

## ■ Original article

## Risk factors of needle stick and sharp injuries among health care workers

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### Abstract

**Background and Purpose:** Needle stick injuries (NSIs) remains a significant risk of occupational transmission of Blood-borne pathogens in health care workers (HCWs). This study aimed to determine the “Risk Factors of Needlestick and Sharps Injuries among Healthcare Workers in Naft hospital, Mahshahr”.

**Methods:** A descriptive-cross sectional study carried out on 135 HCWs in Naft hospital in Mahshahr, in 2011-12. Data were collected by a self-administered questionnaire. The first part included questions about demographic characteristics. The second part of the questionnaire consisted of 11 items related to the sharp instrument injuries. After confirming content and face validity, reliability of the questionnaire was determined to be 0.88, using Cronbach's alpha test. Data analysis, including descriptive and analytical statistics was performed using SPSS Ver. 16. A  $P \leq 0.05$  was considered statistically significant.

**Results:** The mean age of the participants was 33.83 +/- 6.22. (24-50) years old and 69.3% were females. The incidence rate of NSI was 64.1%. Recapping of needles (25.8%) and IV access (19.7%) were the most common actions resulted to exposure. Exposed people believed that the most important reason for NSIs was patients unpercaution (38.5%), and crowdedness (33.8%). The most injuries were occurred in the emergency department(21%) and Internal ward(16.1%). 80.8% of nurses had been vaccinated against hepatitis B virus. There weren't statistically significant differences in demographic variables with NSIs.

**Conclusion:** The present study showed a high occurrence of NSI among HCWs in this Mahshahr hospital. Training in handling and disposal of sharps, preventing and reporting strategies are needed to increase safety practices for HCWs.

**Keywords:** Needle stick Injuries, Health care Workers, Risk Factor, Prevalence, Recapping Practices

### Introduction

Occupational exposure to blood means sticking sharp objects into the body mucosa contact with blood secretions (1). Percutaneous injury with blood and body fluids through contaminated needles and sharp and cutting tools is one of the most important occupational hazards, which is the cause of mortality and morbidity due to infection with blood transmitted pathogens among health care workers (HCWs) (2). Each of HCWs working with sharp and cutting tools or equipments, such as scalpels, needles and blood sample collection devices or phlebotomy devices are at a greater risk

due to their nature of the job (3). Needle stick and injuries (NSIs) resulting from sharp and cutting tools cause the risk of transmitting more than 20 types of blood-borne pathogens such as hepatitis B, C and human immunodeficiency virus (HIV) (4). Despite the importance of the issue, no accurate and official statistics is available from previous studies on the NSIs. Because there are not appropriate and precise standard occupational reporting systems (5).

World Health Organization (WHO) estimates that about 3 million of HCWs are at risk of

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occupational exposures to blood-borne viruses each year, and 90% of these infections occur as a result of exposures in developing countries (6). In another report, the risk of transmission through serum after a percutaneous injury with a patient with hepatitis B was reported between 6% and 30%, and depending on the HBe Ag level, it was from 1% to 3% for hepatitis C and approximately 0.3% for HIV (7).

Studies have shown that injuries caused by sharp and cutting tools occur mostly among the followings: female employees, the younger, the whites, anesthesia technicians, gynecologists and surgeons, two or more shift workers, employees with long working hours, employees doing recapping tasks, those who do not wear gloves and employees not appropriately trained regarding risk procedures (8).

The most important factors involved in NSIs events are the knowledge level of blood-borne diseases and standard precautions and adherence to observe them (9). Other factors include improper use of protective equipment such as failure to use proper-sized gloves, concerns due to the high workload, long working hours, job stress, fatigue, lack of personnel, little experience, inadequate training, excessive working hours and fatigue that can lead to damages due to using sharp tools (10). These exposures mostly occur in operating rooms, emergency rooms and ICUs (11). Most situations occur at injection, sampling, recapping and while transmitting blood and body fluids from a syringe to the sampling container (12).

Evaluation of the frequency and the causes of these types of NSIs can be helpful in taking effective and appropriate strategies and plans for reducing related incidents in HCWs in order to improve patient safety. Due to lack of precise information and poor reporting in previous studies on the incidence of NSIs and related factors, the present study was to investigate the risk factors of NSIs among HCWs in Naft hospital, Mahshahr in 2011-12.

