



Study of Needle Stick Injuries Status and its Effective Factors among Nurses

Farid Gharibi^{1*}, Mohammad Asghari-Jafarabadi², Shadi Khodayar Nezhad³, Zahra Tajari³, Zahra Esmaeili³

¹ Students' Research Committee, Department of Health Services Management, School of Health Management and Medical Informatics, Tabriz University of Medical Sciences, Tabriz, Iran

² Road Traffic Injury Research Center, Department of Biostatistics and Epidemiology, School of Health, Tabriz University of Medical Sciences, Tabriz, Iran

³ Department of Nutrition Sciences, School of Nutrition, Tabriz University of Medical Sciences, Tabriz, Iran

Corresponding Author: Farid Gharibi, Golgasht Ave, School of Management and Medical Informatics, Tabriz, Iran,

Email: Gharibihsa@gmail.com, Zip code: 5166614711, Tel: +98 9181332935

Abstract

Background & Aims: Needle Stick Injury (NSI) is one of the important aspects of safety in healthcare centers which has major negative impact on staff and patients health. So, this study aims to assess NSIs status and its effective factors among nurses.

Materials & Methods: This is a cross-sectional study which was done in Tabriz Imam Reza hospital using a researcher-made questionnaire. The obtained data are initially analyzed descriptively and then the relationship between background variables and NSIs aspects was assessed using statistical tests. All of analyses were conducted using SPSS16 and in all cases the significance of P was considered as less than 0.05.

Results: The study results showed that 34.3% of the nurses have had NSIs in the past year and its rate has been average 0.74 time per person annually. Also, it was revealed that there is a significant relationship between NSIs exposure and the variables of job, educational field, job experience and the hospital ward. It was shown that the graduated and working nurses, individual with less than five years of job experience and who working in operation rooms are more exposed with NSIs.

Conclusions: The study results indicate that the status of NSIs in nurses is not satisfactory. It is clear that improvement of this condition requires designing and implementing effective interventions from health managers.

Keywords: Needle stick injury, Effective factor, Nurse

Received 12 August 2017, accepted for publication 25 October 2017

Introduction

The safety is one of the main performance indicators in health delivery system which has remarkable positive effects on community health and satisfaction. The safety has various aspects including clinical, physical, chemical, microbiological, psychological and social (1-4). The previous studies indicated this reality that the nurses, physicians and laboratory staffs that are in direct contact with blood and its related products are seriously exposed to the infection risk. Although there are more

than 20 types of blood-borne infections but the Hepatitis B, Hepatitis C and HIV are most important communicable diseases through blood and its products especially through NSIs (5, 6).

The National Institute of Occupational Safety and Health (NIOSH) in the United States defines NSIs as "injuries which are made by sharp objects such as needles, syringes, blood-related tools and intravascular needles" (7). This phenomenon is the most common cause of occupational exposure to blood-borne diseases

(8, 9). It is estimated that annually three million healthcare providers are exposed to blood-borne diseases which are created through NSIs (2 million, 900,000 and 300,000 people are exposed to Hepatitis B, C and HIV respectively) worldwide (10). As a result of these exposures, 150,000 healthcare providers infected with Hepatitis C, 70,000 people infected with Hepatitis B and 500 people infected with HIV (11); and Most of these cases happen in developing countries (10).

The previous studies which were conducted regarding NSIs rate in healthcare providers indicated that the nurses are at risk more than other healthcare providers. The authentic studies conducted in this area reported that the rate of NSIs in Iranian nurses is 63.3% (12), Japan is 46% (13), Poland is 28% (14) and in Turkey is 48.1% (15). In Iran the occurred NSIs are not often registered and for this reason there is no precise statistics in this area (12, 16). Review of literature showed that the influencing factors including performing excessive injections, lack of safe needle and equipment to cover it, lack of suitable containers for used needle storage, hiring inappropriate individual in healthcare centers, inappropriate recapping of needles after use, the quality of developed medical procedures, fast and precise transfer of equipment from one person to another in operating room and lack of healthcare awareness regarding needle stick dangers for their insufficient training are lead to NSIs (8).

