

İkinci Basamak Devlet Hastanesinde Sağlık Çalışanlarında Görülen Kesici Delici Alet İlişkili Yaralanmalar

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Objective: Objective: Injuries of healthcare workers caused by medical sharp materials such as needle sticks and lancets, are among the most common occupational accidents. In this study, it was aimed to examine all injuries caused by medical sharp instruments that health workers were exposed to, and to create an up-to-date profile of these accidents.

Methods: In a three-year period between January 2020 and December 2022 in our secondary care hospital, injuries with medical sharp instruments were included in the study. A total of 69 healthcare workers who had an accident with a sharp medical instrument or equipment were included. Data were obtained from hospital records.

Results: The mean age of the participants was 29.9±10.7 (range: 15-50), 76.8% of them were female, 35 (50.7%) were nurses and 14 (20.3%) were intern medical or nursing students. Of the instruments that caused the accident, 49 (71.0%) were needle sticks, 12 (17.4%) were lancets, and all of them were contaminated. The injured body area in all cases was the hands, of which 58 (84.1%) were finger injuries. The most frequently injured finger was the right hand 2nd finger (27.5%). Health status was unknown in 51 (73.9%) patients who were applied by the

sharp instrument that caused the accident. Of the patients, two (2.9%) were hepatitis C positive, and two (2.9%) were hepatitis B positive.

Conclusion: The findings of our study show that medical sharp instruments injuries occur most frequently with the needle sticks, that most frequently during or immediately after the application to the patient, and that most frequently nurses and intern students are exposed.

1. INTRODUCTION

Occupational accidents to which healthcare workers are exposed can be a source of serious infection, as they mostly occur with medical equipment directly in contact with clinical material. In hospitals, especially sharp materials such as needle sticks and lancets, and broken medicine ampoules and serum bottles can often cause such accidents (1-3). For a long time, it has been observed that there are very frequent accidents, especially during the fitting of the caps of the needle sticks after use. In this regard, it is recommended not to try to close the needle caps and special mechanism garbage cans have been developed for needle sticks. Despite this, accidents with needle sticks are still common (1-4).

Almost all of the accidents that occur with medical sharp instruments occur after the application of these materials to the patient. For this reason, the possibility of infecting the healthcare worker with blood-borne viruses such as hepatitis B and C, and HIV that present in the patient increases significantly. The more frequent occurrence of such accidents, especially in emergency rooms and intensive care units where invasive interventions are applied intensively and frequently, causes an increase in the probability of infection (2-5).

In this study, it was aimed to examine all injuries caused by medical sharp instruments that health workers were exposed to in a three-year period in our secondary care hospital and to create an up-to-date profile of these accidents.

2. MATERIALS AND METHODS

This retrospective study was approved by the local ethics committee.

2.1. Participants

In a three-year period between January 2020 and December 2022 in our secondary care hospital, injuries with needle stick, lancet, etc. were included in the study. A total of 69 healthcare workers who had an accident with a sharp medical instrument or equipment were included. Information about the staff who had the accident, the injured body area, and the patient's blood-borne infectious disease status, in which the material causing the accident was used, were obtained from the hospital records retrospectively.

2.2 Statistical analysis

The sample size in the study was calculated by power analysis using G-Power (version 3.1.9.6, Franz Foul, Universitat Kiel, Germany). Effect size, type1 error, and the test power were taken as 2.5, 0.05, and 0.8, respectively, and the required sample size was calculated as 38.

All statistical analyzes in the study were done using SPSS 25.0 software (IBM SPSS, Chicago, IL, USA). Descriptive data are given as numbers and percentages. In terms of categorical variables, comparisons between groups were made with Pearson's Chi Square test and Fisher's Exact Test. The results were evaluated within the 95% confidence interval, and $p < 0.05$ values were considered significant. Bonferroni correction was made where appropriate.



3. RESULTS

The mean age of the participants was 29.9 ± 10.7 (range: 15-50), 76.8% of them were female. Of those who had an accident, 35 (50.7%) were nurses and 14 (20.3%) were intern medical or nursing students. Of the materials that caused the accident, 49 (71.0%) were needle sticks, 12 (17.4%) were lancets, and all of them were contaminated. The injured body area in all cases was the hands, of which 58 (84.1%) were finger injuries. The most frequently injured finger was the right hand 2nd finger (27.5%). The data on blood-borne viral disease could not be reached in 51 (73.9%) of the patients in whom the materials causing the accident were used, and their health status was unknown, 13 (18.8%) were healthy, two (2.9%) were hepatitis C positive, Two (2.9%) were found to be hepatitis B positive, one patient was suspected to be HIV positive, but it was not confirmed. Hepatitis B, hepatitis C and HIV positivity were not detected in any of the tests performed on healthcare workers that had a needle stick accident (Table 1). Hepatitis B, hepatitis C and HIV positivity were not detected in any of the tests performed on health workers who were exposed to the accident within weeks after the accident.

