

Needlesticks and Sharps Injuries Among the Personnel of Baharlou Hospital in Tehran, Iran

Nazanin Izadi,¹ Farzaneh Chavoshi,¹ and Mahdi Sadeghi^{2,*}

¹Department of Occupational Medicine, Center for Research on Occupational Diseases, Tehran University of Medical Sciences, Tehran, IR Iran

²Department of Environmental Health, Environmental Health Research Center, Faculty of Health, Golestan University of Medical Sciences, Gorgan, IR Iran

*Corresponding author: Mahdi Sadeghi, Department of Environmental Health, Environmental Health Research Center, Faculty of Health, Golestan University of Medical Sciences, Gorgan, IR Iran. Tel: +98-1732436102, Fax: +98-1732436107, E-mail: mahdikargari@gmail.com

Received: June 9, 2015; Revised: August 1, 2015; Accepted: August 8, 2015

Background: The prevalence and incidence of needlesticks and sharps injuries (NSSIs) have not been well documented in Iran. In most previous studies, the data were obtained through anonymous, self-reporting questionnaires, which are subjected to bias.

Objectives: The focus of this study was to investigate the frequency and causes of NSSIs among health care workers (HCWs) in collaboration with an occupational health office and to compare these data with related previous studies.

Patients and Methods: In this cross-sectional study, all HCWs exposed to NSSIs in Baharlou Hospital, Tehran, Iran, were included. Among 309 studied cases, 83 HCWs who were directly exposed to NSSIs were enrolled in this study.

Results: The case incidence of NSSIs was 26.86% (83/309). Of all the occupational groups, the nurses had the highest rate of NSSI incidence (63.9%, n = 53.83). Moreover, the incidence rate of NSSIs in the HCWs on rotational shift work (90.4%) was higher than that among their counterparts on fixed shift work (9.6%), with the latter chiefly employed on night shift (90.4%, n = 75). NSSIs (83.1%), followed by splash (16.9%), were the most common method of exposure.

Conclusions: This study confirmed a relatively high incidence of NSSIs among HCWs. Inadequate occupational health and safety measures such as lack of training on occupational health hazards and safety issues, absence of written protocols for reporting NSSIs, and lack of safety instructions were associated with NSSIs. Effective training programs and raising the awareness of HCWs to reduce unsafe behaviors and implementing organizational strategies to prevent exposure are essential.

Keywords: Incidence; Needlestick Injuries; Occupational Groups; Hospitals

1. Background

Needlesticks and sharps injuries (NSSIs) are considered among the most common occupational injuries among health care workers (HCWs) (1, 2). More than 30 hazardous blood-borne pathogens can be transmitted by contaminated needles (2). These blood-borne pathogens may cause serious fatal infections such as human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV), cytomegalovirus, herpes simplex virus, and parvovirus B19 (1, 3, 4).

HCWs are constantly at risk of developing hazardous infections by the said pathogens through work-related factors such as NSSIs, stab scratch, cuts, or other bloody injuries. More than 35 million HCWs are at risk of percutaneous injuries by a contaminated sharp object every year (5). According to the reports by The world health organization (WHO), the worldwide incidence rate of NSSIs is estimated at 3 million from 35 million HCWs each year. In consequence of these 3 million injuries, 70,000, 15,000, and 500 individuals are infected with HBV, HCV, and HIV, respectively (2, 6, 7). The total incidence of HBV, HCV, and HIV transmission via sharp in-

juries is estimated at 2.1 million, 926,000, and 327,000, respectively (8). According to the WHO, exposure to sharp injuries in the workplace accounts for 40% of infections with HBV and HCV and 2% - 3% of HIV infections among HCWs (9). Although the estimated rates of HBV infection among HCWs in the United States have declined since 1980 by almost 95%, recent evidence suggests that more than half of all the sharps injuries are not reported (10).

