

Needlestick and Sharps Injuries Among Healthcare Workers at a Tertiary Care Hospital: A Retrospective Single-Center Study

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Background: Healthcare workers are still at risk from needlesticks and sharps injuries, which can expose them to blood-borne diseases like hepatitis B, hepatitis C, and HIV. We aimed to investigate the proportion of needlesticks and sharps injuries among healthcare workers in a tertiary care hospital in Somalia and also evaluate associated risk factors.

Materials and Methods: This retrospective study was conducted at the Mogadishu Somalia Turkey Recep Tayyip Erdogan Training and Research Hospital. The data was retrieved from the hospital record of the infection prevention and control department over a six-year period between 2017 and 2022.

Results: There were a total of 233 needlestick and sharps injury incidents. The highest number of needlestick and sharps injury cases were reported among nurses (52.4%), followed by cleaners (22.3%), physicians (18.5%), and technicians (6.9%) during the six-year period. Operation theaters were the most frequent place (21.9%) where injuries happened, followed by inpatient care (17.6%) and emergency rooms (16.7%). The most commonly reported instrument that resulted in injuries was a hypodermic needle (81.1%). About 24.9% of the needles or sharps devices that caused needlestick and sharps injury cases were contaminated with hepatitis B. There was a significant difference between gender and place of injury for needlestick and sharps injuries ($P=0.001$).

Conclusion: Healthcare professionals around the world continue to face major health risks from needle stick and sharps injuries. The present study found that 8.6% of healthcare workers sustained a needle stick and sharps injuries incident in the past year. According to our findings, healthcare institutions need to regularly teach healthcare professionals, especially nurses and cleaners about the significance of needle stick and sharps injuries.

Keywords: needle stick, sharps injuries, healthcare workers, occupational hazards, Somalia

Introduction

Needlestick and sharps injuries (NSSI) are major occupational hazards that are commonly associated with healthcare workers' (HCWs) practice standards.¹ More than 20 different types of bloodborne pathogens can be transmitted as a result of NSSIs. Despite the existence of efficient therapies, the likelihood of contracting human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV) can cause HCWs to experience psychological distress such as anxiety, depression, and post-traumatic stress disorder, as well as a reduction in quality of life. HIV, HCV and HBV transmission rates after transcutaneous injury are estimated to be 0.2%, 1.8%, and 30%, respectively, and only HBV infection is preventable through vaccination.^{2,3} Even though preventive measures, including enhanced equipment design and personnel training were applied, sharps injuries continued to occur at every stage of sharps device utilization,

disassembly or discarding. According to the United States Occupational Health and Safety Administration (OSHA), 5.6 million HCWs are at risk of occupational exposure to various blood-borne pathogens as a result of NSSIs.⁴ Globally, approximately three million HCWs are exposed annually to blood-borne pathogens via NSI, two million of whom get HBV, 0.9 million contract HCV, and 170,000 develop HIV, according to the World Health Organization. Developing countries account for more than 90% of these infections.⁵ Despite the fact that the vast majority of NSSIs occur in developing countries, NSSIs are still reported in developed countries, suggesting that NSSIs may be a global issue. Indeed, despite the use of advanced prevention measures such as real-time injury monitoring systems combined with standard operating protocols in developed countries, NSSIs continue to occur.^{6,7} The prevalence of NSSIs is lower in developed countries than in developing countries.¹ In sub-Saharan Africa, where each HCW suffers several injuries a year, they still face challenges due to restricted resources and infrastructure, insufficient personal protective equipment (PPE), and overwork, which contribute to a high number of NSSIs in the region.⁸ According to one study, there were 32.0% of NSSI cases among HCWs in sub-Saharan Africa in 2013.⁹ NSSIs can occur through a variety of exposure pathways; for instance, in northern Uganda, 5.1% of HIV exposure was linked to the use of sharps objects,¹⁰ and 57% of nurses and midwives reported having had at least one needlestick injury annually.¹¹ According to a research conducted at the Rift Valley Provincial Hospital in Kenya, (19%) of HCWs said they had percutaneous injuries, (7.2%) had mucosal membrane splashes, and (25%) had contact with blood and other bodily fluids in the previous 12 months. Nurses reported a high incidence of percutaneous injuries during stitching 30% and in the obstetric and gynecologic department 22%.¹² HIV and HBV infections are serious health risks for people around the world, but they are especially problematic in undeveloped countries. The risk of occupational BBI for HCWs in low- and middle-income countries is high due to overcrowded hospitals, high patient loads per HCW, limited risk awareness, insufficient PPE, a lack of sharps containers, limited understanding and use of post-exposure prophylaxis (PEP), low adherence to universal precautions (UP), a high prevalence of bloodborne viral infections (BBV) patients, and low rates of hepatitis B vaccination among HCWs.¹³ To the best of our knowledge, this is the first study to explore the prevalence of needlestick and sharps injuries in Somalia. In the current study, we aimed to investigate the proportion of needlestick and sharps injuries among HCWs in a tertiary care hospital in Somalia and also to evaluate associated risk factors.