Table 1. Demographic and epidemiological characteristics of health workers.

	n	%
Gender		
Male	16	23.2
Female	53	76.8
Occupation		
Nurse	35	50.7
Intern student	14	20.3
Clinical advisor	10	14.5
Cleaning staff	5	7.2
Midwife	2	2.9
Anesthesiologist	1	1.4
Chef	1	1.4
Paramedic	1	1.4
Medical unit		
Intensive care unit	22	31.9
Wards	21	30.4
Emergency room	16	23.2
Operation room	6	8.7
Sterilization room	3	4.3
Outpatient clinic	1	1.4
Medical equipment		
Needle stick	49	71.0
Lancet	12	17.4
Broken ampoule	5	7.2
Scalpel	3	4.3
Injured limb		
Right hand total	43	62
Left hand total	26	38
Injured area		
Right hand 2nd finger	19	27.5
Right hand excluding fingers	8	11.6
Right hand 1st finger	8	11.6
Left hand 2nd finger	8	11.6
Left hand 1st finger	7	10.1
Right hand 3rd finger	4	5.8
Right hand 4th finger	4	5.8
Left hand 3rd finger	4	5.8
Left hand 4th finger	4	5.8
Left hand excluding fingers	3	4.3
Source patient's health status		
Unknown	51	73.9
Serology negative	13	18.8
HBV positive	2	2.9
HCV positive	2	2.9
HIV suspected	1	1.4
Material contamination status	69	100.0
Anti-HBs (+) in staff	69	100.0
	Mean+SD	Min-max
Age (years)	29.9+10.7	15-50

HCV: Hepatitis C virus, HIV: Human immunodeficiency virus.

The distribution of injured limb ($p=0.883$) and type of injury ($p=0.703$) according to occupations was similar. Injuries with needle stick, lancet and ampoule fragment were significantly lower in medical units, except intensive care unit, wards, and emergency units, while the rate of scalpel injuries was significantly higher than in these units ($p=0.015$). Units were similar in terms of limb injury distribution ($p=0.200$) (Table 2).

Table 2. Comparison of medical equipment types and injured limb distributions according to occupations and medical units.

	Total n	Medical equipment								Injured limb				p
		Needle stick		Lancet		Ampoule piece		Scalpel		Right hand		Left hand		
		n	%	n	%	n	%	n	%	n	%	n	%	
Occupation										0.703				0.883
Nurse	35	24	68.6	7	20.0	3	8.6	1	2.9	21	60.0	14	40.0	
Intern	14	11	78.6	3	21.4	0	0.0	0	0.0	8	57.1	6	42.9	
Clinical assistant	10	7	70.0	1	10.0	1	10.0	1	10.0	7	70.0	3	30.0	
Cleaning staff	5	3	60.0	1	20.0	0	0.0	1	20.0	3	60.0	2	40.0	
Other	5	4	80.0	0	0.0	1	20.0	0	0.0	4	80.0	1	20.0	
Unit										0.015				0.200
ICU	22	16	72.7	4	18.2	16	72.7	0	0.0	10	45.5	12	54.5	
Wards	21	15	71.4	5	23.8	15	71.4	0	0.0	16	76.2	5	23.8	
ER	16	12	75.0	3	18.8	12	75.0	0	0.0	10	62.5	6	37.5	
Other	10	6	60.0	0	0.0	6	60.0	3	30.0	7	70.0	3	30.0	

ICU: Intensive care unit, ER: Emergency room.

4. DISCUSSION

It has been stated that injuries with sharp medical instruments occur in health centers, especially in units such as the emergency services where the workload of health workers is high, especially during procedures such as injection, IV insertion or blood collection, especially due to unpredictable sudden reactions of the patient or due to rushing. Such accidents carry the risk of infection for healthcare workers (5,6). In this study, the general profile of these accidents was analyzed.



