

# The prevalence of sharp object injuries among the operating room staff

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## Abstract

**Context:** Identification and investigation of the prevalence of factors that may cause needlestick injuries can provide a field ground about preventive planning.

**Aims:** The purpose of this study is to determine the prevalence of sharp object injuries among the operating room staff of Ahvaz educational hospitals in 2017.

**Settings and Design:** In the present cross-sectional descriptive study, attempts are made to assess the prevalence of needlestick injuries among 104 operating room staff (Bachelor of Science) of Imam Khomeini, Razi, Golestan hospitals of Ahvaz.

**Materials and Methods:** Researcher-made questionnaire was used for data collection.

**Statistical Analysis Used:** The collected data were analyzed using SPSS version 21 and descriptive statistical tests (mean, standard deviation, and relative frequency) and analytical tests (independent *t*-test, Chi-square, and Fisher test).

**Results:** The results of this study showed that suture needle is the most common cause of needlestick injury. Factors that affect the frequency of needlestick injuries include overhastiness (76%), significant workload (70.2%), and not taking precautions (63.5%). Most needlestick injuries occur during surgery (90.4%), removal of needle (19.2%), washing of contaminated instruments (13.5%), and blood drawing and injection (6.7%). The most frequent taken measure after sustaining needlestick injuries is washing of hands with soap and water (82.7%).

**Conclusion:** Due to the high prevalence of needlestick in the operating room, it is necessary to develop programs to prevent this problem.

**Keywords:** Needlestick, Operating room staff, Sharp objects

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## INTRODUCTION

Needlestick injuries are among the most common injuries caused by sharp objects that threaten everyone working

within the health and medical environment and has attracted considerable attention for increasing the working safety of the personnel.<sup>[1]</sup> These injuries can expose

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medical practitioners to blood-borne infections such as HIV, Hepatitis B, and C<sup>[2,3]</sup> and in fact, it is the main cause of such diseases.<sup>[4]</sup>

The Center for Disease Control and Prevention estimates each year 385,000 of the medical staff in America suffer needlestick injury.<sup>[5]</sup> We have no clear understanding of how people get needlestick in Iran. However, Taheri *et al.* report the prevalence of needlestick injury to be 65.5% among single individuals and 50.8% among married individuals.<sup>[6]</sup> Taghavi *et al.* report the prevalence of needlestick injury to be 84.29% among the staff.<sup>[7]</sup>

The estimated costs for evaluation and initial prevention of needlestick injuries which are caused by sharp objects of the staff in America is calculated to be 500 million Dollars. Furthermore, in this study, the costs of employee absence from work and the costs of hepatitis B and C treatment must be calculated separately, which is estimated to be roughly one million dollars. While the costs of tracking suspected injuries or suffering from these three disease are estimated to be 3000 Dollars,<sup>[4]</sup> more than 90% of infections resulting from sharp objects among medical staff occurs in countries with low-income rate and this can be prevented.<sup>[8]</sup>

Meanwhile, the operating room personnel are exposed to the greatest risk of suffering such injuries.<sup>[9]</sup> Since the operating room is an exceptional environment regarding being exposed to needlestick injury. Because scrub nurses and technicians in operating room constantly exchange objects which are sharp and infected by the patient's blood in a small environment.<sup>[10]</sup>

Although injuries by surgical knives and scalpels are less prevalent compared to needlestick, they are nonetheless considered a serious threat to the nurses, surgeon's assistants, and other operating room staff. In addition to increasing the risk of infectious diseases, surgical knives and scalpels can cause considerable damage to skin or connective tissues and thus blood-borne diseases are easily transferred. The operating room is a closed and limited environment in which the staff are often under pressure and stress and are dealing with sharp equipment for most of the time and are exposed to blood and infectious fluids from the patient's body.<sup>[11]</sup>

In developing countries, that have the highest epidemics of HIV in the world needlestick injuries are at the highest level.<sup>[11]</sup> The most common way for the viral pathogens to enter the subject's body is by penetration of sharp and needle-like objects in medical centers as well as

hospitals.<sup>[12]</sup> Using safety equipment by the staff in medical centers reduces these injuries by 80%. In addition, 90% of the injuries can be prevented by proper training and education.<sup>[7]</sup> Different studies suggest the prevalence of needlestick injury among medical staff is varied. However, such studies are rarely found in case of the operating room personnel.<sup>[13]</sup> Considering that the developing countries have 90% of these injuries, very few studies have been carried out in this regard in Iran.<sup>[14,15]</sup>

The mentioned injuries can have serious health consequences and cause mental stress for medical service providers.<sup>[16]</sup>

