

An Investigation into Occupational Hazards Faced by Nurses in Paediatrics Hospitals of Tehran University of Medical Sciences, 2006-2009

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ABSTRACT

Background

Injuries resulting from sharp and cutting objects and exposure to patients' blood and other body fluids are considered as one of the most important occupational hazards facing health care personnel due to exposure to blood-borne viruses such as Hepatitis B and C and HIV. The aim of this study is to investigate occupational hazards that involve safe handling of sharp and penetrating objects by nursing staff working in paediatrics hospitals of Tehran University of Medical Sciences (2006–2009).

Methods

In this descriptive study, nursing personnel employed at the paediatrics hospitals of Tehran University of Medical Sciences were selected. Data were collected through a self-administered questionnaire containing two parts; part one was related to demographic information and part two focussed on details of injurious incidents. The collected data were analyzed using SPSS software, version 16.

Results

The study population reported 134 needle stick injuries (134 HCWs exposure group, 380 HCWs not exposure group). The incidence rate of NSI was 26.07% (8.17% per year). In most cases, needles (40.3%) and vein catheters (28.36%) were accounted for injuries. IV access (31.33%) and recapping of needles (20.9%) were most common actions that resulted in exposure. There was no statistically significant difference in demographic variables except in work experience between two groups.

Conclusion

Based on the findings of this study, the incidence rate of NSI among HCWs working in paediatrics wards was less than those of other studies in different countries. This might be related to inadequate reporting, and also our results emphasize the importance of training and education of nursing personnel for reporting needle stick injuries.

KEYWORDS: Occupational Injuries; Sharp Objects; Emergency Hospital

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INTRODUCTION

Injuries caused by contact with sharp and cutting objects as well as exposure to patients' blood and other body fluids is one of the most important hazards endangering health and safety of health care workers in hospitals as it exposes them to the risk of becoming carriers of viruses transmitted by blood stream, i.e. Hepatitis B and C and HIV.¹ A needle stick injury is an occupational exposure to blood borne pathogens caused by precutaneous piercing wounds (typically set by a needle or other sharp objects) but possibly also by mucous membranes and non intact skin.² The main concern is exposure to the blood or other body fluids of another person. A recent report by the British Institute for the Protection of Health and Safety at work states that some 400,000 cases of injuries from professional handling of sharp and cutter objects are reported annually by healthcare workers at the Department of Health.³

Results from research carried out by Dement et al indicated that out of 24425 healthcare personnel at the department of health in North Carolina State some 2,730 cases of serious injuries caused by professional handling of sharp and cutting objects were reported during the year of the research, i.e. 5.5 cases of serious injuries out of every 100 full time healthcare personnel annually. This study also showed that most injuries were sustained by the inexperienced healthcare personnel. That is, 36.2% of the incidents involved those who had less than four years of work experience as healthcare workers.⁴ Also the results of a two year study revealed that 73 cases of injurious accidents caused by handling sharp surgical instruments were reported by healthcare staff and that 66% of the reported cases were related to nurses, while 63% of the injuries were caused as the result of professional contact with needle sticks.⁵ Another study showed that out of 111 personnel at two educational and non-educational hospitals 46% had experienced harmful contact with contaminated needle sticks (penetration of

contaminated needle stick into their hand) while at the same time it was found that 45% of the nurses had at least one experience of harmful contact with sharp and cutting objects when performing clinical duties.⁶ Moreover, out of 158 nursing personnel under a study 56.96% had experienced injurious professional contact with sharp and cutter objects at least once a year, and 44.3% of these cases had occurred during recapping of needle sticks. This study also showed that in paediatrics wards 2.2% experienced this occupational hazard.⁷

The British Institute for Protection of Health in 2008 reported that 68% of these work-related accidents, during the years 2000-2007, had occurred among nurses when handling unused and dry needle sticks. It also states that one third of these injuries took place inside hospitals, not clinics, and trauma and emergency wards.³

