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## Frequency and damage caused by sharp instruments and needle sticks among staff in a university hospital, Kerman, Iran

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### ABSTRACT

**Objective:** To determine the frequency and causes of injuries from sharp instruments contaminated by blood in hospital staff.

**Methods:** The study was cross-sectional and conducted at an educational hospital supervised by Kerman University of Medical Sciences in 2018. Using a researcher-made questionnaire, we determine the frequency and causes of injuries from sharp instruments contaminated by blood in 142 hospital staff.

**Results:** Of the 142 patients, 68 persons (48%) did not have a history of needle stick injury, but 74 persons (52%) had suffered needle stick injury 1 to more than 5 times. Among those who suffered a needle stick, 74.3% were trained, while 70.7% of those who did not suffer needle stick had been trained. The results indicated that the needle was the most common sharp instrument causing needle stick injury.

**Conclusions:** The study showed a high prevalence of needle stick injury among hospital personnel specifically in ICU, orthopaedic and surgery departments. Supportive measures such as improving injection practices, modification of working schedule, planning training programs targeted at using personal protective equipment, and an adequate number of safety facilities for the effective prevention of needle stick injury incidents are needed.

## 1. Introduction

Health care workers have been particularly exposed to occupational diseases for the occupation type and long-time contact with patients and risk of transmission of pathogens by blood and secretions to health care personnel has particularly attracted attention over the past two decades. Since the late 1940s, the transmission of viral hepatitis has been highlighted[1]. During the past 25 years, these diseases were transferred from patients to health care providers and

vice versa, and it was also possible to transfer pathogens among patients[2]. 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[3].

Injectable lesions resulting from sharp and blood-borne infections or secretions of the patients are great dangers for health care centers

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workers. These workers are at risk of major viruses including HIV, hepatitis B and hepatitis C, which can cause acute and chronic diseases even deaths in individuals with a history of the disease[4]. The most commonly reported pathway for viral pathogens aforementioned is the sharp objects in health centers and hospitals[5]. About 80 to 90 percent of the transmission of infectious diseases to health care centers workers is related to the needle threading[1].

Nurses accounts for the major part of the medical staff, therefore the higher rate of exposures can be observed among this group[5]. The working staff in operation rooms, emergency units and laboratories have the highest exposures to the pathogens which frequently threaten their lives[6]. Needlestick injuries can cause fear, anxiety and mental stresses among the health staff in addition to imposing high-cost burdens on the health systems[7]. The estimated annual costs for tests and the treatment of sharp injuries vary from \$6.1 million in France to \$118–591 million in the USA[8]. The Occupational Safety and Health Administration estimates that 6.5 million health workers in the United States have the risk of exposure to blood-borne pathogens[9].

Infectious diseases caused by sharp objects injuries in the medical center have significant impacts and deprive a large part of the human resources of the hospital environment of the services. Regarding this fact, the correct assessment of the rate and causes of injuries should be performed to adopt preventive methods and reduce such injuries. Considering studies on sharp objects injuries are few in Kerman city, we carried out the study to investigate the frequency and damage caused by sharp instruments and needle sticks in personnel of one of the hospitals of Kerman city.

## 2. Materials and methods

This study was approved by the Ethical Committee of the Kerman University of Medical Sciences before the collection of data. The ethical approval code is IR.KMU.REC.1393.124. A cross-sectional design was employed in 2018.

### 2.1. Respondent characteristics and setting

The target population of this study was 212 employees who worked in the healthcare field and were recruited from wards of an educational hospital including ICU units, department of orthopaedics, neurosurgery, angiography, emergency, surgery, eye, heart, radiology, rheumatology, CT scan, CCU, nephrology, and operating room. Confidentiality was kept by putting no name or other personal information in the questionnaires. All participants were fully informed regarding the purpose of the study, and informed consent was obtained from each participant. A total of 212 questionnaires were distributed, and 163 questionnaires were returned from which 21 were incomplete. And the overall response rate was 66.9%.

### 2.2. Inclusion and exclusion criteria

Inclusion criteria were having at least one years working experience in hospital and direct contact with patients. Exclusion criteria included lack of consent for participation in the study and incomplete questionnaires.

### 2.3. Data collection

For data collection, the research team initially developed a questionnaire in two parts. The first part included questions about demographic characteristics of employees including personal information (age, sex, workplace, job position, and work experience), protective strategies, immunization with hepatitis B vaccine, and how to deal with injuries. The second part has been filled in only by the staff with the history of needle injury or sharp objects (a year before the study) and included injury characteristics and post-injury measures.

The validity of this questionnaire was done using the face and content validity, so the questionnaire was given to 10 faculty members of Kerman University. The relevant comments were considered and applied. The reliability of the questionnaire was obtained (Cronbach's alpha=0.75) after completing the questionnaires by 38 hospital personnel.

### 2.4. Data analyses

Descriptive statistics such as frequency distribution and percentages were used.