By regarding that the different literature name nurses as one of the groups who are the most exposed to NSIs and there are no comprehensive published studies which assess the relationship between background factors with NSIs aspects, this study aims to study NSIs status and its related effective factors among nurses. The researchers are hopeful that successful implementation of this study could take a fundamental step to promote safety for healthcare providers and care givers in healthcare centers.

Materials and Methods

This is a cross-sectional study which was conducted in 2015 by participation of 265 individual which were working as nursing group in Tabriz Imam Reza hospital. The sample size was determined using Morgan table based on 886 nurses which are occupied in this hospital (17). The research data was collected using random sampling method. The inclusion criteria were employment in nursing field (general nurses, anesthesia nurses, operation room nurse and nurse aids which are called Behiar) and having at least one year job experience.

The study tool was a researchers-made questionnaire which its validity and reliability was confirmed by statistical tests. In the first step of preparing the questionnaire, the researchers used the key word of “needle stick” from authentic data sources of Science Direct, Pub Med, Ovid Medline and Cochran as well as the Persian equivalent of needle stick in Persian data bases of SID, Magiran and Irandoc. After vast literature review and gaining sufficient information regarding NSIs and its related parameters, the primary questionnaire was designed.

Then the content and face validity of designed questionnaire was assessed from the viewpoint of 15 experts based on five aspects of relevance, transparency, simplicity, necessity and measurability of the questions/parameters in a four-option scale (18). According to statistical principles, firstly the Content Validity Ratio (CVR) which calculated based on necessity of questions/parameters was assessed and if the question was confirmed in that aspect, the Content Validity Index (CVI) was studied based on other four factors. In all cases, the passing score will be valid by 70% (19, 20). It goes without saying that if a question/parameter not being able to pass this norm will be excluded from the final tool.

In this study, the questionnaire was approved by gaining the scores of 87% and 91% for CVR and CVI respectively. Also in order to confirm the face validity, the questionnaire was amended and approved from the expert's perspective qualitatively. In addition to confirm

the reliability (internal consistency) of the questionnaire, it was tested through a pilot study and doing test-retest with 50 samples size. For this aim the Cronbach's Alpha of 0.87 was obtained and the questionnaire was confirmed in this regard too. Finally the questionnaire was designed with 8 background variables and 7 questions regarding NSIs and its related parameters.

The collected data were firstly analyzed descriptively and the obtained results for the quality variables were reported in form of frequency (percentage), then the relationship of background variables and the NSI and its related parameters were investigated. For this purpose, the significance level of this relationship was determined using statistical tests and in all cases, the amount of P less than 0.05 was the criterion for decision-making in this regard. In this study part, the K-square statistical test was used due to the qualitative nature of the variables, and all the analyses were conducted using SPSS16 software.

To protect the ethical principles, the participants were free to accept or refuse the participants in study. The study results were issued in a way to keep the respondents completely unknown and the privacy of the study participants was respected. The participants were also assured that the obtained data and results will only be used in line with the research goal.

Results

The participant nurses in current study were often the female and more than half of them were between 30 and 40 years old. Most of them held Bachelor's degree of nursing. The nurses with fixed employment status (Peimani) have highest frequency and most of them worked for the internal ward of the hospital. Also the nurses with 5 to 10 years job experience were the largest group (Table 1). Furthermore, the average age of participant was 34.2 years with the standard deviation of 7 years, and the their average job experience was 9.9 years with the standard deviation of 6.1 years.