## Materials and Methods

This cross-sectional study was conducted in the last six months of 2011-12 on HCWs of Naft hospital, Mahshahr with 92 activated bed located in Khuzestan Province, south west of Iran. All the hospital personnel were involved in this study. HCWs participated in the study included doctors, nurses, laboratory personnel and supportive staff who were on duty during the study period. A questionnaire of two parts was prepared as follows: the first part aimed to collect the demographic information of the HCWs (i.e. age, gender, marital status, work experience, history of received training on NSIs, vaccination status, years of professional life, education level, and the employment status). The second part of the questionnaire consisted of 11 items including: existence/not existence of safety box, recapping/unrecapping of needles, needle stick history, number and time of NSIs, using/not using of latex gloves, contaminated/not contaminated of exposed needles with patients' blood or discharges, ward of injury happening, predisposing reason of NSIs, state of hepatitis B vaccination, and post injury prophylaxis. The questionnaire was completed through an interview with selected individuals who were allowed to choose more than one choice where the question was in relevance with actions taken after the injury.

The inclusion criteria for the staff were to first perform at least six consecutive months of caring services. Second, they did not participate in the similar research before. The single exclusion criterion was the incomplete filling of questionnaires. The validity was done using face and content validity, i.e. the questionnaire was given to 10 faculty members of Universities of Tehran 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 ( $r=0.88$ ).

An approval for conducting the study was obtained from the Ethical Committee of the Naft

hospital, Mahshahr. The aim of the current study was explained to the HCWs. All participants were informed that participation in the study is voluntary, so they could refuse to participate or withdraw from the study at any time. Lastly, the participants who agreed to participate in the study were asked to sign a written consent.

We employed the statistical package for social sciences (SPSS v. 16.0; SPSS Inc. Chicago, USA) for data analysis. Data analyses were performed using descriptive statistics (frequency, mean and standard deviation for each variable) and analytical statistics (Chi-square, Pearson correlation coefficients). A P-value less than 0.05 was considered statistically significant.

## Results

A total of 135 HCWs participated in the study. The majority of subjects (69.6%) were females and (57%) were married. The average age of the respondents was 33.6 years ranging from 24-50 years, also mean working experience were 9+/-9.71 years. In terms of education, 69.3% of HCWs' were holding B.S. Degree. (Tab.1). Almost half of nurses (62.22%) were contractual, 88.1% (119 subjects) passed the course about "History of received training on NSIs".

HCWs included 30 doctors (8.8%), 92 nurses (68.1%), 17 laboratory personnel (12.5%) and 14 supportive staff (10.3%). The results showed that the incidence of needle injuries was 64.4% (87 subjects). The Activities being carried out when the respondents sustained the needle stick injuries included;: recapping of needles (25.8%); IV access (17.9%); injection and taking a blood sample (16.3%); transporting sharps (11.9%); inappropriate disposal of needle (11.2%); preparing drug (9.4%); others (6.4%). The colleague indiscretion (38.5%), ward crowdedness (33.85), staff tiredness (19.7), poor quality of devices (6.2%) were the main reasons for the occurrence of needle stick injuries from sharp and cutting objects. In terms of location of the events, the most injuries occurred in the

emergency ward (21.3%) and internal ward (19.2%). This study revealed that 80.7% of HCWs had completed the vaccination against hepatitis B.

**Table 1.** Demographic Characteristics of the Participants and History of HCWs in Mahshahr hospital

Variables	Total, No. (%) N=135	Mean of NSIs Score (SD)	p-value
Gender			
Female	94 (69.6)	62 (2.5)	
Male	41 (30.3)	65 (3.6)	0.001
Marital status			
Single	57 (42.9)	63 (8.01)	
Married	78 (57.03)	65 (0.5)	0.76
Work experience			
<5	39 (23.6)	65 (8.6)	
5.1-10	44 (33.5)	63 (3.6)	
10.1-15	28 (20.7)	64 (3.4)	0.09
15.1-20	17 (12.5)	62 (0.8)	
>20.1	7 (5.10)	63 (3.1)	
History of received training on NSIs			
Yes	93 (68.8)	62 (5.2)	
No	42 (31.1)	66 (3.03)	0.07
Hepatitis B Vaccination			
Yes	109 (80.7)	64 (0.9)	
No	26 (19.2)	64 (8.7)	1.04
Immunization Status			
Incomplete	108 (80)	63 (8.3)	
Complete (3 doses)	27 (20)	64 (9.7)	2.70
Education level			
Diploma & lower	24 (17.7)	65 (6.2)	
Bachelor	94 (69.6)	64 (4.20)	0.08
Higher	17 (5.1)	63 (7.5)	
Age			
>30 years	38 (24.4)	64 (3.4)	
31-40	82 (60.7)	64 (5.8)	1.09
41-50	15 (11.1)	64 (3.1)	
employment status			
permanent	84(62.22)	63(9.2)	
contract	51(37.7)	64(6.1)	0.76
Location of the event			
emergency ward	28 (21.3)	64 (9.4)	
Internal ward	26 (19.2)	64 (1.5)	
Laboratory unit	25 (18.5)	64 (8.6)	2.43
women wards	23 (17.6)	64 (3.0)	
Surgery ward	14 (10.3)	63 (8.6)	
Other	19 (14.07)	63 (9.9)	