The studies carried out in Iran and Taiwan showed that with proper education these injuries can be reduced by a considerable amount.<sup>[17,18]</sup> Regarding the consequences and mortality rate of infectious diseases caused by injuries through sharp objects among the medical personnel<sup>[19,20]</sup> and the lack of knowledge and awareness on the part of the personnel regarding the methods for prevention of these injuries, it is necessary to examine the number of incidences, so that the managers and concerned authorities of the hospitals can plan on how to confront such incidences. Furthermore, considering that the operating room is one of the places where there is high possibility of needlestick injuries and few studies have investigated the issue, the present study aims to determine the prevalence of injuries caused by sharp objects among the operating room personnel of Medical and Educational Hospitals in Ahvaz in the year 2017.

## MATERIAL AND METHODS

In this descriptive-cross sectional study, 104 of the operating room staff in the mentioned hospital were examined. The participants were selected using census method with the goal of determining the prevalence of injuries resulting from sharp objects and their causes in the year 2017. The criteria for participating in the study included willingness, 1-year work record, holding a diploma, or BS in operating room. The criteria for exclusion from the study included partial answering of the questionnaires.

For collecting data, the questionnaire designed by the researcher was employed. Thus, after explaining the goals of the study and gaining participant's informed consent in 3 weeks, the questionnaire was distributed among the operating room staff working in various shifts and then collected.

The tool used in this study was researcher-designed questionnaire which consisted of two parts: The first

part related to the demography of the participants which included 9 items (age, gender, marital status, work experience, education, field of study, position, type of employment, and type of working shift in the operating room) and the second part related to the prevalence of injuries caused by sharp objects among the operating room personnel which included 29 items regarding the occurrence of the injury by sharp object, type of injury, type of object, position during accident, the cause of injury, the measures taken after the injury, etc. These were Yes/No questions.

To determine the validity of the questionnaire, face validity method was used. The questionnaire was distributed between 10 members of lecturers in the Faculty of Nursing of the medical University of Ahvaz, then the questionnaires were collected and were refined based on the feedback given. In order to determine, the reliability of the questionnaire pilot method was used. The correlation between the variables of the questionnaire was calculated by Cronbach's alpha at 0.79.

The present study was approved in the Research Council and the Ethical Committee of Jundi Shapur Medical University holding the research number 95S72 and Ethics code IR.AJUMS.REC.1396.219. Due to ethical considerations, the data collected from participants were kept completely confidential, and the questionnaire was given after explaining the research project and gaining informed consent. In addition, the results were published without any mention of the participants:

Data were analyzed using SPSS version 16 (SPSS Inc., Released 2007 SPSS for Windows, Chicago), after being collected and encoded. In addition, after examining the normality of the data, parametric or nonparametric statistical tests of descriptive statistics, Chi-square test, Pearson correlation coefficient test were used for data analysis in this study.

## RESULTS

Analyzing the data showed that out of the 104 studied personnel 79 were female (76%). The age range of the participants was 20–55 with the mean  $29.32 \pm 6.82$ , and the average job experience for the staff was  $6.84 \pm 6.2$  (at least 1 year and at most 30 years). A total of 54 of the individuals (51.9%) were married.

Regarding the job variable, 99 participants (95.2%) were technicians and assistants and five participants (4.8%) were nurses. A total of 20 participants (19.2%) were permanent employees, 32 participants (30.8%) were

under contract, 12 participants (11.5%) were contractual, and 40 participants (38.5%) were conscriptions. Most of the operating room staffs (86 participants (82.6%) were floating between different working shifts and 17.3% (18 participants) worked in the morning and afternoon shifts. Eighty-nine of the 104 participants (85.6%) reported needlestick injury during the past year.

The findings suggested suture needle as the most prevalent cause of needlestick the operating room personnel [Table 1], the most prevalent time of needlestick was during operations [Table 2], the most prevalent cause of needlestick injury was hastiness [Table 3], and the most prevalent action taken by the participants after needlestick injury was to wash the hands [Table 4].

