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ORIGINAL ARTICLE

Seven-Year Evaluation of Percutaneous and Mucosal Injury in Health-Care Professionals

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Abstract

Introduction: Hospital environments are places where patients are admitted due to sharp object injuries. Therefore, hospitals pose a risk for many diseases that can be transmitted by blood products. Although many diseases can be transmitted as a result of stab wounds, the most important ones are Hepatitis-B, Hepatitis-C, and Acquired Immunodeficiency Syndrome Virus. In our study, it was aimed to evaluate stab wounds in a 7-year period.

Methods: A total of 452 injuries from two different centers were included in the study. Age, gender, time of the injury, serological results of the patient and the personnel exposed to the injury, type of injury, duration of duty of the health personnel, type of exposure, occupational group, and location of the injury were scanned from the Infection Control Committee records and recorded in the study forms.

Results: The mean age of the cases was 29.7±8.2, and 272 (60.2%) were women. The most frequently injured health personnel were nurses and trainees. A majority of the (81.2%) injuries were caused by the needle tip. Source serology was determined in 67.3% of the cases and serologic positivity was found in 19.4% of them. With the onset of the COVID-19 pandemic, no stab wounds were reported in the units dealing with COVID-19 patients during this period.

Discussion and Conclusion: Despite the precautions taken, stab wounds still continue to be an important problem today. The fact that a significant portion of these injuries is preventable increases the importance of the problem. Especially, with the COVID-19 pandemic, the fact that sharp object injuries were not reported in the units where these patients were treated shows that the injuries can be seriously reduced if the personnel comply with the precautions and safety precautions at the maximum level. It should be kept in mind that safety is paramount, and maximum attention should be paid to every action taken.

Keywords: AIDS; Healthcare personnel; Hepatitis-B; Hepatitis-C; Sharp object injury.

Hospital environments are places where patients are admitted due to sharp object injuries. Therefore, hospitals pose a risk for many diseases that can be transmitted by blood products. Although many diseases can be transmitted as a result of stab wounds, the most important ones are Hepatitis-B Virus (HBV), Hepatitis-C Virus (HCV), and Acquired Immunodeficiency Syndrome Virus (AIDS). In our study, it was aimed to evaluate stab wounds in a 7-year period.

By definition, the concept of hospital personnel includes not only nurses or physicians, but all employees working in the hospital environment[1]. For this reason, all personnel working in the hospital environment are at risk for penetrating object injuries (POI). Although many diseases can be transmitted with POI, these infections include especially

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HBV, HCV, and Human Acquired Immunodeficiency Virus (HIV). Fortunately, the risk of transmission of these infections is very low, even after percutaneous contact.

The fact shows that POIs are generally preventable and still frequent despite all the precautions taken; immunoglobulin, vaccine, antiretroviral drugs, and prophylaxis applications in case of injury increase the costs and cause psychological pressure on the personnel. For these reasons, it is important that all personnel working in the hospital should be provided with training on POI. The prevention methods should be explained in addition to providing the fastest feedback in case of injury. In our study, it was aimed to evaluate stab wounds in hospitals over a 7-year period.

Materials and Methods

In this study, 452 stab wounds that occurred in two different centers between January 2015 and November 2021 were evaluated retrospectively. As the inclusion criteria of the study, the complete completion of the Sharps Injuries Notification Form, which includes the sociodemographic characteristics of the occupational group of the people injured by the sharps, was taken. As the exclusion criteria of the study, injuries in people who did not work in the hospital or people who were hospital staff and filled the form incompletely were included in the study. Age, gender, time of injury, source patient and serological results of injured personnel, type of injury, tenure of health personnel, type of exposure, occupational group, and location of injury were recorded in the study forms. The data obtained were evaluated as numbers and percentages. The study has been approved by the Ethics Committee at December 20, 2021 protocol number 54132726–000–27382.

Results

The mean age of 452 sharp object injuries reported was 29.7±8.2, and 272 (60.2%) were women. Of the injuries, 418 (92.5%) were percutaneous, and the remaining 34 (7.5%) were mucosal injuries. Considering the distribution of personnel, 137 (30.3%) of the cases were interns, 171 (37.8%) nurses, 88 (19.5%) cleaning staff, 31 (6.9%) physicians, and 25 (5.5%) anesthesia personnel, technician, or laboratory technician. Of the injuries, 367 (81.2%) were caused by needle tip, 12 (2.7%) by scalpel, 28 (6.2%) by lancet, and 35 (7.7%) by catheter tip/cutting tool. While central venous catheter was inserted in 18 (4%) injuries, room cleaning in 17 (3.8%) injuries, removal of instruments in 136 (30.1%) cases, washing of contaminated instruments in 6 (1.3%) cases, 94 (20.8%) injuries during waste transport, 20 (4.4%) blood glucose test, 54 (11.9%) removal of sutures, 9 (2%) closing injector caps, and 87 (19.2%) vascular access/blood glucose injury occurred during the removal procedure and 11 (2.4%) of them during other procedures. Considering the working hours of the personnel, the number of personnel working between 0 and 1 years was 273 (60.4%), while 103 (22.8%) were >1–5 years, 52 (11.5) >5–10 years, and 24 (5.3%) had been on duty for more than 10 years. A majority of 327 (72.3%) the sharps injuries occurred during the day shift, 84 (18.6%) were in the evening (17:00–00:00) and 41 (9.1%) were in the night shift (00:00–08) (Table 1). While 418 (92.5%) of the injuries were extremity injuries, 29

