

Needlestick Injuries among Nurses

Ebrahimi H. MSc, Khosravi A. MSc

Deputy of research affairs, Shahroud Medical Science University, Iran

(Received 11 July 2007; accepted 10 Oct 2007)

Abstract

Background: Needlestick injuries (NSIs) are among the most important occupational injuries for health care workers (HCWs). In Iran, the problem of exposure to contaminated blood among nursing personnels has not well documented. The aim of this study was to determine the incidence of needlestick injuries in population of nurses in Shahroud Imam Hossein Hospital, northern Iran.

Methods: A self-administrated questionnaire was completed by 180 nurses in September and October 2005 for their NSIs experience in the past year. In this study, needlestick injury was defined as percutaneous injury caused by hollow-borne needles, suturing needles, scalpel blades and lancets.

Results: The case incidence of NSIs was 63.3% (114/180). The total number of episodes of NSIs among respondents was 220 (range: 1-5 episodes) with incidence rate of episodes i.e. 1.2 per person/year. 12.8% of nurses had not been vaccinated against hepatitis B virus (HBV). The causal devices in 105 cases (92.1%) were hollow-borne needles and the main causes of percutaneous injuries with hollow-bore needles were recapping (32.4%) and manipulating needles in patients (18.1%). The majority (51.8%) of injuries occurred after use and before disposal of the objects.

Conclusion: Nurses working in Imam Hossein Hospital are frequently exposed to blood-borne infection. NSIs were highly prevalent in these nurses therefore more intensive education programs should be directed at nurses to increase their awareness of and compliance with universal precautions (UP). We recommend a surveillance system and a center for managing injured persons.

Keywords: *Needle-stick injury, Nurses, Incidence, Iran*

Introduction

Health care workers (HCWs) who are exposed to needle in their clinical activities are at increased risk of acquiring needlestick which may lead to serious or fatal infection with blood-borne pathogens such as hepatitis B virus (HBV), hepatitis C virus (HCV) or human immunodeficiency virus (HIV) (1). Nursing personnel report nearly 30 needle sticks per 100 full-time equivalent employees per year (2). The activities associated with the majority of needlestick injuries (NSIs) are injections, blood sampling, recapping and disposing needles and also handling trash (3). The National Institute for Occupational Safety and Health (NIOSH), USA defines needle stick

injuries as injuries caused by objects such as hypodermic needles, blood collection needles, intravenous (IV) stylets and needles used to connect parts of IV delivery systems (1). Potential exposure are not limited to needle sticks alone because manipulation of other sharp instruments or mucous membrane exposure to infected body fluids also can results in transmission of infectious diseases (2). The risk of pathogen transmission from infected persons to nonimmune persons through an injury with a sharp instrument has been estimated to be between 6% and 30% for HBV, between 5% and 10% for HCV, and 0.3% for HIV (4). While there is considerable evidence to suggest that hepatitis B is rapidly transmissible by needlestick or other muco-cutaneous exposure (2), relatively

Correspondence author: A Khosravi, Tel: +98 273 333 4499, E-mail: khosravi2000us@yahoo.com

few studies have reported the blood exposure accidents among nurses and other paramedical personnel (Table 1).

In Iran, the problem of exposure to contaminated blood among nursing personnels is not well documented. The aim of this study was to determine the incidence of needle stick injuries in population of nurses in Imam Hossein Hospital in Shahroud, a city of Islamic Republic of Iran, in terms of number of cases and frequency of the injuries for the past one year.

Materials and Methods

This was a cross-sectional, questionnaire-based study that was performed among 183 nursing workers in Imam Hossein; a 313-bed public teaching hospital in Shahroud City during September and October 2005. The survey instrument comprised a tick-box format, with sections for demographic items, the type of devices that caused the NSI, whether the device has been used on a patient prior to the NSI (contaminated devices), how the injury occurred and whether the NSI was officially reported to management. The nurses who work in the hospital were asked about their experience of needlestick and sharp injuries from September 2004 to September 2005 (a 12-month recall period). In this study, needlestick injury was defined as percutaneous injury caused by hollow-borne needles, suturing needles, scalpel blades and lancets. Questionnaires were distributed and collected anonymously one-month period.

Cases of needle stick injuries were the number of personnel who have had at least one experience of needle stick injury. The episodes of needle stick injuries were the number of injuries that were experienced by respondents. The incidence of cases was the number of cases to the number of nurses who answered the questionnaire and the incidence of episodes was the number of epi-

sodes to the number of respondents. The respondents were also asked about needlestick injuries in their overall work experience.