Most of these occupational infections occur in developing countries as there are higher risks of occupational NSSIs and prevalence of blood-borne diseases (2, 11).

NSSIs may lead to the infection, illness, disability, and death of HCWs; therefore, it is vitally important that this particular population be protected against exposure to such risks (2). This study was conducted to determine the incidence of NSSIs among the personnel of Baharlou Hospital (as a case study due to the establishment of the department of occupational medicine and occupational health office in this hospital) in Tehran and to evaluate their associated risk factors.

2. Objectives

The prevalence and incidence of NSSIs are not well documented in Iran. In most studies, data were obtained via anonymous, self-reporting questionnaires, which are subjected to bias. The focus of this study was to investigate the frequency and causes of NSSIs among HCWs through the occupational health office of Baharlou Hospital and to compare these data with previous studies.

3. Patients and Methods

This cross-sectional study was conducted from July 2011 to June 2012 in Baharlou Hospital in Tehran, Iran. All HCWs who were exposed to NSSIs were included in the study. Once a needlestick incident occurred, the subject was referred to the Occupational Health Office and filled out an NSSI report and event sheet. The event sheet was devised by the researcher, and the variables studied were those registered on the event sheets.

From an initial group of 309 HCWs, 83 individuals who were directly exposed to NSSIs were enrolled in this study. Demographic data, including age, sex, occupation, educational level, and marital status, were obtained from the event sheets. Additionally, HIV, HBV, and HCV tests were performed by sending samples to a reference laboratory. The tools for data gathering comprised the NSSI reports, event sheets, and result of the samples.

The studied variables consisted of sociodemographic characteristics, work category (e.g., nurses, doctors, midwives, etc.), medical history, history of HBV immunization, duration of exposure, description of the circumstances leading to the exposure, dominant hand and non-dominant hand of the injured worker, type of the device causing the injury, purpose of the device, visible blood on the device, body exposure site, date of injury, time of injury, place of injury, and identifiability of the source patient.

3.1. Statistical Analysis

The obtained data were analyzed using Statistical Package for the Social Sciences (SPSS), version 16. The mean and standard deviation of the data was drawn upon for the quantitative analysis of the variables.

4. Results

In this cross-sectional study, 83 individuals out of 309 HCWs had needlestick exposure. The distribution of the sociodemographic characteristics of this study population is depicted in Table 1.

The study population was comprised of 16 (19.3%) males and 67 (80.7%) females. The age of the participants ranged from 22 to 55 years with a mean age of 31.4 ± 7.5 years. The highest number of NSSIs was reported among the subjects between 26 and 35 years of age. The highest percentage (63.9%) was reported among the nurses. The incidence of NSSIs among the married HCWs (59%) was

higher than that among their single counterparts (41%). Moreover, the prevalence of NSSIs in the HCWs on rotational shift work (90.4%) was more than that in those on fixed shift work (9.6%), with the latter chiefly comprising individuals on night shift (90.4%, $n = 75$). NSSIs (83.13%), followed by splash (16.9%), were the most common method of exposure (Table 1). The majority of body exposure sites in the injuries were in the hand (88%), followed by face (8.4%) and eye (3.6%).

The incidence of NSSIs within the professional groups is presented in Table 2. According to this table, the laboratory staff (4.8%) and physicians (6%) had lowest risk, whereas the nurses (63.9%) had the highest risk of injury.

Table 1. Sociodemographic Characteristics of the Health Care Workers^a

Variables	Total Study Subjects (n = 83)
Age group, y	
< 25	17 (20.5)
26 - 35	49 (59)
36 - 45	12 (14.5)
46 - 55	5 (6)
Gender	
Male	16 (19.3)
Female	67 (80.7)
Educational level	
< High school diploma	5 (6)
High school diploma	8 (9.6)
Bachelor of science (BSc)	66 (79.5)
Doctor of medicine (DM)	4 (4.8)
Marital status	
Married	49 (59)
Single	34 (41)
Shift	
Night (rotational shift work)	75 (90.4)
Morning (fixed shift work)	8 (9.6)

^a The values are presented as No. (%).