Sharps injuries in the past 12 months were reported in 64.1%. Among the participants, 47.6% (n=49) over the past 5 years and 17.6% (18 people) during the last year had experienced needle stick. At the time of needle stick event, 52.2% of employees had not worn gloves. The Chi-square test showed a significant association between sex and the incidence of needle stick ( $P < 0.005$ ), and  $OR = 3.5$ , in the sense that the chance of needle

stick occurrence in women was 3.5 times higher than men. The Chi-square test showed that there was no significant relationship between education levels and the occurrence of the needle stick, sex and using gloves, sex and vaccination, sex and recapping. The Pearson correlation coefficients showed no relationship between age and work experience with the number of needle sticks.

## Discussion

The results of this study showed that 64.4% of hospital staff, at least once a year, and 47.6% of them over the last 5 years have suffered a needle stick. Lotfi et al. in a study conducted among 90 nurses, midwives, doctors, laboratory technicians, nurse-aids and anesthesia technicians assist in Astara showed that 67% of the staff have had needle stick events at least once a year (13). A study performed on 158 nurses in Tehran Khanevadeh hospital showed that 56.96% of staff, at least once a year, and 22.15% of them have had needle stick events in the past year (14). The prevalence of needle stick was reported as in Mobasherizadeh et al. study (2011) in Isfahan, and Kakizaki et al. study (2011) in Mongolia respectively as 61.4% (15) and 38.4% (2). The results of various studies suggest that the injury is common in various parts of the world, and its incidence appears to be higher in developing countries. In Iran, One of the main reasons is the shortage of personnel, followed by long shifts and newly employed personnel entry over the past years. Special devices is recommended for reducing the incidence of these injuries of Center for Disease Control (CDC) (5).

In this study, the incidence of recapping among the medical staff was reported as 25.8%. This rate was mentioned in other studies as follows: 36.6% in Mobasherizadeh et al. study (15), 21.57% in Galogahi et al. study (14), and 15.2% in Kakizaki et al. study in Mongolia in 2011 (2). While using needle cutter boxes and safety boxes for disposal of contaminated needles in clinical wards

departments has been on the rise in recent years, avoiding the recapping of contaminated needles is recommended to reduce the incidence of injuries (12). Given that the most likely cause of needle stick in the papers has been reported as "recapping", meanwhile implementing a comprehensive training program, other methods of training such as text messaging, installing signs of safe injection and banned Rrecapping posters as well as continuous monitoring on this issue should be considered and used.

The most important underlying causes of needle stick were mentioned respectively as recapping (25.8%), IV time fixing (19.7%) and injections (18.2%). The results of this study are consistent with studies performed in Afghanistan (8). In a study by Shokohi et al. in 2007, it was shown that the cause of needle stick occurrence was as follows: recapping: 26.5%, suture: 24.7% and fixed IV: 24.4% (16). In Rakhshani et al. study conducted in Zahedan, the most important causes were blood sampling and injections (17). It seems that due to the high rate of recapping of needles in the hospitals, the safe injection instructions of the Ministry of Health should be re-trained and monitored. Educational Training was the main element in increasing the knowledge and improving behaviour and performance the HCWs, also increased the reporting rate (18).

In this study, the highest needle stick injuries were reported respectively in the emergency ward (21%), internal medicine wards (16.1%), women wards and labs (14.5%). Ashkarian et al study in Shiraz showed that 31.4% of all needle stick events have occurred in the maternity ward, while 22.9% and 17.9% have occurred in operating rooms and emergency rooms, respectively (19).

The results of this study showed that, 80.8% of all subjects had been completely vaccinated against Hepatitis B. This measurements was 84.9% and 81% in Mohammadnejad et al., and Goldberg et al studies, respectively (20,21). In HCWs of uncompleted vaccination, HBV immunization and

monitoring of immune status will ensure maximum protection for HCWs of HBV transmission (22).

One limitation of this study was recalling all cases of needle stick events for the preceding 12 months, which would not be possible for everyone; thus, the results obtained in this study might have been estimated less than the actual rates.

## Conclusion

This study demonstrated a relatively high prevalence of NSIs among HCWs of in Mahshar hospital. Training in handling and disposal of sharps, safety engineered devices (SED), adequate healthcare staffing, effective prevention and reporting strategies are needed to increase safety practices for HCWs.

## Conflict of interests

The authors declare that they have no competing interests.

## Author's Contributions

All authors participated in writing the scientific proposal, data collection, and writing of the manuscript. All authors read and approved the final manuscript.

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