Isara et al. (8) reported that age is a significant factor in medical stab wounds. Wang et al. (9) found in their study that the rates of medical sharps injuries were significantly higher in healthcare staff younger than 30 years of age compared to older workers. Saadeh et al. (10) also reported that the number of accidents is higher in healthcare staff under the age of 30. Kebede and Garensea (11) found that the risk of such an accident for inexperienced staff is 6.3 times; Khan et al. (12) reported that it was 5.9 times higher. In our study, the mean age of the participants who had such an accident was found to be 29.9 years. Our findings are in agreement with other study data. The reason why medical stab wounds are seen at a higher rate in young healthcare workers may be that older staff are more experienced and behave more carefully.

Wang et al. (9) reported in their study that the rate of medical sharps injuries in female healthcare workers was significantly higher than in male workers. Jahangiri et al. (13) determined that the risk of this type of accident is approximately four times higher for female healthcare professionals. In our study, it was determined that 76.8% of those who had medical sharps injuries were women. When it is estimated that there is a higher number of female workers in health workers in general, it can be thought that it is normal that the rate of women in these accidents was high in our study. However, other study findings may explain the reason why such accidents are higher in women, especially the fact that injection and blood collection are the procedures performed at the highest rate among invasive procedures, and this is mostly performed by nurses.

Medical sharps injuries can happen to health staff such as nurses who directly perform invasive procedures on the patient, as well as to all health workers who come into contact with these materials (8,10,14). Isara et al. (8) reported that nurses have a 3.4 times higher risk of medical sharps injury. Bouya et al. (15) reported the rate of medical sharps injury history as 43% in healthcare workers in their meta-analysis. Xu et al. (16) found in their large meta-analysis that



the rate of medical sharps injuries was 35% in intern nursing students. Wang et al. (9) reported that nurses were most frequently exposed to medical sharps injuries. Saadeh et al (10) found that these accidents were mostly experienced by nurses (39.7%), cleaning staff (36.3%) and doctors (10.4%). Bekele et al. (17) reported that the rate of nurses in these accidents was 49.7%, and the rate of cleaning staff was 18.2%. In the present study, 50.7% of the accident victims were nurses, 20.3% were intern medical or nursing students, 14.5% were clinical consultants, 7.2% were cleaning staff. Accordingly, nurses were exposed to half of the injuries caused by medical sharp equipments. It has been reported that needle stick injuries can be reduced by 50-60% by providing training to health staff and/or using protective designs for these materials (18). This situation shows that nurses should be trained on the careful and proper use of medical sharps or piercing materials, and standard procedures should be done and applied in order to prevent these accidents. Apart from this, the intense involvement of intern students in the accidents shows that the lack of working experience in the relevant department causes these accidents. This shows that the trainees should be given information training on the use of such sharp materials immediately after the intern student's admission and they should be monitored when they practice on the patients. It is seen that necessary precautions should be taken for other clinic workers and cleaning staff who are frequently exposed to accidents, that standard procedures should be determined and applied for the use and disposal of these materials, and that these people should also be trained.

It has been stated that the heavy workload in injuries caused by needle sticks significantly increases the risk of accident (11,19). In some studies, it has been reported that sharp medical instrument injuries are most common in wards (10,14,20). In another study, it was found that these accidents occur most frequently in outpatient clinics (21). Abalkhail et al. (22) reported that they occurred most frequently in emergency services (33.8%). In our study, it was found



that 31.9% of the accidents happened in intensive care units, 21.7% in the emergency room, 14.5% in wards, and 8.7% in operating rooms. These findings show that accidents happen mostly in the intensive units in terms of workload and the unit that invasive interventions are most frequently applied. And accordingly, standard application procedures for the use of medical sharp instruments should be determined, especially in units where patient density is high such as intensive care units and emergency rooms and where invasive interventions need to be done quickly and in large numbers. This shows that the employees of these units should be periodically trained and warned on this issue. Moreover, in these crowded environments, not being able to identify the source patient and access information about his condition leads to bad results.

It has been stated that the accidents caused by the needle sticks occur during the fitting of the caps after use. For this reason, it is known that the caps should not be tried to be reattached after the use of the needles and that the special waste bins prepared for the needle sticks should be used appropriately (19-21,23). Reattaching the needle caps are reported to increase the accident risk by 2.6 times by Gabr et al. (19), and by 4.3 times by Weldesamuel et al. (24). Sivic et al. (6), reported that needle stick injuries constituted 79% of the medical sharps injuries suffered by healthcare staff. In another study, needle stick caused 86% of accidents (21). Abalkhail et al. (22) reported that 53.8% of these accidents were with the needle stick, and 16.3% of the accidents occurred during the re-installation of the needle cap. Similarly, in this study, it was determined that 71% of the materials causing the accident were needle sticks, 17.4% were lancets, 5.8% were ampoule pieces, and the others were surgical materials. These findings show that, as expected, the needle stick is the most common cause of medical sharp accidents. It has not been determined whether the cause of the accidents was an attempt to reattach the covers or whether they occurred during the application. Mendelson et al. (21) found that 44% of such



