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Investigating the Effective Factors on the Needle Stick Injuries and Personnel's Approach in Bahar Medical Education Center in Shahroud During 2009-2018

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Abstract

Background: *The aim of the study was to determine the causes and rate of needle stick injuries among Bahar hospital in Shahroud during 2009-2018.*

Methods: *This is a descriptive case series study conducted in Bahar educational and research center in Shahroud. The study population included all health care workers and service staff during 2009-2018. Census sampling was performed using health care records of the medical and paramedical group (individual at risk of occupational exposure) from the beginning of January 2009 to the end of December 2018. Data analysis was performed using descriptive statistics (absolute and relative frequency), and t-test and analysis of variances for quantitative values.*

Results: *A total of 246 cases of needle sticks were reported in ten years. Most cases belonged to bachelor's staff (69.1%), nursing job group (69.5%), emergency department and labor (28.9%), equipment of injections (75.6%), injections (45.5%), carelessness (37%), recapping (24.8%), and at night shift (51.6%) were observed. Bleeding from the injured site was the most common post-exposure action (44.3%).*

Conclusions: *Considering the high prevalence of needle stick among health care workers, instruction of prevention methods, holding educational classes, emphasizing on vaccination, controlling HBV antibody titer, and designing a precise reporting mechanism for personnel is necessary.*

Keywords: Needle stick, Health care workers, Incidence, Iran.
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Introduction

Needle stick injury (NSI) is defined as any type of accidental skin perforation among health care workers (HCW) by needle or any sharp objects during medical or nursing care interventions. Skin lesion by the sterile needle is risky at all, though skin perforation with a used needle or a needle contaminated with patient's blood is dangerous and in this meanwhile, the highest risks belong to Hepatitis B Virus (HBV) Hepatitis C Virus (HCV) Human immunodeficiency virus (HIV).[1]

Most reported injuries are caused by needles, canola, surgical blade, broken ampules, or other sharp tools contaminated with blood or body fluids.[2] In 2008, more than 35 million HCW experienced needle stick worldwide.[3] Studies show more than 100,000 injuries caused by sharp objects in nurses in England.[4] In the United States, approximately 600 thousand to 1 million cases of NSI occur annually half of which are not reported.[5] A study conducted in South Korea revealed that 67.3% of nurses have experienced syringe injury.[6]

World's Health Organization (WHO) reported that nearly 40 percent of HCW are infected with HCV and HBV and 2.5 percent to HIV.[7] On the other hand, approximately 90% of NSIs occurred in the developed countries.[8] Previous studies in Iran reported a prevalence ranging from 20 to 70 percent of NSI in nursing staff.[9-11] Although the NSI case report is important for prevention and treatment, 59% of HCWs do no report their injuries.[2] NSI underreport in HCWs can be up to 10-fold. Thus, health care authorities should not interpret this low incidence as the low damages caused by HCWs.[12]

Considering the significant complications of NSI in HCWs, lack of reporting, lack of systematic reporting protocol throughout the country and the limited number of studies on NSI incidence in Iran, knowing latest statistics about NSIs incidence can be helpful in designing and implementing plans and guidelines to reduce this national and international health issue. This study is designed to assess the incidence of the needle and the affecting factor in HCWs in Bahar hospital in Shahroud during 2009-2018. Authors hope that more accurate knowledge of the level of injury, HCWs' occupational exposures, and the causes will be helpful in adopting strategies and educational and executive planning required in the hospital as well as designing a systematic plan for accurate collection of NSI cases and performing appropriate follow-ups and treatments.

Materials and Methods

This descriptive case series study was conducted in Bahar hospital in Shahroud. The study population included all HCWs who worked in this medical center from 2009 to 2018. Census sampling was performed using health profile forms in medical and nursing groups (individuals at risk of occupational exposure) working in this hospital from the beginning of January 2009 until the end of December 2018. The mentioned forms included two parts: the first part belonged to demographic information including age, sex, working experience, education level, occupation, and ward. The second part belonged to questions regarding vaccination history, and in case of needle stick occurrence type and time of exposure, contaminated needle source (known or unknown patients), preventive and therapeutic actions, and follow-up.