**Table 1: Frequency distribution of injuries resulting from sharp objects among the operating room personnel in the educational hospitals of Ahvaz in 2017**

Type of needle stick injury	n (%)
Needle tip	52 (50)
Suture needle	77 (74)
Scalp vein set	6 (5/8)
Scalpel	39 (37/5)
Peripheral venous catheter	10 (9/8)
Others	8 (7/7)

**Table 2: Distribution of the time of needle stick injury among the operating room personnel in the educational hospitals of Ahvaz in 2017**

Time of needlestick injury	n (%)
Surgery	85 (81/7)
Venipuncture and injection	7 (6/7)
Cleaning infected equipment	12 (11/5)
Disposing the needle	18 (17/3)
Others	2 (1/9)

**Table 3: Distribution of needlestick injury based on the cause among the operating room personnel in the educational hospitals of Ahvaz in 2017**

Cause of injury	n (%)
Hastiness on task	72 (69/2)
Lack of protective and cautionary equipment and facilities	21 (20/2)
Problems with equipment quality	13 (12/5)
Carelessness	60 (57/7)
High work load	66 (63/5)
Others (specify)	9 (8/7)

**Table 4: Distribution of actions taken after needlestick injury among the operating room personnel in the educational hospitals of Ahvaz in 2017**

Actions taken after incidence	n (%)
Washing with soap and water	77 (74)
Putting pressure on the site of injury	25 (24)
Disinfect with alcohol	32 (30/8)
Washing the eyes and mucus with plenty of water	38 (36/5)
Sending blood sample to the laboratory	52 (50)
Disinfect with povidone-iodine	59 (56/7)
Others	6 (5/8)

Using independent *t*-test, a meaningful relation was found between working experience and needlestick injury ( $P = 0.0001$ ), in a way that the personnel with better working experience had less needlestick injuries than personnel with less working experience. A meaningful relation was found between age and the needlestick injury ( $P = 0.001$ ). The younger individuals were injured by needlestick more [Table 5].

No meaningful relation was found between gender, marital status, employment status, and the working shift and needlestick injury [Table 6].

## DISCUSSION

The findings of this study demonstrated that 85.6% of the operating room personnel had suffered injuries while on duty in the past year had suffered injuries while on duty. This percentage was 74.3% in the study conducted by Heydari and Shahbazi on Borojen and Lordegan Hospitals<sup>[21]</sup> and 64.9% in the study conducted by Rakhshani *et al.* on Medical centers of Medical University of Zahedan.<sup>[22]</sup>

The present study suggested, regarding gender, there is no difference in the level of exposure to needlestick injury, which is in accordance with most of the similar studies. However, in the study conducted by Shah *et al.*, as high as, in compared with females was reported to be

**Table 5: Distribution of age and work record variables divided into two groups with and without record of needlestick injury**

Variable	Mean±SD		P
	With record of needlestick injury	Without record of needlestick injury	
Age	28.4±5.8	34.7±9.6	0.001
Work record	5.9±5	12.2±8.8	0.001

SD: Standard deviation

**Table 6: Distribution of demographic and clinical variables divided into two groups with and without record of needlestick injury**

Variable	With record of needlestick injury (89 individuals)		Without record of needlestick injury (15 individuals)		P	Statistical test
	Amount	Percentage	Amount	Percentage		
Gender						
Female	67	75.3	12	80	0.1	Fisher's exact test
Male	22	24.7	3	20		
Marital status					0.270	
Single	45	50.6	5	10		
Married	44	49.4	10	66.7		
Employment status					0.459	Chi-square test
Permanent	16	18	4	26.7		
Under contract	26	29.2	6	40		
Contractual	10	11.2	2	13.3		
Conscription	37	41.6	3	20		
Working shift					0.536	
Morning	11	12.4	3	20		
Afternoon	4	4.5	0	0		
Night	00	00	00	00		
Floating	74	83.1	12	80		

twice the exposure level in males, and the reason could be more responsibility and duties of women.<sup>[23]</sup> However, considering that 76% of the studied samples were female, the results might have been affected by this. Maybe if the male participants were more, the results would have been different.

Regarding the type of employment, permanent employees (18%) and after that contractual employees (40.4%) had the lowest record of needlestick injury which has no meaningful relation with needlestick injury record. In this sense, the study conducted by Ghaneii Gheshlagh and Fallahi Khoshknab, demonstrated.<sup>[10]</sup> Regarding the employment status, contractual nurses (47.2%) had the highest needlestick injury record after.

In addition, the highest amount of needlestick injury was for the personnel working in floating shifts (83.1%), which is in accordance with the study by Smith. He concluded that working in different shifts against working in regular shifts, is one of the most important factors affecting the prevalence of such incidents.<sup>[24]</sup> And after that, the personnel working regularly in morning shift (12.4%) had the most incidents. Adib-Hajbaghery and Lotfi<sup>[25]</sup> concluded most incidents occur in morning shift. The reason could be related to related to higher reception of patients requiring operation and the higher work load of the staff in the morning shift. Nevertheless, a meaningful relation was not found between the employment status and the type of working shift and the needlestick prevalence.