Table 1. General characteristics of percutaneous and mucosal injuries in healthcare workers

	n (%)
Gender	
Woman	272 (60.2)
Boy	180 (39.8)
Distribution of duties of health workers	
Nurse	171 (37.8)
Intern	137 (30.3)
Cleaning staff	88 (19.5)
Doctor	31 (6.9)
Anesthesiologist or laboratory technician	25 (5.5)
Type of injury	
Percutaneous	418 (92.5)
Mucosal	34 (7.5)
Behavior that causes injury	
When removing tools from the environment	136 (30.1)
During waste transport	94 (20.8)
During venipuncture/blood collection	87 (19.2)
While suturing	54 (11.9)
When checking blood sugar	20 (4.4)
While inserting a central venous catheter	18 (4)
During room cleaning	17 (3.8)
When closing the injector cap	9 (2)
During cleaning of contaminated instruments	6 (1.3)
Other*	11 (2.4)
Occupation period (years)	
0–1	273 (60.4)
1–5	103 (22.8)
5–10	52 (11.5)
Over 10 years	24 (5.3)
Injury time (hour)	
Daytime shift (08:00–17:00)	327 (72.3)
Evening shift (17:00–00:00)	84 (18.6)
Night shift (00:00–08:00)	41 (9.1)

*Stinging a needle in someone else's hand, a forgotten sharp tool in the environment.

(6.4%) were caused by contact with the eye mucosa and 5 (1.1%) with the oral mucosa.

Source serology was clear in 304 (67.3%) of the cases and serologic positivity was found in 59 (19.4%) cases. Two of the sources had anti-HCV positivity together with HbsAg. Of these patients, 27 (8.9%) had HbsAg, 23 (7.6%) had anti-HCV, and 9 (3%) had anti-HIV positivity (Fig. 1). Anti-HBs titer was found to be <10 mIU/mL in 13 of 27 healthcare workers exposed to HbsAg positive source, and all of them were given HBV vaccine together with HBV immunoglobulin and no disease has developed. Two doses of HBV immunoglobulin were administered to these healthcare workers, 1 month apart. In two of nine source patients with anti-HIV positive, mucosal injury occurred, and seven patients percutaneously injured the healthcare worker. Prophylactic antiretroviral treatment was given to all healthcare workers who were exposed to injury.

All of the healthcare workers were followed up for 6 months and the serological tests performed by the routinely applied workplace health and safety were also examined. No HbsAg, anti-HCV, and anti-HIV positivity was detected in any of the health workers. With the onset of the COVID-19 pandemic, the units dealing with these patients were not notified during the pandemic process.

Discussion

Penetrating-stab wounds (POI) do not only include percutaneous injuries, but also include mucosal contacts[2]. POI is a situation with occupational risk in terms of blood-transmissible diseases in the hospital environment. Although all personnel working in the hospital are at risk, the risk rate may vary according to the unit they work in. Many diseases

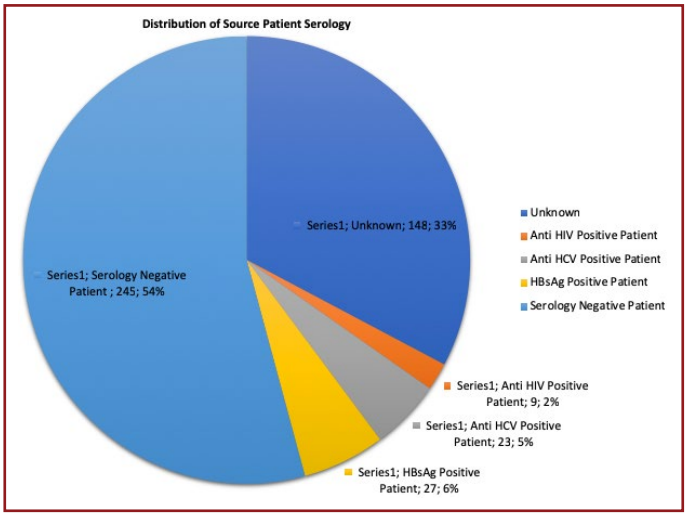

Figure 1. Distribution of source patient serology.

can be transmitted through blood, and the most important of them are HBV, HCV, and AIDS[3].

Awareness of POI started to increase in the 1980s, when the Acquired Immunodeficiency Virus was detected[4]. With the widespread use of the protection methods put into practice, the number of health personnel exposed to POI has started to decrease over the years. A significant portion of these injuries is preventable and occur mainly due to ignoring safety precautions during the procedure[4]. In the studies conducted on POI, it is seen that the personnel exposed to injury are mostly inexperienced and newly started healthcare workers[5,6]. Similarly, the average age of the health personnel who were exposed to POI was around 29, mostly during the internship period and/or in the 1st year of their professional life. With the increase in professional experience over time, it is seen that the injury rates decrease to 5%.