Materials and Methods

This retrospective study was conducted at Mogadishu Somali Turkey Recep Tayyip Erdogan Training and Research Hospital over a six years' period between 2017–2022, in the infection control office. All HCWs who were exposed to needlestick and sharps injuries during the target period and reported those incidents to the infection control office of the hospital and filled out the files for the NSSIs completely were included in the study, and those with incomplete information were excluded. The infection control office records detailed information about every NSSI in the hospital using a structured questionnaire, including age, gender, occupation, place of the injury, site of the injury, type of device causing the injury, the patient's blood-borne infection status, and so on. We used these preregistered records of all NSSI cases and included them in the study.

Ethics Approval

Ethical approval for this study was obtained from the institutional ethics committee of Mogadishu Somalia Turkish Training and Research Hospital (MSTH: 12360, Ref.No: 734). All HCWs previously consented to use data for research purposes if needed.

Statistical Analysis

The study data collected as a result of the research were analyzed by transferring them to the Jamovi project (2022), Jamovi (Version 2.3) [Computer Software]. Mean values (\pm standard deviation) for continuous variables and values for categorical variables were expressed as frequency and percentage. The conformity of non-categorical data to normal distribution was investigated using the Shapiro–Wilk Test, and Mann Whitney U test were used for non-normally distributed variables. In addition, categorical data were analyzed using the Chi-Square test (χ^2) and Fisher Exact test. $P < 0.05$ (bilateral) was considered statistically significant.

Results

Demographic Parameters of the NSSIs Among HCWs

Out of the 233 incident reports, 54.1% of the cases were female and 61.2% were between 26–40 years of age. The majority of the cases were nurses (43.3%) and 81.1% had injector injuries. 42.1% of the cases had left-hand injuries. When the source of the materials causing injury was analyzed, One-fifth of the instruments (24.9%) responsible for the NSSI incidence cases were infected with the hepatitis B virus. Deep injuries (57.5%) were generally observed (Table 1).

Using Personal Protective Equipment

The use of protective equipment in cases with a history of injury was analyzed. PPE use was present in the majority (84.5%) of cases with a history of injury. The majority (62.7%) were wearing disposable gloves. However, 11.2% did not have any protective equipment (Table 2).

