

Frequency of sharp injuries and its related factors among high-risk wards staff

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Abstract

Context: Blood-borne infections are a serious problem of health systems. Most of these infections are caused by sharp injuries.

Aims: This study was conducted to determine the frequency of sharp injuries and its related factors among high-risk wards staff.

Setting and Design: This cross-sectional study was conducted on high-risk wards staff at educational hospitals of sari in 2018.

Materials and Methods: In this study, 306 high-risk wards staff who were working in educational hospitals of sari district for more than 1 year completed a self-administered questionnaire.

Statistical Analysis Used: Data were analyzed using descriptive statics, independent T- test and Chi –square.

Results: All participants had a history of sharp injuries during their work experience, and in the last year, from the 306 participants in this study, 250 (81.7%) had at least one Needle Stick Injuries (NSI) event. in 66.7% of cases in the surgical technologists, suture needles were reported to cause NSI. While, 61.1% of nurses, 61.4% of anesthesia personnel and 45.5% of physicians, reported syringe needles as the main cause of injury. Suture and stitch needle was the most important cause of injury. The result shows that there is no significant relationship between work experience and gender with NSI rate.

Conclusions: The results of this study indicate a high prevalence of NSI in personnel of high-risk wards, especially in the operating room. Due to the excessive use of needles and needle stitches in these areas, the incidence of them is high. It is recommended that safety measures be taken in the use of sharp equipment to reduce the complications in case of an accident.

Keywords: High-risk wards, Occupational infections, Operating room, Sharp injury

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INTRODUCTION

Health-care workers (HCWs) are at risk of many injurious factors, such as biological, chemical, physical, and

psychological. One of these hazards is “needlestick.”^[1] Needlestick is defined as a penetrating wound caused by a sharp object, possibly contaminated by another person’s secretions.^[2] Approximately in the United States, more than

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600–800,000 injuries from sharp objects occur annually in medical staff.^[3] The results of a study conducted in 2011 in China suggest that each HCW will be injured by sharp objects at least four times in a year.^[4] In spite of comprehensive precautions, the possibility of occurrence of needlestick injuries (NSIs) is unavoidable. These events can lead to the transmission of viral infections such as AIDS, hepatitis C and hepatitis B (HB) to HCWs, patients, and their families. In this regard, the risk of transmission of HB from 30% to 60%, hepatitis C from 10% to 50%, and AIDS is estimated at 0.3%.^[5,6] The result of different studies indicates that the most common cause of AIDS in HCWs is the transmission of infection through NSI.^[7,8]

The main factors that increase the transmission risk of infections include deep wounds, visible blood on devices, hollow-bore blood-filled needles, the use of a device to access arteries or veins, and the high viral load status of patients.^[9]

The rate of injury is different according to the type and conditions of work, specialty, and type of ward.^[4] The operating rooms, intensive care unit (ICU), and emergency department, due to the special and critical conditions of patients, different stressors, and teamwork of activities that may increase the risk of injuries, they are more likely to be injured by sharp objects. For example, the surgical team is at high risk of NSI due to frequent contact with the secretions and blood of patients and sharp objects.^[10,11] The results of the studies indicate that the highest prevalence of NSI is related to the operating room, and its staff has the most contact with sharp objects such as needles, suture needles, and surgical blades.^[12,13] A study in China suggests that emergency staff and ICU staff are more likely to NSI.^[4] Moreover, in another study conducted in Iran, the emergency department is described as the most dangerous ward.^[14]

Despite the prevalence of sharp injuries among health-care providers, evidence suggests that usually due to “lack of time,” “lack of belief in the transmission of infection through sharp objects,” and defects in the control systems of infection, NSIs are not reported and no specific action is taken to follow them.^[15] Underreporting these injuries threatens the health of the personnel and the extent of the problem remains unknown.^[16]

Nowadays, infections caused by needlestick and hospital wounds are great importance and have challenged the health system of countries. Increasing the number of hospitals, the appearance of reemerging and emerging diseases, the increasing incidence of microbial resistance, and the need for a diverse range of medical services will make inevitable the emergence of healthcare-associated infections.^[17]