Some of the most important factors affecting the degree of injurious contacts with sharp and penetrating objects are considered to be high stress, high work pressure, lack of safe instruments and equipment for carrying out duties at work, and shortage of staff while the number of patients are increasing daily.^{8,9} Exposure to contaminated blood and other body fluids could have dangerous, life threatening, debilitating consequences, as this occupational hazard exposes almost all medical personnel to carriers of viruses that thrive in blood stream. The risk ratio for catching diseases transmitted by blood stream subsequent to injurious contact with and/or under the skin or deeper penetration by needle sticks and/or subsequent to visible exposure to contaminated blood from carrier patients is said to be 1:3 for hepatitis B, 1:30 for hepatitis C, and 1:300 for HIV or AIDS. Moreover, the reports in 2007 were indicative of the fact that there have been five proven and fourteen probable cases of becoming HIV carriers, among healthcare staff, subsequent to sustained injuries while handling needle sticks and other sharp and penetrating objects at work place. Five of

these carriers died of their illness, AIDS.³ A report by the World Health Organization states that some 16000 cases of Hepatitis C, 66000 Hepatitis B, and 1000 HIV cases are registered following injurious professional contact with needle sticks and other sharp and cutter objects by healthcare staff.¹

Occupational injuries with sharp and cutter objects put a heavy economic burden on the health care service of any country. At least one case of serious injury would cost the health care service at least one million US dollar medically and loss of job and inability to attend work, while the cost of preventing the occurrence of these injurious accidents is estimated to be as little as US\$3000.⁴ Economic costs of preventing harmful injuries caused by professional contact with sharp and penetrating objects at workplace in the USA is estimated to be 51 to 3766 million US dollars as the number of harmful contacts with sharp and penetrating objects in the USA is approximately between 14 to 839 out of every 1000 medical staff employed in the clinical sectors of the US health industry.¹⁰

However, results of some studies indicate that 90% of injurious professional contacts with sharp and penetrating objects take place in the developing countries where few studies are carried out to determine the extent of the problem and it still remains scattered and limited in their value and quality.⁸ On the other hand, the Centre for Management of transmittable infectious diseases, Training and Treatment of the Ministry of Health and Treatment in Iran recently observed that there has been a growing trend for blood borne viruses, HIV in particular, in the country in recent years.¹¹ This alarming information indicates the need for further and extensive research into the extent of workplace accidents with sharp and penetrating instruments among healthcare staff in Iran in order to identify the risk factors that are considered to contribute to this problem and determine the required preventive practices, appropriate actions

for effective intervention in order to ensure health and safety of healthcare workers. This study is a step towards achieving this objective. Therefore, the aim of this present study to investigate occupational hazards that involve safe handling of sharp and penetrating objects by nursing staff employed by paediatrics hospitals affiliated to Tehran University of Medical Sciences during 2006–2009.

MATERIALS AND METHODS

In this descriptive research which was carried out from 2006 to 2009, all nursing personnel employed at two Bahrami and Medical centre paediatric hospitals affiliated to Tehran University of Medical Sciences, consisting of nurses, nurse assistants, anaesthetics and operating room technicians, were included in the study. Altogether, there were 514 nursing staff, all of whom were selected using Census method. The list of nursing personnel employed at these hospitals and demographic information related to each of them were obtained subsequent to arrangements with Infection Control Department and Nursing Administration of each hospital. The instrument for collecting data in this study was a questionnaire. It included ten demographic questions and 22 questions on details of each harmful contact with sharp and cutter objects; questions such as the type of professional contact, type of instrument involved, number of harmful incidents that has led to the injury, time and location of the incidents and type of measures taken when the accident occurred. In order to determine the validity of the questionnaire, content validity method was used. The questionnaires were distributed among ten members of the authorities at the Committee for the Control of Infections at the University of Medical Sciences, while more copies of the questionnaire were given to academic specialists in research methods. After collecting their views, all necessary corrections were made to the questionnaire. To test the reliability of the questionnaire, test-retest method was used in two stages within 15 days'

time; the reliability proved to be 0.71%.

On 21 July 2006, a general meeting of supervisors in infection control wards of the hospitals was held and the purpose of investigation was explained to them. The information included detailed instructions on how to fill in the questionnaires.