Table 1. Background characteristics of the study participants

Background variables	Variable classification	Frequency	Percentage
Age	20 to 30 years old	89	33.6
	30 to 40 years old	136	51.3
	40 to 50 years old	35	13.2
	Over 50 years old	5	1.9
Gender	Male	58	21.9
	Female	207	78.1
Job title	Nurse	172	64.9
	Nurse aids	79	29.8
	Operation room	9	3.4
	Anesthesia area	5	1.9
Educational field	Nurse	172	64.9
	Nurse aids	7	2.6
	Operation room	9	3.4
	Anesthesia area	5	1.9

Background variables	Variable classification	Frequency	Percentage
	Other jobs	38	14.3
	Diploma	34	12.8
	Under Diploma	12	4.5
	Diploma	38	14.3
Educational grade	Upper Diploma	24	9.1
	Bachelor's degree	187	70.6
	Master's degree	4	1.5
	Tenured	42	15.8
Employment status	Fixed term	119	44.9
	On contract	73	27.5
	Probation	31	11.7
	Internal	92	34.7
	Surgical	40	15.1
	Neural	16	6
	Emergency	33	12.5
Name of hospital ward	ICU	49	18.5
	Infectious diseases	5	1.9
	Orthopedic	4	1.5
	Operation room	23	8.7
	ENT	3	1.1
	1 to 5 years	61	23
Job experience	5 to 10 years	103	38.9
	10 to 20 years	86	32.4
	20 to 30 years	15	5.7

The study of the NSIs status and its related aspects showed that more than one third of the participants had exposure to needle stick in recent year and the participants with one or two times of exposure were the highest frequency. Also the average exposure of participants in the past year was 0.74 times with the standards deviation of 1.4 times, it mean that every nursing group member had experienced NSIs roughly 0.74 times in the recent year (Table 2).

Most of the participants were vaccinated against Hepatitis B and almost two third of them were examined serological test for assessing antibody amount in their blood after completing the vaccination. The absolute majority of respondents admitted to the fact that they had not checked their antibody degree after having need stick injury and almost all of them admitted that even when the antibody amount of Hepatitis B in their body was proved to be low, they did not inject

Immunoglobulin immediately and were not vaccinated again either. Moreover the participants believed that the most important reasons for their exposure to NSI were

their high work load, wrong and unsafe recapping of needles by themselves and low safety of existence syringes respectively (Table 2).

Table 2. Situation to find NSIs and relevant aspects to it among participants

Variables of NSI	Variable classification	Abundance	Percentage
Exposure to NSI in the recent year	Yes	91	34.3
	No	174	65.7
Number of exposure in the recent year	Once	37	40.6
	Twice	31	34.1
	Three and four times	18	19.8
Receiving Hepatitis B vaccine	More than four times	5	5.5
	Yes	252	95.1
	No	13	4.9
Antibody test after receiving Hepatitis B vaccine	Yes	185	69.8
B vaccine	No	80	30.2
Antibody test after NSI	Yes	38	14.3
	No	227	85.7
Receiving Immunoglobulin and vaccine if the number of antibody Titer is low	Yes	9	3.4
Causes of NSIs	No	226	96.6
	Wrong recapping of needle by others	26	17.6
	Wrong recapping of needle by the participants	18	12.2
	Lack of or unsafe container of used needles	3	2
	Unsafe transfer of needles	4	2.7
	high work load	64	43.2
	Insufficient training about the needle sticks	10	6.8
	Low safety of syringes	19	12.8
	Other causes	4	2.7

The study results showed that there is no statistically significant relationship between the number of exposure, antibody Titer test of Hepatitis B after injury, as well the re-vaccination in the case of low blood immunity level with any demographic variables ($P>0.05$), but the statistical relationship showed between other aspect of NSIs with demographic variables in

different ways ($P<0.05$). The assessing statistical relationship between exposure to NSI with demographic variables, it was shown that there is significant relationship between variable of job, educational fields, job experience and hospital ward where the participants were working. The significant relationship is a way that the exposure to NSIs is more in nurses than nurse aids,

in personnel of operation room is more than others personnel and in personnel with 1 to 5 years job experiences is more than the personnel with longer job experiences significantly ($p<0.05$).

There is significant relationship between doing vaccination against Hepatitis B in participants with all background variables except the hospital ward where the participants are working. In this way that the vaccination rate against Hepatitis B in nurses and operation room personnel is more than nurse aids and individuals which working in anesthesia area, in participants with diploma and under-diploma is less than other educational grade groups, in participants with fixed term and contracted is more than other, in female personnel is more than males, in participants between 20-30 years old is more than other age groups and is less in personnel with more than 20 years job experiences significantly ($p<0.05$).