Therefore, the overall goal of controlling hospital infections is to minimize these infections as much as possible. Because these infections, in addition to mortality and complications, increases the cost of health-care services.^[18]

Regarding the importance of the issue and considering the uncertainty of the needlestick occurrence and the reasons for the failure to report the cases of damage in high-risk wards, the current study aimed at determining the frequency of sharp injuries and its related factors in the staff of the operating rooms, ICU and emergency departments of Mazandaran University of Medical Sciences hospitals in 2018.

MATERIALS AND METHODS

The present study is a cross-sectional study that focuses on determining the frequency of NSIs and its related factors in the staff of the operating rooms, ICU, and emergency departments. HCWs participated in the study included doctors, surgical technologists, nurses, and anesthesia technicians who were on duty during the study. The study was carried out over 4 months from July to October 2018. The informed consent of the participants, having at least 1 year of experience in the clinical setting and working in the operating rooms, ICUs (ICU, neonatal ICU, and critical care unit), and emergency departments were the inclusion criteria for the study. Moreover, those who did not have the consent to participate in the study and nursing staff who were in general administrative positions were excluded from the study because they were not involved with sharp objects.

Data collection was done using a researcher-made questionnaire and through convenient sampling. The dissemination and collection of the questionnaires were done manually.

The validity of this questionnaire was done using the face and content validity, i.e., the questionnaire was given to 10 faculty members of Mazandaran University, and after collecting the comments, the relevant comments were applied, and by considering their correctional comments. The reliability of the questionnaire was determined using Cronbach's alpha test ($r = 0.82$). As well as the validity of the questionnaire previously reviewed and approved by Ghanei Gheshlagh *et al.*^[19] The reliability of the questionnaire was obtained 78% by the test-retest method after completing the questionnaires by 20 nurses.

The questionnaire was made up of the following two parts: the first part of the questionnaire included

demographic information and the second part of the questionnaire contained 25 questions that examined the history of injuries with sharp objects, time of exposure, the type of damaging device, the possible cause of injury, postexposure prophylaxis, the vaccination status, the attitude of the personnel toward the transfer of infectious agents through needlestick and causes of nonreporting of NSI.

This study was approved by the Ethical Research Committee of Mazandaran University of medical sciences, and the questionnaires were distributed among the participants without mentioning the name in the study.

Data entered into SPSS Software (IBM company, Armonk, New York, USA), version 20 and were analyzed using descriptive statistics, independent *t*-test, and Chi-square.

RESULTS

The present study was conducted on 306 personnel of operating room, ICU, and emergency department of Sari teaching hospitals in 2018. The results of the demographic data survey are shown in Table 1. Ninety-seven (31.7%) of the participants were male and 209 (68.3%) were female. Most participants (79.4%) had a bachelor's degree. The mean age of participants was 35 ± 7 years, and the average work experience of them was 10.7 ± 6.3 years.

Based on the differentiation of expertise, most of the participants in this study were nurses. Moreover, in terms of the department type, most of the participants were from the operating room ward [Table 1].

All participants in this study had a history of sharp injuries during their work experience. However, in the last year, from the 306 participants in this study, 250 (81.7%) had at least one NSI event [Table 2].

One hundred and forty (45.8%) of the samples reported washing with soap and water as the first and most common action immediately after the injury [Table 3].

The most common causes of NSI were syringe needles (46.4%) and suture needles (20%) [Table 4].