That is, each medical personnel that sustained injury as a result of contact with sharp and penetrating objects was exposed to blood or body fluids from patients and referred to the infection control under their supervision for treatment and follow-up should be asked to complete one of the questionnaires. Informed consent forms regarding willingness to participate in the study were signed by the participants. The subjects were told that they can leave the session at any time during the interview. All interviewees were anonymous as the questionnaire did not include any personal information, and all information was kept as strictly confidential during all stages of the research. Participants were kept fully informed of all these aspects of the research. Following completion of the questionnaires, they were given to the researchers once every six month. The collected data were analyzed using SPSS, version 16.

RESULTS

The results of this study indicate that the incidence rate of NSI was 26.07% (8.17% per year). That is, out of 514 nursing staff in two paediatric hospitals who participated in this study, 134 had experienced injurious professional contact with sharp objects with which they performed their duties at hospitals. We divided the subjects into two groups: one group consisting of those who did sustain injuries caused by professional contact with surgical tools and instruments and the second group consisting of 380 subjects who did not sustain any injuries when handling sharp and penetrating instruments. We call these two groups “exposed” and “non-exposed”. Results of the study showed that in the group exposed to injurious sharp objects, 122 subjects (90.04%) were female, 85 (63.43%) were married, 96 (71.64%) were qualified nurses, and 98 (73.13%) were graduates/post-graduates. Moreover, it was found that among the group that was not exposed to sharp and penetrating objects 361 (95%) or were female, 266 (70%) were married, 289 (76.05%) were qualified nurses, and 293 (77.11%) were graduates/post graduates. Demographic information of both groups of “exposed” and “non-exposed” subjects are shown in table 1.

Table 1: Demographic information of the participants and its correlation with injurious incidents at Tehran paediatric hospitals

| Individual conditions Demographic particulars | Exposed to N (%) | Not exposed to N (%) | Chi-square Test | df | P value |
|--|---------------------|-------------------------|--------------------|----|---------|
| Marital status | | | | | |
| Married | 85 (63.43%) | 266 (70%) | 1.97 | 1 | 0.16 |
| Single | 49 (36.57%) | 114(30%) | | | |
| Sex | | | | | |
| Female | 122 (91.04%) | 361 (95%) | 2.73 | 1 | 0.09 |
| Male | 12 (8.96%) | 19 (5%) | | | |
| Medical Team | | | | | |
| Nurse | 96(71.64%) | 289 (76.05%) | 9.098 | 4 | 0.05 |
| Assistant Nurse | 5 (3.73%) | 19 (5%) | | | |
| Technician | 5 (3.73%) | 24 (6.32%) | | | |
| Nurse aid | 25 (18.66%) | 36 (9.47%) | | | |
| Others | 3 (2.27%) | 12 (3.16%) | | | |
| Level of Education | | | | | |
| Graduate/post graduate | 98 (73.13%) | 293 (77.11%) | 14.64 | 2 | 0.00 |
| Below High School | 26 (19.14%) | 32 (8.42%) | | | |
| Assistant Nurse Diploma | 10 (7.46%) | 55 (14.47%) | | | |

However, the findings of this study indicate that 76.12% (102 subjects) in the group exposed to injurious sharp and cutter objects had only one case of sustaining injuries from contact with sharp and cutter objects, 18.66% (25 subjects) had two cases and 7 subjects had three or more cases of injurious professional contact with sharp and cutter objects.

Moreover, the findings of this study indicate that with respect to the type of tool or sharp and penetrating object, needle stick and IV catheter/injection kit had caused 54 cases and (40.3%), 38 cases (28,36%) injuries respectively. It was also revealed that these injuries were sustained mostly during intravenous injection and/or taking blood samples from patients. In other words, 42 cases (31.33%) of injuries occurred when doing intravenous injections and 28 cases (20.9%) occurred when taking blood samples. These results are presented in table 2.

It was also found that accidents involving sharp and cutting objects occurred more frequently than other incidents. 47 subjects (35.7%) were injured by sharp objects and 32 (23.88%) by the cutting tools. The majority of these incidents happened in the internal and special care wards of the two paediatrics hospitals (table 1).

Results of this study indicated that the mean age of those who had experienced

injurious incidents was 35.3±4.6 years and that for those who had not experienced any injurious incident was 37.9±1.3 years. Comparison of these two means showed no significant differences between the two groups (P=0.08).