## 3. Results

Of the 142 studied individuals (21.6% female and 78.4% male), 12.2% are physicians, 64.9% were nurses and 22.9% were operating room staff. The result showed of the 142 patients, 68 persons (48%) did not have a history of needle stick injury, but 74 persons (52%) had suffered needle stick injury 1 to more than 5 times. A total of those who suffered needle stick injury 40.5% of were 1-30 years old, 32.4% of 30-38 years old, and 27.1% over 30 years. Also the result showed 36.5% of these individuals who suffered needle stick injury had a career history of 1 to 7 years, 33.8% between 7 to 13 years and 29.7% more than 13 years. In terms of working hours per month, 32.4% of individuals who suffered needle stick injury worked for 1-170 h, 35.1% worked 170 to 200 h and 32.5% more than 200 h a month. The results indicated the agent most commonly that caused the needle stick is needle. Other devices caused needle stick are listed in Table 1. Frequency of participants with needle stick injury and without needle stick injury from different departments shows in Table 2. It was found that most people had needle stick worked in ICU departments. The result of this study showed among those who suffered needle stick, 74.3% were trained, while 70.7% of those who did not suffer needle stick had been trained.

**Table 1.** Different devices cased needle stick injury.

Devices	Number (%)
Needle	50 (67.6%)
Angiocate	17 (23.0%)
LP Needle	1 (1.4%)
Bone marrow needle	1 (1.4%)
Suture needle	15 (20.3%)
Broken vial	18 (24.3%)
Razor blade	7 (9.5%)
Lancet	1 (1.4%)

**Table 2.** Participants with needle stick injury and without needle stick injury.

Groups	Number	Percent
Needle stick injury (n=74)		
ICU	21	28.4
Orthopedic	15	20.3
Nerves	4	5.4
Angiography	4	5.4
Emergency	2	2.7
Surgery	9	12.2
Eye	6	8.1
Heart	4	5.4
Radiology	1	1.4
Rheumatology	4	5.4
CT scan	1	1.4
CCU	2	2.7
Nephrology	1	1.4
Non-needle stick injury (n=68)		
ICU	16	23.5
Orthopedic	17	25.0
Nerves	1	1.5
Emergency	12	17.6
Surgery	21	30.9
Radiology	1	1.5

#### 4. Discussion

The outcomes of the current study indicated that 52.1% of hospital staff suffered needle stick injury once during the course of one year. Previous studies conducted in Iran and other developing countries have also reported a high prevalence of needle stick injury among hospital personnel. For example, the incidence of needle stick injury among a sample including 267 nursing workers in a university hospital in Tehran, Iran[10] was 97 cases (63.3%). In a study conducted by Heidari *et al.* in Boroujen and Lordegan Hospitals in 2011, 74.3% of workers reported needle stick injury at least once[11]. Similarly, an Egyptian study of 273/371 nurses (62.3%) reported at least one needle stick injury in the previous 12 months[12]. The reason for the high prevalence of needle stick in these studies may be related to less stringent precautions by the staff, or the varieties types of the studies, the combination of occupational categories or sample size, and the duration of the design and records of the employment of medical staff.

According to the frequency of the injuries, the outcomes of this study showed that the needle had the highest percentage of injuries, which are consistent with the results of the Mahmodi *et al.* and

Jorvand *et al.*[13,14]. Blood transfusions and injections were common in the hospital different departments, and as a result, it is expected that there will be more damage from the infected needle tip.

In the forthcoming study, the highest rate of needle stick injury is related to individuals with 170 to 200 h of work per month. In this regard, Aghabeigi recommends increasing the resting time of staff in hospitals. Increasing the resting time of employees and avoiding the accumulation of tasks can solve this problem widely[15].

In this study, there was a difference in needle stick injury patients in terms of gender. It was consistent with the result of Aghabeigi *et al.*[15] and Rapisarda *et al.*[16], who reported that the female had exposure twice as high as the male, and that was attributed to women's engagement and responsibility. But it contradicts the study of Heidari *et al.*[11].

In the current study, the prevalence of occupational exposure was higher in those with a history from 1 up to 7 years, which was similar to that of Yaghoobi *et al.*[17]. Study of Kevitt *et al.* has identified younger age as one of the most common causes of injury[18].

Results of this study showed in the case of vaccination against hepatitis B, 91.4% of study participant has been vaccinated. This rate was 98% in Heidari's study[11]. But in the Hashemi study, it was just 36%[19]. Perhaps the reasons caused this difference includes health promotion, increased facilities and capabilities, emphasizing the importance of applying methods confronting with hepatitis B and training in this area. For promoting the protection of employees against occupational infections, the Center for Disease Control of the Ministry of Health in 2006 announced the strategy for hospital infections, including following four main purposes: (1) Reducing high-risk behavior of employees to prevent injuries caused by sharp devices; (2) Increasing the level of personnel safety while working with sharp instruments; (3) Collecting and disposing of contaminated waste; (4) Changing behavior and attitude of community members and physicians towards the demand and prescribing of injectable drugs[20].

One of the restrictions of the current study is the inaccuracy in the responsiveness of the issues, recalling all cases of needle sticking over the past 1 year may be impossible for all individuals, so the results may be less than the actual amount. Therefore, it is recommended that hospital personnel should be required at the end of daily work to write and record self-reported work-related injuries in special handbooks and to registrate in the Hospital Risk Committee Office to make it easier to access such information for performing of research in future.

The study showed a high prevalence of needle stick injury among hospital personnel specifically in ICU, orthopaedic and surgery departments. Supportive measures such as improving injection practices, modification of working schedule, planning training programs targeted at using personal protective equipment, and providing an adequate number of safety facilities such as puncture-resistant disposal containers and engineered safe devices are essential for the effective prevention of needle stick injury incidents among the studied personnel.

## Conflict of interest statement

The authors report no conflict of interest.

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