The results of the study showed that there was a significant difference between the specialty and the type of damaging object of NSI ($P = 0.001$). So that in 66.7% of cases in the operating room technologists, suture needles were reported to cause NSI. While 61.1% of nurses, 61.4% of anesthesia personnel and 45.5% of physicians reported syringe needles as the main cause of injury. 85.7% of

Table 1: Frequency distribution of participants according to demographic characteristics

Variables	Frequency (%)
Gender	
Female	209 (68.3)
Male	97 (31.7)
Education	
Associate degree	11 (3.6)
B.Sc	243 (79.4)
M.Sc	28 (9.2)
Ph.D	24 (7.8)
Occupational groups	
Surgical technologist	69 (22.5)
Nurse	144 (47.1)
Anesthetist	57 (18.6)
Physician	22 (7.2)
Perfusionist	14 (4.6)
Department type	
Operating room	168 (54.9)
ICU, CCU, and NICU	86 (28.1)
Emergency	52 (17)

ICU: Intensive care unit, CCU: Critical care unit, NICU: Neonatal intensive care unit

Table 2: Comparison of results of needlestick injury surveillance based on the number of needlestick injuries, root cause of needlestick injuries, work shift and reporting

Variables	Frequency (%)
Number of NSIs	
0	56 (18.3)
1	144 (47.1)
2-5	81 (26.5)
5-7	12 (3.9)
7<	13 (4.2)
Main cause of NSIs	
Suturing	74 (24.2)
Withdrawing medication	72 (23.5)
Needle recapping	68 (22.2)
Venipuncture	60 (19.6)
Others	32 (10.5)
NSIs reported	
Always	176 (57.5)
Often	56 (18.3)
If the patient was infected	68 (22.2)
Never	6 (2)
Work shift	
Morning	174 (56.9)
Afternoon	56 (18.5)
Night	64 (21)
No answers	12 (3.6)

NSIs: Needlestick injuries

Table 3: Frequency distribution of the first action after the needlestick injury

Action type	Frequency (%)
Washing with soap and water	140 (45.8)
Disinfection with alcohol and betadine	73 (24)
Pressure on damaged area	39 (12.7)
Gloves replacement	37 (12)
Others	17 (5.5)

the perfusionists mentioned the connections on the cardiopulmonary bypass pump as the main cause of the injury.

Table 4: Frequency distribution of needlestick by type of damaging object

Device involved	Frequency (%)
Syringe needles	142 (46.4)
Suture needles	61 (20)
Ampoules	34 (11)
Angiocath	32 (10.5)
Surgical blade	22 (7.2)
CPB pump connections	13 (4.2)
Others	2 (0.6)

CPB: Cardiopulmonary bypass

Table 5: Occupational safety training and preventive measures against needlestick injuries among health-care workers

Item	n (%)	
	Yes	No
Vaccinated against HBV	280 (91.5)	26 (8.5)
Trained for infection prevention and control	229 (74.8)	75 (25.2)
Use safety boxes for disposal	279 (91.2)	27 (8.8)

HBV: B hepatitis virus

In this study, 229 (74.8%) participants had completed infection control and prevention training course. Two hundred and eighty (91.5%) participants were vaccinated against HB virus (HBV) [Table 5].

The results of the study showed that suturing (24.2%), withdrawing medication (23.5%), and needle recapping (22.2%) were the most common process that caused injury in personnel of high-risk wards [Table 2].

One hundred and seventy-four (56.9%) of the victims with sharp objects had stated that their damage had occurred in the morning shift [Table 2].

In this study, 176 (57.5%) of the participants stated that they always inform NSIs to the infection control unit and 68 (22.2%) of the participants stated that the NSI was only reported to the infection control responsible that the patient was infected [Table 2].

The most frequent reasons of not reporting the injury to the infection control responsible were the “no previous use of the damaging object (46.4%)” and the “confident of absence of any serious infection in patients (23.5%),” respectively.

In this study, 41.5% of the participants stated that HCWs are usually not interested in the diagnostic and therapeutic process after NSI. As well as 70.9% of participants stated that the use of gloves prevents the damage or transmission of infectious agents and 79.5% of the participants said that the risk of infectious diseases in the victims is high.

