 40 hours and above. Similar finding was also reported by the study in Dire.Dawa, Gandhi Memorial Hospital and Tigray, northern Ethiopia which was conducted by (28, 40, and 45)

Being single was significantly protective for sharp injury as compared to married in Jimma University Ethiopia (12). Availability of reporting protocol have been significantly increase the risk of having sharp injury by 1.98. obviously, if reporting protocol is available the chance of observing the risk of sharp injury is high. Moreover, attendance seminar or workshop training will decrease the risk of sharp injury significantly. Similar finding was also reported by the studies in Ethiopia regional hospitals, Iran and southwest Ethiopia which was conducted by (5, 8, and 12). Similarly, Absence of adequate safety box, was also significantly associated with sharp injury. On the contrary age, sex, use of PPE during clinical practices, recapping needle after use, safety guideline availability and comfortable work environment were not significantly affecting the risk of having sharp injury

Factors were assessed with occurrence of biological splashing and significantly associated variables were selected. The current study showed that; professional experience (service years) was a significant factor

for reducing biological splashing. Having more years of service decreased the occurrence of biological splashing.

In the current study participants who had service year of 1-5 were 3.76 times more likely to have biological splash as compared to those who had 6 years and above service year, which is supported by similar studies conducted in Kenya, Bahir-Dar, Mizan-Tepi, and Nigeria (38, 39, 49, and 53). In the current study age was insignificantly associated with experiencing biological splashing. In line with the current study, others study also indicated that, experiencing biological splashing was not affected by age in Kaduna State, Nigeria (53) similarly, education was also another significant factor for biological splashing and this result was in line with other study done in Ganadhi and Mizan Tepi (40,49) Moreover, working in comfortable work environment was significantly decrease having biological splash. Another study done in Southwest, South Ethiopia, Gondar hospital and Bahir-Dar also reported that attending seminar workshop or a professional training have been significantly reducing the chance of having biological splashing, (12, 13 and38)

But the current study shows that, age, sex, working hour, marital status, recapping needle after use, adequate safety box availability, time to replace safety box, time to replace safety box, reporting protocol availability and Safety Officer Availability were not significantly affecting the risk of having biological splashing.

7. LIMITATION OF THE STUDY

Since there is no similar study conducted in the area medical laboratory professionals it can contribute a lot as baseline information for future studies.

The study was conducted in public Hospitals in Addis Ababa because of, budget and healthy status constraint the current study focuses only on public hospitals of Addis Ababa Medical laboratory professionals.

The study would have been more comprehensive and general, if more medical laboratory professionals had been included from other regional town's hospitals.

But this could not be done because of shortage of and budget healthy status. Most of the participants were felt positive regarding some questions and were described the problem they were involving in their work area.

8. CONCLUSIONS AND RECOMMENDATION

8.1. Conclusions

In the current study, the magnitude of sharp injury was 191(65%).Whereas; the magnitude of biological splashing was 212(72.1%). The years of professional experience (service years) were a significant factor for both reducing having sharp injury and biological splash. Moreover, attending at professional seminar workshop or training will significant factor for both decrease having the risk of sharp injury and biological splash. Similarly, level of increase education was also significantly associated with both sharp injury and biological splash. Moreover, those who were working 40hour/week and less were less likely to have sharp injury as compared to those who have been working more than 40hours/week. Being single was less likely to have a sharp injury as compared to married. Availability of reporting protocol have been significantly increase the risk of having sharp injury, obviously, if reporting protocol is available the chance of observing the risk of sharp injury is high. Moreover, working in comfortable work environment will significantly decrease having biological splash.

8.2. Recommendations

- Creating comfortable work environment changing infrastructure for workers to decrease the risk of biological splashing exposure
- There are high rates of work-related injuries among medical laboratory professionals in order to minimize risk and occurrence of injury, all levels of the health institutions and regulatory bodies, especially the Ministry of Health must pay attention to these remedies.
- There must be an effort to eliminate needle-bearing devices where safe and effective alternatives are available. The development, evaluation, and use of needle devices with safety features should be considered.
- Medical laboratory professionals should be trained, filling the gap of work experience sensitized and updated on issues related to infection prevention and occupational risk reduction.
- In hospitals, a reasonable workload on individuals will reduce occupational hazard exposure. This can be addressed by increasing the number of staff at each of the health institutions.
- Funding of further large-scale research is necessary to determine a more precise picture of the incidence of needle-stick and sharp injury as well as splash exposure to blood and body fluids in the health workers.
- The hospital should establish surveillance system for registering, reporting and management of occupational injuries and exposure

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ANNEXES

Annex I: English Version Information Sheet and Consent Form

English version information sheet and consent form for the questionnaire developed for the assessment of magnitude of sharp injury, biological splash exposure and association factors among medical laboratory professionals in public hospital, Addis Ababa Ethiopia

A. Information Sheet

Greeting:

Hello, how are you?

My name is _____. I am data collector on behalf of a Masters Student in Addis Ababa University, Master of Laboratory, who wants to conduct this survey

The objective of the study: - is to assess the magnitude of sharp injury, biological splash exposure and associated factors among medical laboratory professionals in public hospital, which will be important to improve the health service delivery. Your cooperation and willingness for the interview is very helpful in identifying the problems related to the issue. Your name will not be written in the form and I am sure you that all information that you give will be kept strictly confidential. Your participation is voluntary. If you are not still comfortable with filling out the questionnaire, please be free to stop any time you like. Filling out the forms will take only 10 minutes. Would you like to continue?