Table 2. Prevalence of Needlesticks and Sharps Injuries (NSSIs) Within the Professional Groups^a

Health Care Workers	Frequency of NSSIs
Nurse	53 (63.9)
Doctor (physician)	5 (6.0)
Midwives	6 (7.2)
Nurse aid	6 (7.2)
Laboratory staff	4 (4.8)
Service worker	9 (10.84)

^a The values are presented as No. (%).

The incidence of NSSIs in the different wards of the hospital is presented in Table 3. According to this table, the intensive care unit (ICU) (33.73%) and operating room (15.66%) personnel had the highest risk of NSSIs injuries.

The incidence of NSSIs apropos the procedures is illustrated in Table 4. According to this table percutaneous injury (83.1%) was the most common type of NSSIs, followed by splash (16.9%). The highest incidence rate of NSSIs occurred in June (16.9%), followed by January (14.5%) (Figure 1).

Table 3. Prevalence of Needlesticks and Sharps Injuries (NSSIs) in the Different Wards of the Hospital ^a

Different Wards of the Hospital	Frequency of NSSIs
Coronary care unit and intensive care unit	28 (33.73)
Operating room	13 (15.66)
Emergency	11 (13.25)
Toxicology	5 (6.0)
Labor	5 (6.0)
Internal	4 (4.82)
Pediatrics	3 (3.62)
Other wards	14 (16.87)

^a The values are presented as No. (%).

Table 4. Prevalence of Needlesticks and Sharps Injuries (NSSIs) According to the Procedures ^a

Type of Procedure	Frequency of NSSIs
Percutaneous injury	
During vein and arterial puncture	36 (43.37)
Recapping of hollow-bore needles	10 (12)
Disposal to needle containers	13 (15.66)
Solid suture needles (scalpels)	10 (12)
Splash	
	14 (16.87)

^a The values are presented as No. (%).

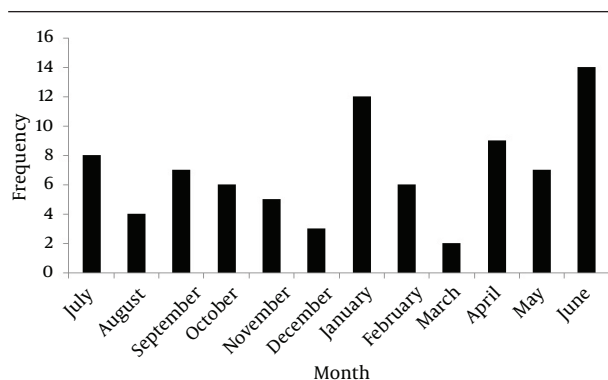


Figure 1. Time of Injury Occurrence Among the Health Care Workers

5. Discussion

The present study demonstrated the incidence of NSSIs among HCWs in an Iranian university hospital. This study was carried out by the occupational health office of Baharlou Hospital and focused on injuries caused by contaminated sharps. Overall, 26.86% of the HCWs had the experience of sustaining at least one needlestick injury in the previous year. The results indicated that most of the exposures to NSSIs occurred among the nurses (63.9%), which is concordant with the results reported by several studies (2, 12, 13). This could be due to the unavailability of appropriate devices, high price of safer devices compared with conventional sharps, degree of extended work shifts, time pressure or understaffing, heavy workload, distractions at work, poor organization, and insufficient number of nurses at workplaces (14). Moreover, nurses are responsible for administering most of the injections and procedures which require the use of needles and other sharps (2).