DISCUSSION

The results of this study showed that during the last year,

the frequency of NSI was 81.7% in personnel of high-risk wards. In some studies, such as Aghabeigi *et al.*, Abdifard *et al.*, and Nasiri *et al.*, the frequency of NSIs was 76.6%, 73.3%, and 76.7%, respectively, which is consistent with the present study.^[20-22] The incidence of sharp injuries appears to be higher in developing countries. Presumably in Iran, one of the main reasons is the shortage of personnel.^[23]

In the present study, the highest rate of sharp injuries was reported in the operating room department. The results of some studies, such as Cho *et al.*, in South Korea, Beker and Bamli in Ethiopia, Yoshikawa *et al.*, in Japan, are consistent with this study and show that the frequency of NSIs in the operating room is higher than other wards.^[13,24,25] In addition, a study that conducted in Iran reported a higher incidence of NSIs in the operating room than other wards^[26] which is consistent with the present study. Probably, teamwork and use of a variety of sharp objects in small area, long-term work, and occupational stress, increases the likelihood of skin damage in the personnel of operating room.^[27,28] The use of hands-free technique when turning over the sharp objects during surgery is recommended to prevent and reduce NSI in the operating room.

The results of this study showed that syringe needles and suture needles caused the highest rate of injuries, which was consistent with the results of Nasiri *et al.* and Heidari (2011) study.^[22,29]

The results of this study showed that suturing is the most common damaging process, which is consistent with the results of Ghanei Gheshlagh *et al.*^[19]

In this study, there was no significant difference between gender and NSI exposure, which is consistent with Heidari (2011) study.^[29] However, it is inconsistent with results of Shah *et al.* and Aghabeigi *et al.*^[20,30] In the study of Shah *et al.*, NSI rates in women have been reported twice as many as men, which presumably has been attributed to more women's engagement and responsibility.

In addition, the findings of this study showed that there is no significant relationship between work experience and NSI rate, which is consistent with the results of Thakur *et al.* study.^[31]

The result showed that the performance of majority of the participants was relatively suitable regarding the first action after NSI. In this study, most participants mentioned washing the hands with soap and water (45.8%) and

washing the hands with alcohol and betadine (24%) as the first action after NSI. Which is consistent with Vahedi *et al.*^[32] and is inconsistent with the results of Abdifard *et al.*,^[21] which 62.2% of samples mentioned their first action after sharp injury as “pressing the wound site.” The studies show that pressing wound for bleeding does not decrease disease transmission risk, and it also contaminates the environment.^[33,34]

In the present study, the highest NSI rate occurred in the morning shift, which is consistent with the results of the Parks *et al.*, Ghanei Gheshlagh *et al.*, and Mbaisi *et al.* study.^[19,35,36] Presumably, the reason for the high rate of NSIs in the morning shift can be attributed to the high admission of patients undergoing surgery and the high volume of work in the wards in the morning shift.

In this study, 91.5% of the participants were vaccinated against HB infection. This high rate of vaccination has also been reported in most studies.^[37-39] In HCWs with uncompleted vaccination, HBV immunization and monitoring of immune status will ensure maximum protection for HCWs of HBV transmission.^[40]

NSI reporting is important for prevention and treatment and lead to postexposure prophylaxis and detect early changes in antibodies in the serum. However, sometimes, health-care providers do not report and do not follow-up. In this study, the most common reasons for not reporting the damage to the infection control unit were the “no previous use of the damaging object” and “confident of absence of any serious infection in patients,” which is consistent with the results of Shiaho *et al.*, and Azadi and Anosseh studies.^[16,41]

Self-reported data collection over the past 12 months may be a limitation of the study as it might introduce recall bias.

CONCLUSIONS

The high prevalence of needlestick in this study emphasizes the importance of promoting awareness, training, and education for HCWs as a part of preventive strategies. To reduce the incidence of these injuries, managers of health centers should consider preventive approaches such as maintaining safety measures in work environment, providing complete vaccination coverage, and a reliable reporting system to confront with this problem. In addition, in the operating room, the surgical team can reduce the occurrence of injuries using the hands-free technique and disposing of sharp objects.

Conflicts of interest

There are no conflicts of interest.

Authors' contribution

All authors contributed to this research.

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