Table 1 Demographic Parameters

| Parameters | | N | % |
|---|--------------------------|-----|------|
| Gender | Female | 126 | 54.1 |
| | Male | 107 | 45.9 |
| Age group | 18–25 | 77 | 33 |
| | 26–40 | 141 | 60.5 |
| | 41–50 | 13 | 5.6 |
| | >50 | 2 | 0.9 |
| Job | Nurses | 122 | 52.4 |
| | Cleaners | 52 | 22.3 |
| | Doctors | 43 | 18.5 |
| | Technicians | 16 | 6.9 |
| Causing injury | Injector needle | 189 | 81.1 |
| | Surgical blade | 13 | 5.6 |
| | Catheter | 2 | 0.9 |
| | Broken glass vial/bottle | 1 | 0.4 |
| | Blood | 23 | 9.9 |
| | Others | 3 | 1.3 |
| | Suture needle | 2 | 0.9 |
| Site of injury | Left hand | 98 | 42.1 |
| | Right hand | 96 | 41.2 |
| | Lower limb | 15 | 6.4 |
| | Chest and abdomen | 2 | 0.9 |
| | Head and neck | 15 | 6.4 |
| | Eye | 2 | 0.9 |
| | Face | 5 | 2.1 |
| Severity of injury | Superficial | 48 | 20.6 |
| | Deep | 134 | 57.5 |
| | Mucous | 32 | 13.7 |
| | No | 19 | 8.2 |
| Bloodborne contamination of the devices | HBV | 58 | 24.9 |
| | HCV | 30 | 12.9 |
| | HIV | 11 | 4.7 |
| | HBV+HCV | 2 | 0.9 |
| | HBV+HCV+HIV | 1 | 0.4 |
| | No | 131 | 56.2 |

Abbreviations: HBV, hepatitis B; HCV, hepatitis C; HIV, human immunodeficiency virus.

Table 2 Contaminated Material Contact and Using PPE Status of Cases

| Parameters | | N | % |
|-----------------------|----------------------------------|-----|------|
| Contaminated Material | Yes | 222 | 95.3 |
| | No | 11 | 4.7 |
| Using PPE | Yes | 197 | 84.5 |
| | No | 36 | 15.5 |
| Type of PPE | Single Layer gloves | 146 | 62.7 |
| | Double layer gloves | 42 | 18 |
| | Gown+Single Layer gloves+Mask | 5 | 2.1 |
| | Gown | 3 | 1.3 |
| | Gown+Glasses | 1 | 0.4 |
| | Gown+Single Layer gloves | 1 | 0.4 |
| | Gown+Double layer gloves+Mask | 1 | 0.4 |
| | Glasses | 2 | 0.9 |
| | Glasses+Double layer gloves+Mask | 1 | 0.4 |
| | Single Layer gloves+Mask | 1 | 0.4 |
| | Double layer gloves+Mask | 2 | 0.9 |
| | Mask | 2 | 0.9 |
| | No | 26 | 11.2 |

Abbreviation: PPE, personal protective equipment.

Injury Sustained Area in the Hospital

When the injury risk classification of healthcare workers in the hospital was made, it was determined that the riskiest areas were operating rooms, emergency departments, ICUs, service patient rooms and waste bins. Sterilization units and blood transfusion sets were the least risky areas (Table 3).

Number of Injuries According to Years

When the number of injuries according to years is evaluated, it is observed that there is an increase in 2022 (Figure 1), and based on the total number of hospital personnel, 8.6% of the HCWs had at least one NSSI incident in that year.

Comparison of Other Parameters According to Gender, Job and Age

When other parameters of the cases were compared according to gender, no significant difference was observed except for the injury site ($P=0.001$). When the parameters were compared according to the job; gender ($P=0.001$), place of injury

Table 3 Injury Sites at the Hospital

| Place of Injury | N | % |
|---------------------------------|----|------|
| Operation room | 51 | 21.9 |
| Intensive care units | 26 | 11.2 |
| Emergency | 39 | 16.7 |
| Inpatient service | 41 | 17.6 |
| Medical waste collection | 26 | 11.2 |
| Duration of the taking of blood | 15 | 6.4 |
| Laboratory | 10 | 4.3 |
| Endoscopy room | 7 | 3 |
| Radiology | 7 | 3 |
| Dental department | 3 | 1.3 |
| Outpatient clinics | 3 | 1.3 |
| Dialysis unit | 3 | 1.3 |
| Sterilization unit | 1 | 0.4 |
| Blood transfusion set | 1 | 0.4 |