The results also showed that the night-shift nurses experienced greater injuries (90.4%), which may be in consequence of fatigue and excessive workload. After the nurses, the service workers had the highest incidence rate of NSSIs (10.84%) among the study subjects. This may be due to improper handling and disposal of solid waste, which has also been suggested by several other studies (3, 15, 16). In our study, the injury rates were higher in the women than in the men as women are more sensitive. As regards hospital wards, the incidence of NSSIs was highest in the emergency department because of the urgent nature of the procedures.

Our findings showed a low incidence rate of NSSIs in comparison with that previously reported in studies conducted by Ayranci and Kosgeroglu (17), Askarian and Malekmakan (18), and Ebrahimi and Khosravi (19). To our knowledge, the existing literature lacks research on the incidence of NSSIs among HCWs based on occupational health unit databases or on comparison of the incidence rates of such incidents between different sources (17-20).

While most previous studies obtained data via an anonymous self-reporting administered questionnaire (2, 3, 13, 17-19), the current study implemented a timely manner of data collection through the occupational health office of a hospital to avoid bias.

It should be noted, however, that the rate of NSSI incidence found may be lower than the actual rate inasmuch as a number of medical staff may have sustained such injuries and not referred to the occupational health office.

Our results revealed that the physicians had a low risk of injury (Table 2). Wicker et al. (20) showed that self-assessment of low risk and self-care for NSSIs constituted the principal reason for underreporting by the physicians in their investigation.

The risk of injuries among the laboratory staff recruited in the present study was also low. This could be due to employee training, safe recapping procedures, effec-

tive disposal systems, and improved equipment design. In contrast, the shift workers had the highest incidence rate of NSSIs, which may have been caused by sleepiness, fatigue or sleep deprivation, and loss of alertness during night shift. The second highest incidence rate of NSSIs was reported among the service workers. This may be due to low literacy level, lack of knowledge, and poor practice of universal precautions.

The ICU and operating room personnel had the highest risk of NSSIs as they are intensively exposed to blood and body fluids (20, 21). The low NSSI rate in the pediatric ward might be in consequence of the fact that in this ward, invasive procedures are less frequent than those in the ICU and operating room.

Percutaneous injury was the most common type of NSSIs. These incidents could have been avoided if a safety device had been used and the needle safety mechanism had been activated (13, 19, 22).

The current study confirmed a relatively high incidence of NSSIs among HCWs. Inadequate occupational health and safety measures such as lack of training on occupational health hazards and safety issues, absence of written protocols for reporting NSSIs, and lack of safety instructions were associated with NSSIs.

Effective training programs and raising the awareness of HCWs to reduce unsafe behaviors and implementing organizational strategies to prevent exposure are essential to reduce the risk of such injuries. It is also recommended to follow up the injured personnel in order to reduce the risk of possible infections among HCWs. Last but not least, educational lectures should be given to HCWs on the hazards and methods of preventing NSSIs and sufficient numbers of disposal bins for sharps should be installed in workplaces.

Acknowledgements

This research was supported by Tehran University of Medical Sciences (Grant # 92-01-10-20023).

Authors' Contributions

Data collection and sampling was done by Nazanin Izadi and Farzaneh Chavoshi. Data analysis was done by Mahdi Sadeghi. Paper preparation was done by Mahdi Sadeghi.

Funding/Support

This study was financially supported by Tehran University of Medical Sciences.