The study results indicated that there is significant relationship between the antibody Titer test after receiving Hepatitis B vaccine and all background variables under study except age. It means that doing

antibody Titer test in the nurses is more than other professions, in participant with academic education is more than other educational groups, in individuals with tenured and contracted employment status is more than the individuals with other forms of employment, in participant which working in ICU ward is more and in individuals working in infectious disease and orthopedic wards is less than the other wards, in women is more than men and in individuals with job experience less than 5 years is more than the individuals with higher job experience significantly ($p<0.05$).

Also, the statistically significant relationship was seen among causes for NSIs and the variable of job and educational field. In this way that the nurse aids were the biggest group who suffered NSIs due to improper syringe recapping by others, while the nurses were the biggest group who suffered NSIs for improper recapping of syringes by themselves. Also the nurses was a group which had most complain about high work load and low safety of existing syringes ($p<0.05$).

Table 3. Significance relationship between background variables and NSIs aspects

	Exposure to NS	Number of exposure	Hepatitis B vaccination	Antibody test after vaccination	Antibody test after exposure	Re- vaccination	Cause of injury
Job	0.008	0.683	0.003	0.002	0.425	0.823	0.001
Educational Field	0.012	<u>0.599</u>	0.020	0.004	0.527	0.957	0.009
Educational grade	0.097	0.684	<0.001	0.013	0.544	0.946	0.430
Employment status	0.105	0.074	0.014	0.003	0.434	0.442	0.125
Job experience	0.027	0.415	0.048	0.025	0.407	0.793	0.359
Wards' Name	0.002	0.813	0.670	0.004	0.886	0.961	0.541
Gender	0.895	0.270	0.030	<0.001	0.160	0.426	0.339
Age	0.099	0.723	0.001	0.533	0.810	0.892	0.182

Significant cases are made distinct by underlining them.

Discussion

The study results showed that 34.3% of the working individuals in nursing field exposed NSIs and had

roughly experienced 0.74 times in the past year. This NSIs rate was less than 63.3% and 1.2 times exposure per person in Ebrahimi study (12), is similar to Bijani

study by 32% exposure (21) and is more than the 22.5% exposure in Kazemi Gelogahi study (22) or 18.8% exposure in the study which was conducted by Parsapili (23). About 95% of the participants received complete vaccination against Hepatitis B which was similar to the Parsapili study (96.9%) (23) and was more than the study which was conducted by Serafinska (75.7%) (24). In addition, 69.8% of participants did the antibody Titer on their blood to make sure the vaccination effectiveness which this rate was 99% and 68% in the study conducted by Parsapili (23) and Gershon respectively (25).

Only 14.3% of the participants re-checked their blood antibody after exposure to NSIs, and 3.4% of them injected Immunoglobulin immediately or were re-vaccinated. In Heidari study it was also identified that 16% of the individuals referred to determine the antibody Titer after injury and only 12% of them followed up and completed Hepatitis B vaccination (26). Also, the participants believed that the most important reasons for their exposure to NSI were their high work load, wrong and unsafe recapping of needles by participants and low safety of existence syringes respectively. In Vahedi study the high work load was introduced as the most important cause on NSIs too (27).

To assess statistical relationship between exposure to NSI with demographic variables, it was shown that there is a significant relationship between variable of job, educational fields, job experience and hospital ward where the participants were working. In the conducted studies by Gholami (28) it was shown that the nurses had the highest rate of NSIs among health personnel. Also many studies such as Ilhan's study found the effect of individuals' job experience on NSI, so that the individuals with job experience of less than five years have shown higher rate of NSIs (29). In addition many studies found that the hospital ward is effective on NSIs so that the researchers like Darvishzadeh found that working in operation rooms is one of the effective factor on NSI like the current study (30).