Statistical analyses

The data obtained was analyzed with SPSS software, version 11.0 (SPSS Inc, Chicago, IL, USA). Data are given as mean±SD for quantitative variables and counts as well as percentages for categorical variables. Chi-square test for nominal variables and Student's *t*-test (two-tailed) were used to determine the significance of difference between two numeric variables. One-way analysis of variance was applied to determine the relationship between episodes of needle stick injuries and work experience of nurses. Level of statistical significance was chosen 5%.

Results

A total of 180 from the 183 questionnaires were returned which gave a response rate of 98.4%. The majority of nursing staff were female (68.3%) and their mean age was 32.5 (SD= 8.0) years old. The difference in the mean ages of both sexes was statistically significant ($P < 0.05$). Characteristics and status of hepatitis B vaccination and antibody measurements of HBV and HIV are shown in Table 2. One hundred and fifty-seven (87.2%) of nurses in our hospital received the complete courses of hepatitis B vaccines (3 doses).

During their clinical work, 47 of males (82.5%) and 93 of females (75.6%) had received one or more needlestick injuries (NSIs prevalence across a nurse career was 77.8%). One hundred and fourteen nurses experienced at least one needle stick injury, which was an incidence rate of 63.3% (0.95 CI: 56.3- 70.3) for one year (Table 3). There were a total of 220 episodes ranging from 1 to 5 injuries per case. The incidence of these episodes among all nurses in both sexes was equal (1.2 vs. 1.2 per nurse for one-year).

There were no significant differences between male and female in incidence rate of cases and episodes of needlestick injuries.

For the nurses who reported that they had a needle stick injury in the last year, 50.9% (58/114) had one, 28.1% (32/114) two, 8.8% (10/114) three, 1.8% (2/114) four and 10.5% (12/114) five needlestick injuries. The causal devices in 105 cases (92.1%) were hollow-borne needles. Injuries caused by solid suture needles, scalpels and lancets were 18.4% (21 cases). The most common procedures involving handling hollow-borne needles were intramuscular and subcutaneous injections (44.8%), vein puncture (obtaining blood from veins or arteries) (43.8%), setting up drips and drugs (34.3%), and giving parenteral injections (5.7%). The main causes of percutaneous injuries with hollow-borne needles were recapping (32.4%), manipulating needles in patients (18.1%), disposal to needle container (14.3%), opening a nee-

dle cap (10.5%), removing a needle (9.5%), withdrawing medication (8.6%) and placing a needle in a full container (6.7%).

Of the all injuries 22 cases (19.3%) occurred before the use, 59 cases (51.8%) after the use but before disposal, 13 (11.4%) during disposal and 20 (17.5%) before and after use (more than one accidents). In almost two thirds of the cases, the accidents occurred in morning (31.6%) or two continuous shift work that followed each other (31.6%). One hundred seventy-six of nurses (97.8%) reported the facilities such as sharp containers to dispose needles.

Frequency of nurses according to their work experiences is shown in Table 4. The majority of them, 117 out of 180 respondents, had work experience less than ten years (65%). There was no difference between mean frequency of NSIs in nurses and various work experience.

Table 1: NSIs incidence rates in HCWs: Comparison of published studies.

Country	No-studied	Group of study	Incidence of cases (%)	Incidence of episodes/ person year
Australia ⁵	274	Nursing students	13.9	---
Iran ⁴	203	Anesthesiology personnels	31.7	---
Iran ⁶	688	Medical students	71.1	1.9
Iran (present study)	180	Nurses	63.3	1.2
Japan ⁷	860	Nurses	46.0	0.75
Malaysia ⁸	417	Medical students	14.1	0.21
Nigeria ⁹	474	HCWs	27.0	0.6
Poland ¹⁰	232	Nurses	28.0	---
Taiwan ¹¹	8645	HCWs	87.3	---
Taiwan ¹²	708	Student nurses	61.9	---
Turkey ¹³	289	Nurses	48.1	---
Venezuela ¹⁴	129	HCWs	30.0	---
Uganda ¹⁵	526	Nurses& Midwives	57.0	4.2

Table 2: Status of hepatitis B vaccination, hepatitis B anti-body assessment and HIV test of the nursing staff of Imam Hossein hospital, Iran

Variables	Male (n = 57)	Female (n = 123)	Total (n =180)
Age (year)	35.7± 8.2	31.0± 7.4	32.5±8.0
Work experience (year)	12.5± 8.7	8.0±7.8	9.4±8.3
Hepatitis B vaccination			
Yes	50 (87.7)	107 (87.0)	157 (87.2)
HBS-Ab assessment			
Yes	26 (45.6)	58 (47.2)	84 (46.7)
HIV- test			
Yes	16 (28.1)	20 (16.3)	36 (20.0)