References

- van der Molen HF, Zwinderman KAH, Sluiter JK, Frings-Dresen MHW. Better effect of the use of a needle safety device in combination with an interactive workshop to prevent needle stick injuries. *Safety Sci.* 2011;**49**(8-9):1180-6.
- Kebede G, Molla M, Sharma HR. Needle stick and sharps injuries among health care workers in Gondar city, Ethiopia. *Safety Sci.* 2012;**50**(4):1093-7.
- Shah SF, Bener A, Al-Kaabi S, Al Khal A, Samson S. The epidemiology of needle stick injuries among health care workers in a newly developed country. *Safety Sci.* 2006;**44**(5):387-94.
- Martins A, Coelho AC, Vieira M, Matos M, Pinto ML. Age and years in practice as factors associated with needlestick and sharps injuries among health care workers in a Portuguese hospital. *Accid Anal Prev.* 2012;**47**:11-5.
- Deisenhammer S, Radon K, Nowak D, Reichert J. Needlestick injuries during medical training. *J Hosp Infect.* 2006;**63**(3):263-7.
- World Health Organization. In: Aide-memoire for a strategy to protect health workers from infection with bloodborne viruses. Department of Blood Safety and Clinical Technology, editor. Geneva, Switzerland: WHO; 2003.
- Kakizaki M, Ikeda N, Ali M, Enkhtuya B, Tsolmon M, Shibuya K, et al. Needlestick and sharps injuries among health care workers at public tertiary hospitals in an urban community in Mongolia. *BMC Res Notes.* 2011;**4**:184.
- Pruss-Ustun A, Rapiti E, Hutin Y. Estimation of the global burden of disease attributable to contaminated sharps injuries among health-care workers. *Am J Ind Med.* 2005;**48**(6):482-90.
- World Health Organization. Geneva: 2002. Reducing risks 2002: promoting healthy life.
- Center for Disease Control and Prevention. *Sharp injury prevention workbook: workbook for designing, implementing and evaluating a sharps injury prevention program.* Center for Disease Control and Prevention; 2008.
- Varghese GM, Abraham OC, Mathai D. Post-exposure prophylaxis for blood borne viral infections in healthcare workers. *Postgrad Med J.* 2003;**79**(932):324-8.
- Hazmi MM, Al Majid FM. Needle stick and sharps injuries among health care workers: A 5-year surveillance in a teaching centre in Saudi Arabia. *Biomed Res.* 2008;**19**:133-40.
- Muralidhar S, Singh PK, Jain RK, Malhotra M, Bala M. Needle stick injuries among health care workers in a tertiary care hospital of India. *Indian J Med Res.* 2010;**131**:405-10.
- Clarke SP, Rockett JL, Sloane DM, Aiken LH. Organizational climate, staffing, and safety equipment as predictors of needlestick injuries and near-misses in hospital nurses. *Am J Infect Control.* 2002;**30**(4):207-16.
- Memish ZA, Almuneef M, Dillon J. Epidemiology of needlestick and sharps injuries in a tertiary care center in Saudi Arabia. *Am J Infect Control.* 2002;**30**(4):234-41.
- Jayanth ST, Kirupakaran H, Brahmadathan KN, Gnanaraj L, Kang G. Needle stick injuries in a tertiary care hospital. *Indian J Med Microbiol.* 2009;**27**(1):44-7.
- Ayranci U, Kosgeroglu N. Needlestick and sharps injuries among nurses in the healthcare sector in a city of western Turkey. *J Hosp Infect.* 2004;**58**(3):216-23.
- Askarian M, Malekmakan L. The prevalence of needle stick injuries in medical, dental, nursing and midwifery students at the university teaching hospitals of Shiraz, Iran. *Indian J Med Sci.* 2006;**60**(6):227-32.
- Ebrahimi H, Khosravi A. Needlestick Injuries among Nurses. *J Res Health Sci.* 2007;**7**(2):56-62.
- Wicker S, Jung J, Allwinn R, Gottschalk R, Rabenau HF. Prevalence and prevention of needlestick injuries among health care workers in a German university hospital. *Int Arch Occup Environ Health.* 2008;**81**(3):347-54.
- Nelsing S, Nielsen TL, Nielsen JO. Percutaneous blood exposure among Danish doctors: exposure mechanisms and strategies for prevention. *Eur J Epidemiol.* 1997;**13**(4):387-93.
- Moradi AR, Mostafavi E, Moradi A. The prevalence and causes of needle stick injuries among the primary health care workers of Bahar city, Hamadan Province. *Iran occup heal.* 2010;**7**(2):39-42.