accidents occurred during or after the destruction of the material, 8% after the application to the patient, and 28% before the disposal after the application. Ishak et al. (20), on the other hand, reported that 42% of the accidents occurred during the application to the patient, and 22% after the application. Goniewicz et al. (25) reported that 37% of these accidents occurred during application. All these findings show that healthcare professionals should be trained on the proper use of special waste bins, especially after the use of needles. In addition, checking for the lack of needle stick waste bins in the required units, replacing the ones that are full, and preventing this situation by detecting those who do not use these trash cans can reduce such accidents. Proper use and disposal of lancets other than the needle stick, proper breakage of ampoules, and proper collection in case of unsuitable and scattered breakage can reduce such accidents.

In a study, it was reported that most of the needle stick injuries occurred during the invasive application, but the accident occurred in a significant part before the application (6). However, Ishak et al. (20) found that 96% of the materials causing such accidents were contaminated meaning that they were mostly after the contact of the instrument to the patient. In our study, it was determined that all of the instruments that caused the accident were contaminated. This finding shows that the accident occurred during or after the use of the relevant material, not before. In this case, it is possible that in our study, minor accidents caused by the sharp medical equipments while it was still sterile might be ignored and not reported by the healthcare worker. The occurrence of an accident during or after the use of the material seriously endanger the health of the healthcare worker. For this reason, it is seen that necessary precautions should be taken for the careful and appropriate use of the contaminated material.

In a study (10), it was reported that needle stick injuries were found to be 48.9% in the left hand and 41.1% in the right hand, but right hand injuries in nurses were 73.1%, and left hand injuries



in cleaning staff were 88.2%. In our study, it was found that all of the injured body parts were hand injuries (62% was the right hand), 84.1% of them were fingers, and the most frequently injured finger was the right 2nd finger (27.5%). In addition, right hand injuries occurred in 66.7% of nurse injuries. These findings give an idea that these materials may have occurred more in nurses during the application to the patients, and in the other staff during the disposal or collection phase. For this reason, the implementation of procedures for the use, disposal and collection of such sharp medical equipment and the periodic provision of necessary training can reduce or prevent such accidents.

It has been reported that the risk of hepatitis B is 30-35%, the risk of hepatitis C is 3-10%, and the risk of HIV is 0.3-0.4% in medical sharps injuries (26). In this study, two of the patients were found to be hepatitis C positive and two were hepatitis B positive, one patient was suspected to be HIV positive, but HIV positivity was not confirmed by tests. These positive or suspicious patients constitute 7.2% of the total accidents. This is a very high rate in terms of medical sharps injuries, and it shows that healthcare workers are in great danger in terms of these viral diseases due to these accidents. For this reason, in addition to the measures to be taken for these accidents, when invasive procedures are performed, especially for hepatitis B and C and HIV patients, separate notifications and warnings for them before and after the procedure may reduce this risk.

In the study, it was determined that all of the staff exposed to the accident were vaccinated against hepatitis B, and hepatitis B, hepatitis C and HIV positivity were not detected in any of the tests performed on the health workers who were exposed to the accident. Although this situation is pleasing, it cannot be said that the risk of disease is not present or very low.

There were some limitations in the study. The data of 73.9% of the patients in whom the medical equipment that caused the accident was used could not be reached. This situation prevented the



calculation of the risk ratio in such accidents. In addition, the number and content of accidents that were not reported by the healthcare worker or their supervisor are unknown. Therefore, the actual analysis of such accidents may be incomplete. However, the fact that the number of accidents that could be included in the study was seen to be sufficient in the three-year period may have kept this deficiency at a minimal rate.

The findings of our study show that medical sharp instruments injuries occur most frequently with the needle sticks, that most frequently in units such as intensive care units or emergency rooms where invasive interventions are applied, that most frequently during or immediately after the application to the patient, that most frequently nurses and intern students are exposed, and that 5-10% of patients who were applied using the medical sharps may be carrying a serious blood-borne viral infection. Accordingly, the establishment and implementation of the necessary standard procedures for the proper use of such materials, the disposal and collection of waste, and the periodic training of those who are new to work or internship will be effective in reducing such accidents.

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