The results of this study suggested the suture needle as the most common cause of injuries, which is similar to the results of Bakaeen *et al.*<sup>[26]</sup> However, Rakhshani *et al.*, and Heydari and Shahbazi reported the infected needle tip as



causing most injuries.<sup>[21,22]</sup> The reason for this is probably related to the unit on which the study was carried out. The present study focused on the operating room where there is less venipuncture and more dealing with suture needle but in the case of the study by Rakhshani and Heydari, the focus was on all the treatment units in a hospitals. There is usually much more injection and venipunctures carried out and consequently the injuries cause by infected needle tips is more often seen.<sup>[27]</sup>

In the present study, from the perspective of the hospital staff, the affecting factors in needlestick injury included hastiness during work (76%), high workload (70.2%), ignoring precautions (63.5%). However, in the study of Rakhshani *et al.*,<sup>[22]</sup> hastiness was responsible for 25% and high workload was responsible for 39.5% of the injuries. Considering the close relation between high workload and hastiness, it can be argued the ratio of staff to bed in hospitals must meet the standards so that density of tasks will not endanger the well-being of the staff. In addition, empowering the staff in managing time and avoiding work overload can deal with this problem to a large extent.

Regarding the place of injury, most injuries happened during operations (90.4%), 19.2% when disposing of the needles, 13.5% when cleaning infected equipment, and 6.7% during venipuncture and injection. In a study carried out in Pakistan, 50% of needlestick injuries happened during venipuncture and injection.<sup>[28]</sup> The reason for this difference is difference in research environment, since in the present study only operating room personnel where studied.

Regarding the measures taken, needlestick injury, the most common action was washing with soap and plenty of water (82.7%) and then decontaminating with povidone-iodine (62.5%) and the least-resorted-to action was putting pressure on the site of injury (28.8%). In a study carried out in Kurdistan in 54% of the cases, washing measures were resorted to.<sup>[29]</sup> However, in a study conducted in Kashan, more than 80% of the time the required postinjury measures were not practiced or not fully practiced and in half of the cases regarding contamination, the required tests were not carried out.<sup>[30]</sup>

In the present study, a meaningful statistical relation was found between job experience and needlestick injury. The personnel with more working experience had less needlestick injuries. In various studies,<sup>[31-33]</sup> lower working experience was regarded as a contributing factor in needlestick injuries. In addition, there was a meaningful relation between the personnel's job experience and stick

injury during cleaning of the infected equipment. Thus, the personnel with lower working experience were more exposed to injury. Therefore, it can be argued that working experience is an important factor in preventing the risk of needlestick injury.

This is in line with the findings of Ganguli *et al.* which described that with increase in age, the awareness of HIV occurrence as a result of needlestick injury increases too.<sup>[34]</sup> In addition, Dement *et al.* introduced young age as a common cause of injuries.<sup>[35]</sup> Furthermore, in the study by Rezaei and Smith, younger age was mentioned as a risk factor pertaining to needlestick injury.<sup>[31,36]</sup> In the study carried out by Cho, older age was considered as a protective factor against needlestick injury.<sup>[37]</sup>

Thus, in general, it can be said that incidents resulting from human error, especially in the case of mental tasks, does not happen just because of unawareness of the individual. The focus of the individual fails momentarily in a way that he/she forgets what they already knew or read about, even tasks they have already performed. This is more often seen in certain professions such as medicine, nursing, etc.

Thus, the studies suggest a written comprehensive program to prevent injuries from equipment with sharp points in hospitals. This program will organize the processes of diagnostic, screening, reporting, and tracking in addition to assuming responsibility for educating the staff.<sup>[38]</sup>

Among the limitations of the present study is the lack of accuracy on the part of participants responding to the study. Such that the process of needlestick injury may not be remembered by all individuals, thus the results of this examination might be less than the actual estimated amount.

## CONCLUSION

According to the results of the present study, it seems essential to educate managers and nurses regarding the injuries resulting from objects with sharp points, especially new recruits, and it would serve to prevent such injuries. Furthermore, considering the high prevalence such problems, it is suggested that all hospitals and medical centers have an injury registry log so that the details of all injuries are recorded and examined by the contamination control committee at least once a year and the required cautionary measures for decreasing the number of injuries is then transferred to the hospital staff. Decreasing invasive methods, as much as possible, creating a safe environment, and increasing the ratio of staff to patients, can also decrease the occurrence of incidences.

### Conflicts of interest

There are no conflicts of interest.

### Authors' contributions

All authors contributed to this research.

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