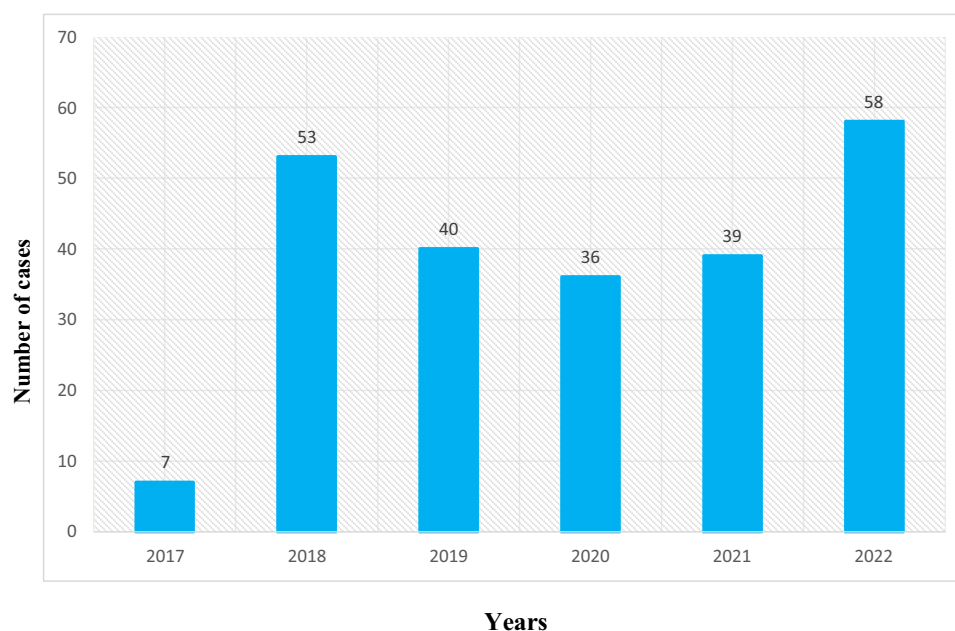


Figure 1 Number of injuries according to years.

($P=0.001$), causing injury ($P=0.004$), using PPE ($P=0.049$), and type of PPE ($P=0.022$) were found to have statistically significant differences. The cases were divided into four groups in terms of age range. When age groups were compared with other parameters, significant differences were found in terms of gender ($P=0.003$), job ($P=0.001$), and using PPE ($P=0.004$) (Table 4).

Table 4 Comparison of Other Parameters According to Job, Age and Gender

| Parameters | Gender (p-value) | Job (p-value) | Age Range (p-value) |
|---------------------------------------|---|---|--|
| Gender | – | 0.001 (Male: Technician =68 cases, Female: Cleaning Personnel =26 cases) | 0.003 (Male: 18–25 age=53 cases, Female: 18–25 age:69 cases) |
| Job title | – | – | 0.001 (26–40 age: Technician=67cases) |
| Place of injury | 0.001 (Male:Right calf =24 cases, Female:Right leg =34 cases) | 0.001 (Technician: Right calf =23 cases, Cleaning Personnel: Right leg =23 cases) | 0.051 |
| Causing injury | 0.955 | 0.004 (Technician: Needle tip =84 cases) | 0.975 |
| Site of injury | 0.940 | 0.314 | 0.309 |
| Contaminated material | 0.763 | 0.641 | 0.202 |
| Devices with bloodborne contamination | 0.377 | 0.641 | 0.525 |
| Using PPE | 0.836 | 0.049 (Technician=73 cases) | 0.004 (18–25 age:164 cases) |
| Type of PPE | 0.848 | 0.022 (Technician:3=73 cases:Single layer of gloves=73 cases) | 0.626 |
| Severity of injury | 0.770 | 0.099 | 0.099 |
| Per years | 0.448 | 0.059 | 0.109 |

Abbreviation: PPE, personal protective equipment.