The current study was showed that there is a significant statistical relationship between vaccination

of participants against Hepatitis B and background variables including job, educational field, employment status, gender, age and job experience of individuals. Also it seems that the significant relationship between employment status and vaccination can be affected by age and work record because most individuals with employment status of fixed term or contracts have less age and job experience. The study results indicated that there is significant relationship between the antibody Titer test after receiving Hepatitis B vaccine with all background variable including job, educational field, employment status, gender, job experience and hospital ward. In addition, the statistically significant relationship between NSI causes and job or educational field is notable.

By regarding that the NSI rate is remarkably high and no acceptable among the nurses of Tabriz Imam Reza Hospital (and in many healthcare providers in other geographical area of Iran), the researchers offer recommendation to establish the NSs reporting and minimizing system. As well, developing of national proper protocol with mechanism for prevention and management of NSI is vital (31) because these NSIs cases are not registered commonly in developing countries and this could be the biggest barrier to remove the relevant problems in this regard. The study limitations was the hard answering of participants to questionnaire for their high work load and lack of enough studies for comparing with current study specially in related aspects to NSI.

Conclusion

The current study is a proof of the fact that the status of NSIs and protection against it in nursing group is not satisfactory and there are serious shortcomings in this regard. It is clear that improvement of this status require the officials to pay due attention to this scope and remove the existing fundamental problems using effective and efficient interventions. Undoubtedly the results of the current study can be helpful to resolving

identified shortcomings and pave the ground for further studies in this area.

Acknowledgments

At the end, the researchers find it necessary to appreciate the valuable nurses of Imam Reza Hospital of Tabriz who answered the questions of the questionnaire patiently despite their heavy work load.

Conflicts of Interest

The authors declare no conflict of interest.

References

1. Mardani S, Tabibi SJ, Riahi L. Relationship between Safety and Staff Performance in Hospital. *Int J Hosp Res* 2013;2(4):205-14.
2. Azimi L, Tabibi SJ, Maleki MR, Nasiripour AA, Mahmoodi M. Influence of Training on Patient Safety Culture: a Nurse Attitude Improvement Perspective. *Int J Hosp Res* 2012;1(1):51-6.
3. Tabatabaei SS, Kohpeima Jahromi V, Asadi M, Kalhor R, Sharifi T. Ranking Factors Contributing to Medication Error Incidents in Private Hospital: A Nurse Perspective. *Int J Hosp Res* 2013;2(4):187-94.
4. Dehnavieh R, Ebrahimpour H, Jafari Zadeh M, Dianat M, Noori Hekmat S, Mehrolhassani MH. Clinical Governance: The Challenges of Implementation in Iran. *Int J Hosp Res* 2013;2(1):1-10.
5. Shah SF, Bener A, Al-Kaabi S, Al Khal AL, Samson S. The epidemiology of Needle Stick Injuries among health care workers in a newly developed country. *Saf Sci* 2006;44(5):387-94.
6. Moazeni-Bistgani M, Sharjerdi S, Khosravi N. Evaluation of Preventive Interventions in Reporting Needle Stick Injuries among Health Care Workers. *Int J Hosp Res* 2014;3(1):31-6.
7. NIOSH. Preventing Needle Stick Injuries in health care settings. Cincinnati. DHHS (NIOSH) publication, 1999.
8. Wilburn SQ, Eijkemans G. Preventing Needle Stick Injuries among Healthcare Workers: A WHO- ICN Collaboration. *Int J Occup Environ Health* 2004;10(4):451-6.
9. Sagoe-Moses C, Pearson RD, Perry J, Jagger J. Risks to health care workers in developing countries. *N Engl J Med* 2001;345:538-41.
10. Prüss-Üstün A, Rapiti E, Hutin Y. Estimation of the global burden of disease attributable to contaminated sharps injuries among health-care workers. *Am J Indus Med* 2005;48(6):482-90.
11. Ansa VO, Udoma EJ, Umoh MS, Anah MU. Occupational risk of infection by human immunodeficiency and hepatitis B viruses among health workers in south-eastern Nigeria. *East Afr Med J* 2002;79(5):254-6.
12. Ebrahimi H, Khosravi A. Needle stick Injuries among Nurses. *J Res Health Sci* 2007;7(2):56-62.
13. Smith DR, Mihashi M, Adachi Y, Nakashima Y, Ishitake T. Epidemiology of needle sticks and sharps injuries among nurses in a Japanese teaching hospital. *J Hosp Infect* 2006;64(1):44-9.
14. Bilski B. Needle stick injuries in nurses the Poznan study. *Int J Occup Med Environ Health*. 2005;18(3):251-54.
15. Ayrancı U, Kosgeroglu N. Needle stick and sharps injuries among nurses in the healthcare sector in a city of western turkey. *J Hosp Infect* 2004;58(3):216-23.
16. Arabloo J, Rezapour A, Ebadi Fard Azar F, Mobasher Y. Measuring Patient Safety Culture in Iran Using the Hospital Survey on Patient Safety Culture (HSOPS): an Exploration of Survey Reliability and Validity. *Int J Hosp Res* 2012;1(1):15-28.
17. Krejcie RV, Morgan DW. Determining Sample Size for Research Activities. *Edu Psyc Measur* 1970;30(3):607-10.
18. Premkumar K, Hunter W, Davison J, Jennett P. Development and validation of an evaluation tool for multimedia resources in health education. *Int J Med Info* 2000;50(1-3):243-50.
19. Yaghmaie F. Content validity and its estimation. *J Med Edu* 2003;3(1):25-7.