Table 3: Incidence of cases of needlestick injuries for one-year according to sex

	No. of cases	%	χ^2	P
Male (n= 57)	32	56.1	1.9	0.17
Female (n= 123)	82	66.7		
Total (n= 180)	114	63.3		

Table 4: The relationship between episodes of needlestick injuries with work experience in Shahroud Imam Hossein hospital nurses

work experience (year)	No.- studied	%	No.- cases with NSIs (past year)	No.- episodes of NSIs	Mean	SD
0- 4.9	57	31.7	41	73	1.8	1.0
5- 9.9	60	33.3	39	74	1.9	1.2
10- 14.9	14	7.8	8	20	2.5	2.1
15- 19.9	13	7.2	6	15	2.5	1.5
20- 24.9	25	13.9	14	31	2.2	1.5
25-30	11	6.1	6	7	1.2	0.4
Total	180	100	114	220	---	---
F-test	---	---	---	---	1.3	---
P	---	---	---	---	0.3	---

Discussion

This study showed that nurses were exposed to the risk of exposure to blood-borne diseases such as HBV, HCV and HIV through NSIs. Needlestick injuries are one of the hidden problems in the health care workers (12, 16). The incidence of cases of NSIs in this study (63.3%) was considerably higher

than studies which were done in other countries (5, 7-10, 13-15), but is lower than that of Askarian et al. (6) in medical students in Shiraz, Iran (6), Shiao et al. (11) (Table 1) and the incidence in Chinese nurses (87%) (17). Present survey revealed that nurses encountered a total of 220 NSIs events in the previous year. The incidence of episodes of

NSIs among the nurses was high, i.e. 120% (1.2 /nurse/year). As such, this rate is much higher than that reported in Malaysia nurses (8), Nigeria (9), Japan (7) (Table 1) and in Australian nurses (0.2/ person/ year) (18) but is lower than that found in medical students in Shiraz (6) and also in Uganda (15).

The majority (51.8%) of injuries that occurred after use and before disposal of the objects was similar to other findings (19). In our study the most common cause of injuries from needles in nurses was improper handling of needles after usage (removing a needle from a syringe, recapping, disposal to needle container and placing the needle in a full container) that is similar to the study of Askarian et al. and Bilski et al. (6, 10). Guo et al. (20) and Galindez et al. (14) reported the most frequently circumstances of needlestick as recapping of needles. According to the USA OSHA's blood-borne pathogen standards (1996), in order to reduce the risk of transmission of blood-borne pathogens (21) recapping a needle is prohibited. Poor compliance of the prohibition by US OSHA on needle recapping by the nurses is one of the reasons for high rate of NSIs. In the study conducted in Mulago national referral hospital in Kampula, Uganda (15), to assess the occurrence and risk factor of NSIs in nurses and midwives, the most important risk factors included working for more than 40 h/week (OR= 1.9), recapping needles (OR= 1.8) and handling needles without usage gloves (OR= 1.9). Our data showed, two shift work followed by each other was a circumstance for NSIs exposure. Regarding to working time in Iran for nurses (44 h/ week), we can interfere in high incidence rate of NSIs similar to Nsubuga et al. (15). The majority accidents occurred in morning shift (31.6%) similar to findings obtained by Bilski et al. (10) while in the study of Abu-Gad et al. (22) was no significant association between injuries and type of shifts. The acceptable reason for this is that majority of

medical services were offered in morning shifts.

According to work experiences of our nurses in Imam Hossein Hospital, majority of them had less than ten years experience (65%), the NSIs prevalence across nursing career was 77.8%. Few studies have looked at NSIs rates across nursing career although research from Mainland China suggests that the lifetime prevalence may approach 100% (23).

Overall, this study showed that NSIs were counted as an important hazard for nurses. Thus, the importance of intervention strategies to reduce NSIs exposure must remain an essential facet of nursing education. In other studies the risk factors for injury have been described. As needlestick injuries often occur during unnecessary handling of a used needle, therefore needles should, never be recapped or otherwise unnecessarily handle after usage. Care should be taken to place used needles in puncture-resistance containers as soon as possible following infection or blood sampling. The benefit of prophylaxis following percutaneous exposure to HBV infection is well documented. We recommend the establishment of a surveillance system and also a center for managing injured persons as well as following up injured health care workers as a part of a local research or ongoing an audit project.

Acknowledgements

We thank the nurses who participated in the study and are grateful for the administration assistance at Imam Hossein Hospital. This study was funded by the Deputy for Research at Shahroud Faculty of Medical Science, Iran.

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