Occupational groups were divided into the nursing group (nurses, midwives, anesthetic technicians, surgical technicians,

head nurses, and supervisors), physicians (general practitioners and specialists), paramedics (vaccinators, laboratory staffs, clinic staffs, oral and dental health workers), and service jobs (services and facilities). Wards were classified into emergency wards (emergency ward and labor room), special wards (operating room, ICU, NICU), pediatric (pediatric and neonatal), surgical (surgery and gynecology), internal and paraclinical (vaccination, clinic, laboratory and facilities). Tools were categorized into injection set (angiocatheter, needle, scalp vein, ampule shell), suture needle and surgical tools (scalpel and surgical blade). Procedures were divided into injections (IV line, types of injections, and blood sampling), surgeries (suture and surgery), and take out (needle disposal and irrigation). Causes of injury were classified as recapping, lack of caution (not using safety box, lack of attention, shaking and fullness of safety box), and collection of sharp tools (needle disposal and needle collection), and workload (high work load and ward crowdedness). Qualitative data were presented by frequency and percent and quantitative data were presented by mean and SD. Mean comparison was performed using independent t-test and analysis of variances.

This study has been approved in the research council and ethics council of Shahroud university of medical sciences with IR.SHMU.REC.1397.185 ethical code.

Results

From 2009 to 2018, 246 HCWs had occupational exposure, 229 of whom were female HCWs (93.1%). The education level of 69 HCWs was an associate degree or below (28%), 171 of them with the bachelor or master degree (69.5%), and 6 HCWs with MD and Ph.D. or above (2.4%). The mean age of participants was 31.7±2.3 years with mean job experience of 6.4±4.5 years. Moreover, mean occupational exposure in HCWs was 2.3±1.5 times.

The mean incidence of NSI was 1.2±9.5 in men and 1.5±2.4 in women, though the difference was not significant (P=0.80). Among all HCWs with NSI, 230 individuals (93.5%) had complete vaccination, 153 individuals (62.5%) had measured anti-body titer of HBV, 140 individuals (56.9%) had an anti-body titer of HBV above 10, and 3 individuals (2.1%) had received immunoglobulin. Exposure or reported incidence rates were 41 and 40 cases per year in 2017 and 2018, respectively. Also calculated incidence based on population at risk in 1000 individuals revealed highest incidence during 2012 and 2014.

Highest reported cases during these years belonged to nursing group (171 cases, 69.5%) and lowest to physicians and specialists (6 cases, 2.4%). Mean number of NSI exposure in different occupations were analyzed using one-way ANOVA and Tukey post hoc test which revealed a significant difference between nursing and paramedic groups as well as nursing and services groups (paramedic groups and services had a higher mean exposure) (Table 1).

Table 1. Frequency of needle-stick injury in terms of occupational groups

Occupational groups	Frequency	Percentage	Mean of NSI
Nursing	171	69.5	2.1±1.2
Medical	6	2.4	1.1±8.2
Paramedics	12	4.9	3.2±8.4
Services	57	23.2	3.1±1.7
ANOVA test			P<0.001

Results of this study showed that highest rate of NSI belonged to, bachelor's staff (69.1%), nursing job group (69.5%), equipment of injections (needle, angiocatheter, scalp vein, and broken ampule) (75.6%), type of procedure (IV line, injection, blood sampling) (45.5%), carelessness (not using safety box, lack of caution, moving, shaking, or fullness of safety box) (37%), and recapping (24.8%) (Table 2).