20. Hajizadeh E, Asghari M. Statistical Methods and Analyses in Health Biosciences. Tehran: Jahad Daneshgahi Publisher; 2010.
21. Bijani B, Sotudemanesh S, Mohammadi N. Epidemiological features of Needle Stick Injuries among nursing staff. *J Guilan Univ Med Sci* 2011;2(77):61-8.
22. Kazemi Galougahi MH. Evaluation of Needle Stick Injuries among nurses of Khanevadeh Hospital in Tehran. *IJNMR* 2010;15(4):172-7.
23. Parsa Pili J, Izadi N, Golbabaei F. Factors Associated with Needle Stick and Sharp Injuries among Health Care Workers. *Int J Occup Hygiene* 2013;5(4):191-7.
24. Serafinska S, Smolinski P, Gladysz A. Critical evaluation of reporting on post exposure skin damage incidents and its consequences for Polish health workers. *Med Pr* 2006;57(5):439-50.
25. Gershon RR, Sherman M, Mitchell C. Prevalence and risk factors for blood borne exposure and infection in correctional healthcare workers. *Infect Control Hosp Epidemiol* 2007;28(1):24-30.
26. Heidari M, Shahbazi S. Prevalence of needle sticks exposure in operation room's staff of Borujen & Lordegan hospitals - 2010-2011. *J Rafsanjan Nurs Medwify Faculty* 2010;5(1):32-7.
27. Vahedi M, Ahsan B, Ardalan M, Shahsavari S. Prevalence and Causes of Needle Stick Injuries, in medical personnels of Kurdistan University's hospitals and dealing with such injuries due to contaminated sharp tools in 2004. *Sci J Kurdestan Univ Med Sci* 2006;11(2):43-50.
28. Gholami A, Borji A, Lotfabadi P, Asghari A. Risk Factors of Needle stick and Sharps Injuries among Healthcare Workers. *Int J Hosp Res* 2013;2(1):31-8.
29. İlhan MN, Durukan E, Aras E, Türkçüoğlu S, Aygün R. Long working hours increase the risk of sharp and needle stick injury in nurses: the need for new policy implication. *J Adv Nurs* 2006;56(5):563-9.
30. Darvishzadeh M. Evaluation of Needle Stick Injuries in health care workers in the first 6 months of 2011. Tehran: Available from: <http://feiz.mui.ac.ir/images/stories/Parastari/Class/1390/51>.
31. Debnath D. Improving reporting of sharp injuries. *Hosp Med* 2000;61(12):852-4.