1. If yes, Name of data collector_____ Signature_____
2. If not, skip to the other participant
3. If you need more information and if you have question here is the contact address of the investigator Demem Bekele Tel: +251912102645, e-mail: demem_bekele@yahoo.com

Annex II Questioner

Instruction: circle the response for questions with alternatives and write for open ended questions on the space provided

Part 1 the socio demographic characteristics of the study population among medical laboratory professionals' public hospital in Addis Ababa Ethiopia (n=294, 2021)

S. No	Questions	Alternative/choice of response	Skip
101	Working intuition		
102	Age of respondent?(in complete years)	
103	Sex of the respondent?	1. Male 2. Female	
104	What is the highest level of your education?	1. Diploma 2. Degree 3. Masters 4. Other (specify) -----	
105	What is total year of service in your current profession?	-----	
106	How many times do you work per week?	1. ≤ 40 hours per Week 2. > 40 hours per Week	
107	What is your marital status?	1. Single 2. Married 3. Divorced 4. Separated 5. Widowed 6. Cohabiting (living together)	

Part II: The standard operating procedure related factors of the study population among medical laboratory professional public hospitals in Addis Ababa Ethiopia (n=294, 2021)

S. No	Questions	Alternative/choice of response	Skip
201	Do you use appropriate personal protective equipment during clinical practices?	1. Eyewear/ Eye shield/ goggle 2. Glove 3. Gown 4. Mask	
202	Do you recap needle after use?	1.Yes 2.No	
203	Is there adequate safety box available at your work place?	1.Yes 2.No	
204	At what time do you replace safety box?	1. When it is full completely 2. When it is full at 3/4 th 3. When it is full at 1/2	
205	Is there safety guideline available at your work place?	1.Yes 2.No	
206	Is there available reporting protocol for incidents or injuries in the work place?	1.Yes 2.No	
207	Have you safety officer in your institution?	1.Yes 2.No	
208	Is there comfortable working environment or set up at your work place	1.Yes 2.No	
209	Have you ever attended any seminar Seminar workshop in infection prevention? or training infection prevention?	1.Yes 2. No	

Part III: Magnitude of sharp injury, biological splash and incident among medical laboratory professional public hospitals in Addis Ababa Ethiopia (n=294, 2021)

S.N	Questions	Alternative/choice of response	Skip
301	Have you ever had sharp injury in the past 12 months?	<ol style="list-style-type: none"> 1. Yes 2. No 	If no jump to Q...
302	If your answer is yes for question number 301, How many times had exposed you?	<ol style="list-style-type: none"> 1. One time 2. Two times 3. Three times 4. Four and Above 	
303	Which working shift time have exposed you more by a sharp injury?	<ol style="list-style-type: none"> 1. Morning 2. Evening (afternoon) 3. Night 	
304	How did a sharp injury occurred?	<ol style="list-style-type: none"> 1. High patients' movement around the sample collection area 2. Two handed recapping needle 3. Assembling device or equipment expose 4. When handling of sample 5. Unsafe sample collection and dispose a sharp waste 6. Carelessness/negligence 7. Others ----- 	
305	What type of a sharp instruments caused the injury?	<ol style="list-style-type: none"> 1. Needle-hallow bore 2. Glasses item 3. Scalpel blade 4. Pricing lancet 	

		5. Other part -----	
306	Have you ever had body splashing of fluid/blood in the past 12 months?	<ol style="list-style-type: none"> 1. Yes 2. No 	If no jump to Q... ...
307	If your answer is yes for question number 306 How many times had exposed you?	<ol style="list-style-type: none"> 1. One times 2. Two times 3. Three 4.Foure and above times 	
308	Which working time shift have exposed you by the blood or body fluids?	<ol style="list-style-type: none"> 1. Morning 2. Evening (afternoon) 3. Night 	
309	If your answer is yes for question number 306, How did the splash exposure occurred (the procedure lead to exposure)?	<ol style="list-style-type: none"> 1. During insert needle in to the skin 2. Shaking or mixing specimen with the specimen bottle 3. Accidental splash by a colleague 4. When draw the sample 5. Excess clients around sample collection area 6. Shortage of glove 7. Emergency Situation 8. After draw sample and when diagnosis time 9. When handling of samples 10. Lack of the training 11.Otherpart ----- 	
310	Which body part is exposed by blood and body fluid?	<ol style="list-style-type: none"> 1. Eye 2. Face 3. Neck and chest 	

		<ul style="list-style-type: none"> 4. Hand 5. Feet 6. Other part----- 	
311	Did you follow the status of the source patient?	<ul style="list-style-type: none"> 1. Yes 2. No 	
312	If yes, what was the sero- status of the source patient?	<ul style="list-style-type: none"> 1. HIV sero +ve 2. HCV sero +ve 3. HBV sero +ve 4. Other (mention) 	
313	Have you worn gloves during the injury?	<ul style="list-style-type: none"> 1. Yes 2.No 	

Annex III Declaration

The undersigned declares that this thesis complies with the regulations of the University and meets the accepted standards with respect to originality and quality. PI also agrees to accept responsibility for the scientific ethical and technical conduct of the research and for provision of required progress reports.

Demem Bekele (B.Sc.)

Signature: _____

Date of submission: _____

This thesis has been submitted with our approval as advisors.

Advisor: Fatuma Hassen (MPH, PhD candidate)

Signature: _____

Date: _____

Place: Addis Ababa, Ethiopia.

Advisor: Abay Sisay (MSc, PhD candidate)

Signature: _____

Date: _____

Place: Addis Ababa, Ethiopia.