It is seen that the most frequently injured personnel are nurses first and then trainee health personnel. We think that this is the effect of relatively more operations with sharps and piercing tools and inexperience. However, the fact shows that 20% of the health workers, who are at relatively less risk and exposed to injury compared to other health workers, are cleaning staff and 5% are technicians, suggesting that there are problems in the security measures taken.

In addition, the fact that 20% of the injured personnel were injured during waste transportation, 4% while checking blood glucose, and 2% while closing the injector cap suggests that practices are applied in an unsafe manner and personnel error, aside from inexperience. Injuries that occur while closing the injector cap and checking blood sugar have decreased significantly with the introduction of needle tip collection cups in recent years, although they were in the previous years. Unfortunately, problems are also encountered in the use of needle tip collection containers. In the studies, it is emphasized that it is more important to develop device designs to eliminate human error or reduce it to the minimum level possible[7]. While patients with diabetes mellitus (DM) can be followed safely with their own and safe needles in blood glucose follow-ups, problems can still be encountered in fingertip blood glucose follow-ups in patients who do not have DM or who do not have a needle for blood glucose monitoring.

A significant portion of the POIs occurs during the day shift, where the majority of procedures take place. In the study conducted by Dizili-Yelgin et al.,[8] they reported that POI occurs over 90% during the daytime shift. In another study,

89.3% of injuries occurred during the daytime shift were reported[9]. In our study, 72.3% of injuries occurred during the day shift. Injury rates were minimal in the night shift, where the interventions were minimal.

While more than 90% of the injuries were extremity injuries, 7% of them were caused by mucosal contact. There are similar rates in the literature and it is thought to be due to the higher rate of percutaneous injury.

Today, the management of personnel exposed to POI requires that source serology should be investigated whenever possible[10,11]. In our study, the source serology could be determined in a large part of the POI.

In addition to the psychological stress of the personnel after the POI, both the personnel exposed to the injury and, where possible, the source should be examined serologically. There is no prophylactic regimen for HCV. However, prophylaxis can be applied in the presence of appropriate indications for HIV and HBV. Both the necessity of additional examinations and prophylaxis applications in the presence of appropriate indications will cause cost increases.

Before the widespread use of the hepatitis B vaccine, HBV acquisition as a result of percutaneous injuries was at the level of 6–25%, but nowadays, these rates have decreased to very low levels[12]. If the injured personnel are not immune to HBV and the source is HbsAg-positive, the use of vaccine and/or HBV immunoglobulin is recommended[10]. In our study, vaccination and/or immunoglobulin indications were determined in line with these recommendations and applied to health personnel, and no problems were encountered in terms of HBV during the follow-up of the personnel.

It has been reported that the risk of AIDS transmission after percutaneous injury is 0.3%[13]. Today, the indications for prophylaxis in this regard have been clearly defined, and these rates can be reduced to even lower levels with prophylactic antiretroviral drugs administered in line with these indications[11]. In our study, two of the nine NSL cases whose source was known to be infected with AIDS were mucosal and seven were percutaneous injuries, and prophylactic regimens of these patients were started and followed up in line with the guidelines. If prophylactic antiretroviral therapy is not as soon as possible after percutaneous or mucosal contact with an HIV-positive source, it should be started within the first 72 h after exposure[11].

In cases where the source is anti-HCV positive, the risk of HCV transmission as a result of percutaneous exposure is between 0% and 7% and is reported to be 1.8% on average[1]. There is no prophylactic regimen for HCV, and serology and liver enzyme monitoring are recommended. For early diagnosis, HCV-RNA can be examined 4–6 weeks after percutaneous injury[1]. In our study, anti-HCV positivity was detected in 7% of the cases in which the source serology could be examined, and anti-HCV positivity was not detected in any of the health-care personnel in the follow-ups of the health-care personnel.

In addition to being an important source of stress for the personnel exposed to POI, it requires additional examinations from both the personnel and the source and the application of appropriate prophylactic regimens in the presence of appropriate indications, and it also causes increased costs due to the long-term follow-up. Although we could not find a study on costs in our country, it was stated in a study conducted in Italy that the cost was approximately 375 Euros per event[12]. Considering that a significant part of the POI is preventable, it will be seen that these costs are quite high.

For these reasons, efforts should be made to improve security measures, maximum care should be taken to repeat the trainings frequently to keep awareness alive, and technological developments should be followed closely. It should not be forgotten that injuries can be prevented with simple precautions and with less cost. It should be kept in mind that safety is a priority and maximum attention should be paid to every action taken.

Conclusion

Despite the precautions taken, stab wounds still continue to be an important problem today. The fact that a significant portion of these injuries is preventable increases the importance of the problem. Especially, with the COVID-19 pandemic, the fact that sharp object injuries were not reported in the units where these patients were treated shows that the injuries can be seriously reduced if the personnel comply with the precautions and safety precautions at the maximum level. It should be kept in mind that safety is paramount and maximum attention should be paid to every action taken.

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