Discussion

NSSIs are becoming more common among physicians, nurses, and other employees of the healthcare profession. According to the World Health Organization (WHO), NSSIs are one of the most significant occupational hazards among healthcare workers (HCWs) worldwide, with over 2 million occupational exposures occurring among 35 million HCWs annually.¹⁴ In this current study, our findings indicated that 8.6% of the HCWs had at least one NSSI incident in the last year. When we evaluate the cases by years, an increase is noticeable. This may be due to the fact that our center's infection control department was established in mid-2017 and staff awareness was low, which may be the reason for the low number of cases that year. Following the implementation of seminars, training programs and requirements for reporting NSSI incidents, the number of cases increased. Following further training and guidance, cases decreased, perhaps due to increased awareness or non-reporting of incidents. The increase in the number of cases in the previous year can be attributed to an increase in hospital staff, some of whom were new to the job and lacked comprehensive training. A study conducted in Saudi Arabia revealed almost similar findings among HCWs.⁴ In contrast to our findings, higher rates of NSSIs were reported in studies conducted in Ethiopia¹⁵ and South Korea.¹⁶ Similarly, contrary to our findings, a recent Iranian meta-analysis of 44 publications found a high prevalence of NSSIs in Iranian HCWs.¹⁷ It's probable that a reduced risk of NSSIs in our hospital is related to higher adherence to infection control protocols and workplace safety knowledge. Another possible explanation can be higher rates of underreporting of NSSI incidents to the infection control and prevention department of the hospital. HCWs are still frequently reluctant to report any injuries that may have been sustained at work. Several studies have indicated under-reporting rates ranging from 38.9% to 60.2%.^{2,6,18} Non-reporting of NSSIs has a number of causes, including ignorance of the reporting process or the requirement to report NSSIs to avoid possible consequences; shame or humiliation; having the impression that the damage was minor or possessing antibodies that provide immunity against the illness; fear of being viewed as having inadequate clinical skills; and unhappiness with the follow-up process made by authorities after the incidents were reported.^{19,20} In the present study, out of 233 cases of NSSI reported among HCWs during the target six-year period, female health care professionals were the majority of victims with NSSIs. This similar finding was reported in previous studies.^{21,22} The fact that there are more women working as nurses and cleaners may be contributing to the greater female prevalence of NSSI injuries. In contrast to our results, Saadeh et al reported a high prevalence rate of NSSIs among male healthcare workers.²³ The majority of our subjects were younger than 40 years of age, which is similar to the previous studies.^{3,23} The majority of NSSIs in this study are attributed to nurses. Similar to these findings, prior research has shown that nurses are the healthcare professionals most commonly affected by NSSIs, with prevalence rates ranging from 39.7% to 72.7%.^{3,4,23-27} This high prevalence among nurses might be due to the nature of their work. Nurses are frequently in close proximity to patients, performing the majority of their patient care with sharps objects such as IV needle insertion, injections, and phlebotomy, which are also frequent incidents for NSSIs. The high number of nurses among healthcare professionals as a whole, rather than a higher risk per individual, can be another factor that might be responsible for the high NSSI rates among nurses. Contrary to our findings, Abalkhail et al reported higher prevalence rates of NSSIs among medical technologists.² After the nurses, the cleaning staff was the next most frequent HCW to report NSSIs in our hospital, which is in agreement with previous studies.^{22,23} The quantity of needles and other sharps objects in the area, as well as the poor disposal practices of the original users of the objects, will affect the number of NSSIs sustained while cleaning up medical waste.²⁸ In contrast to our findings, a number of studies indicated that, after nursing staff, doctors were the HCWs with the highest prevalence rates of NSSIs.^{3,4,24}

According to the results of this study, hypodermic needles were primarily responsible for the majority of NSSIs among HCWs. A recent systematic review and meta-analysis found that the most prevalent sources of NSSIs among HCWs worldwide were hypodermic needles, followed by IV annulations, and then surgical needles.¹ Similarly, a cohort study carried out in an Indonesian tertiary care hospital with a 4-year follow-up showed that syringe needles were the most frequent needle-related injuries.³ The majority of patient treatment in healthcare facilities entails the use of syringes or needles on a daily basis, which necessitates systematic collection, recapping, and disposal. This could explain the high occurrence of NSSIs associated with syringes and needles.