Table 2. Incidence of Needle stick injury based on type of tool, type of procedure, and cause of injury

	Variable	Frequency	Percentage
Tools	Injection set	186	75.5
	Suture needle	45	18.3
	Surgical tools	15	6.1
Procedure	Injection	112	45.5
	Surgery	50	20.3
	Disposal	84	34.1
Cause of injury	Recapping	61	24.8
	Lack of caution	91	37
	Collection	50	20.3
	Work load	44	17.9

Moreover, results of this study showed that emergency wards (28.9%) and intensive care units wards (26.4%) had the highest incidence (Table 3).

Besides, highest incidence of NSI is reported in night shifts (51.6%) and bleeding from the injured site was the most common post-exposure action (44.3%).

Table 3. Needle stick injury incidence in terms of type of ward

Ward	Frequency	Percentage
Emergency	71	28.9
ICUs	65	26.4
Surgery	50	20.3
Pediatric	36	14.6
Internal	15	6.1
Paraclinic	9	3.7

Discussion

Based on the results of the study the quality and rate of NSI case reporting has improved during 2009 to 2012 and then there has been a steady trend, which is consistent with previous studies. These studies have mentioned several reasons for underreporting including work load, lack of awareness, secrecy, and low risk of contamination.[13-17]

In this study, mean NSI cases were nearly equal in men and women which show disagreement with some previous studies in which women had higher exposure[18-22] which can be attributed to the high level of responsibility and high employment.

Moreover, results of this study suggested that HCWs with lower job experiences had higher rates of NSI which is consistent with Ghofranipoor et al.[23] and Dement et al.[24] studies. Lower clinical skills and inappropriate management of procedures due to lack of experience may justify this finding.

In the current study, majority of HCWs had complete vaccination, 62.5% had measured antibody titer, and 56.9% had sufficient titer. Moreover, 1.2% of HCWs received immunoglobulin administration due to caring of positive HBs-Ag patient. In similar studies, HBV vaccination coverage ranges from 14.5% to 100%.[13,16,22,25,26]

In this study, highest exposure belonged to paramedic and services occupational groups which are not consistent with the findings of previously conducted studies in Iran and other countries.[23,27,28] It seems that high frequency of occupational exposure in paramedic and services groups should be attributed to inappropriate use of personal safety tools and not obeying occupational cautionary rules.

In terms of type of tools, highest frequency of exposure belongs to injection tools. This finding is similar to the results of Vahedi et al.[29] and Rezaei et al.[30] studies.

Regarding type of procedure or situations leading to NSI, the highest rate belongs to injection procedure which is in consistency with Nezhadbaghei et al study.[16]

This can be due to non-compliance with safe injectable, high volume of work, busy, and inadequate time.

In terms of cause of injury, the leading reported cause is lack of caution. Needle recapping and collection of sharp tools were two other common causes which are similar to VOS et al. study.[31]

Additionally, results of this study demonstrated that highest exposure was reported respectively in (emergency and labor) and intensive care units' wards (operation room, ICU, and NICU). Highest exposure rate has been reported in emergency ward,[26] ICUs wards, and operation room[20,32,33] in previous studies.

Higher exposure rate in night shifts is another finding of current study which is similar to Rahnavard et al. and Lotfi et al. studies[34,35] while some studies[13,14,36] reported higher exposure rates in morning shifts which is in disagreement with the findings of current study. In this study, fatigue due to sleeplessness, heavy work load, insufficient number of personnel relative to patients, and successive working shifts were considered as attributable reasons, while higher rate of NSI in morning shifts can be attributed to higher number of patient admissions, samplings, visits, and patient transfers to the operation room.

The most common action after NSI, was bleeding from the injured site which is similar to Rakhshani et al4and Adib et al.[13] studies

Since nurses account for the majority of health care providers and are responsible for many therapeutic interventions, their health is greatly important. Results of this study proved that nurses with less work experience are at higher risk of injury. Hence, continuous education for personnel is suggested and emphasizing on vaccination and antibody titer as well as informing injury cases. Also, due to high rate of needle stick and angiocatheter injury, precisely using personal safety and protective equipment is necessary.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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