According to our study, the majority of injuries were found to have primarily affected the left and right hands, which is consistent with a study on Jordanian healthcare professionals that reported similar findings.²³ The higher incidence of NSSIs in the left and right hands may be explained by the fact that right-handed people typically use their right hand to grasp syringes or needles during the collection of medical waste for disposal and their left hand for recapping. Likewise, previous studies have found that recapping syringes or needles is a major factor in NSSIs.^{6,29} We found that the majority of the injured healthcare staff in our study reported extremely serious and deep injuries, which is contrary to several previous studies.^{2,30,31} The most frequent bloodborne diseases seen after the NSSIs are HBV, HCV, and HIV. In this study, we discovered that nearly one-fourth of the needles or sharps devices that resulted in NSSI incidents were contaminated with HBV, which is much higher than the results reported in previous studies^{3,22,27} and much lower than the findings of a previous study.³² Similarly, we found that 12.9% of the needles or sharps objects that resulted in NSSI cases were contaminated with HCV, which is comparable with a previous study³² but a little higher than the findings of the previous authors.^{3,22} In contrast to our findings, Bianco et al reported a much higher percentage than our results.²⁸ As of HIV, few of the instruments that caused NSSI episodes were found to be contaminated, which is slightly higher than previous studies^{22,27,32} and lower than the findings of Yuniastuti et al.³ This study found that operating rooms, followed by inpatient care and emergency rooms, were the locations where NSSIs happened the most frequently. Similar to our findings, previous studies revealed that operating rooms had the highest incidence of NSSI incidents.^{33,34} This higher frequency of NSSIs in operating rooms may be caused by a combination of factors, including exhaustion from work overload, a need to finish the task quickly, a possible lack of familiarity with handling sharps objects safely, and emotional strain related to prolonged standing while performing surgical operations. Contrary to our findings, several previous studies^{3,4,23,35} reported that inpatient care is the most frequent setting for NSSI occurrence.

The present study found that there was a significant association between place of injury and gender for NSSIs among HCWs. Similarly, there was a significant association between profession, gender, place of injury, cause of injury, and site of injury for NSSIs among HCWs. Additionally, there was a significant association between age, profession, and use of PPE for NSSIs among HCWs.

This study has certain limitations that need to be mentioned. Firstly, the study was retrospective in design and relied on secondary data as the main source of information. There were a lot of missing details, which limited the study variables. As a result, the study needed to use existing information. Secondly, the findings cannot be applied to all contexts because the study was restricted to a single tertiary care teaching hospital. Finally, the rate of under-reporting, HCW attitudes and work practices, or other critical aspects of reporting NSSIs were not examined. So, it's possible that not all NSSI incidents that occurred during the target period of six years are represented by this data.

As for recommendations, although we used secondary data, the information acquired from this study was able to provide significant results for improvement. According to our findings, healthcare institutions need to regularly teach healthcare professionals—especially nurses and housekeepers—about the significance of NSSIs.

Conclusion

In conclusion, healthcare professionals around the world continue to face major health risks from needlestick and sharps injuries. It has been determined that an increasing number of cases are reported in our center every year. We also revealed a range of NSSI cases across several professions, with nurses and cleaners having the highest incidence rates. In addition, our study underlined that the majority of the NSSI incidents occurred in the operating theater, followed by inpatient service and the emergency room. The present study found a significant association between profession, gender, place of injury, cause of injury, and site of injury for NSSIs among HCWs. Additionally, there was a significant association between age, profession, and use of PPE for NSSIs among HCWs.

Abbreviation

NSSI, Needlestick and Sharps Injuries; HCW, Healthcare Workers; HIV, Human Immunodeficiency Virus; HBV, Hepatitis B Virus; HCV, Hepatitis C Virus; PPE, Personal Protective Equipment; PEP, Post-Exposure Prophylaxis; BBV, Bloodborne Viral Infections; WHO, World Health Organization.

Data Sharing Statement

The data is available from the corresponding author upon reasonable request.

Ethics Approval and Consent Form

We obtained an approval letter from the review board of Mogadishu-SomaliTurkeyRecepTayyipErdoganTrainingandResearchHospital (MSTH: 12360, Ref. No: 734). All methods were performed in accordance with the relevant Helsinki Declaration contents guidelines. Participants were informed about the purpose of the study, and written informed consent was obtained from the participants.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis, and interpretation, or all these areas; took part in drafting, revising, or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors declare that they have no conflicts of interest.

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