The mean work experience was 3.8±2.4 in the group that had experienced needle stick injuries and 5.09±5.7 for the group that had not been exposed to such injuries. Using the Independent Sample *t* test, a meaningful deviation was observed in the correlation between the work experience and the number of times needle stick injuries were sustained. Subjects who had longer work experience were less likely to sustain needle stick injuries when performing their duties at their workplace. See table 3.

DISCUSSION

Results from current study showed that the rate of unsafe handling of sharp and penetrating/cutting objects and/or contact with bloody fluids in the two paediatric hospitals is 26.07% (8.17 % per year) Other researchers surveyed a training hospital in Germany and reported that the rate of incidents considered as occupational hazards amongst nursing personnel in paediatric wards was 18.7% per year.¹² In a research in North Carolina, United States of America, the rate of injurious incidents and risk of exposure

Table 2: Frequency of situations in the group that sustained injuries

| Situations for injuries sustained | Numbers | Percentages |
|-----------------------------------|---------|-------------|
| Intravenous injection | 42 | 31.33% |
| Taking blood sample | 28 | 20.9% |
| Putting back needle cover | 14 | 10.45% |
| Transfer to safety box | 25 | 18.66% |
| Injections | 17 | 12.69% |
| Washing hands & instruments | 8 | 5.97% |

Table 3: Comparison of age and work experience in the two groups who had/not sustained injuries

| Group / Variable | Exposed to NSI mean±SD | Not exposed to NSI mean±SD | <i>t</i> test | P value |
|------------------|------------------------|----------------------------|---------------|---------|
| Work experience | 3.8±2.4 | 5.09±5.7 | 1.98 | 0.0003 |
| Age | 35.3±4.6 | 37.09±1.3 | 3.71 | 0.08 |

to infectious body fluids amongst nursing personnel in paediatric wards was 13.7% per year.⁴ The results of our research show that the rate of incidents involving needle sticks and sharp objects as well as risk of exposure to contaminated blood for nursing personnel in Tehran is much lower than any other country in the world. Our study also revealed that conditions under which nursing personnel suffered occupational hazard were taking blood samples and/or practicing intravenous infection; a frequency of 42 cases (31.33%) and 28 cases (20.9%) was observed, respectively. These findings are in accordance to the results of two studies in Africa. These studies show that the majority of incidents, (17.5% in one study and 27.3% in another study) took place when either blood samples were being taken or intravenous injections were given.^{8,13} This study also indicated that most injurious incidents took place when needle sticks were being put in their safety boxes; the frequency of incidents under this condition was 18.66%, i.e. the highest after taking blood samples and/or giving intravenous injections. Some studies report that a large percentage of injurious incidents take place when ejecting and/or clearing away surgical tools and equipment; these findings accord with the results from the current study.^{14,15} It seems that the contributing factor to the relatively high frequency of injurious incidents when handling surgical tools is the fact that personnel are either untrained or lack adequate training for handling these objects. On one hand, the level of knowledge and awareness amongst employees is so little that they are not able to follow written instructions on safe handling of sharp objects and injection kits, and on the other hand heavy work load, busy work schedule, shortage of staff leave the nursing staff with no time to do their jobs to the best of their ability.

It has already been mentioned that the results of this study showed that needle sticks and injection kits caused 54 cases (40.3%) and 38 cases (28.36%) of injurious incidents respectively. The findings of some studies show that most workplace accidents in hospitals were caused by mishandling of needle sticks.

the frequency of accidents in these two studies were 50% and 43.77%, respectively.^{15,16} These findings agree with the finding of the current study. It is, therefore, reasonable to argue that the increasing frequency of injurious incidents during medicinal procedures is related to the requirement of using needle sticks in those procedures. In other words, the reason nursing personnel increasingly sustain injuries when performing their duty is the need to use injection kits and/or needle sticks routinely.

Results of the current study indicated that the frequency of occupational and injurious contact with sharp and cutting objects in internal and intensive care wards was 47 cases (35.7%) and 32 cases (23.88%), respectively. These findings are in contrast with the results of two studies in Iran and Germany which show less frequency of 18.9% and 31.3%, particularly in operation rooms and general surgery procedures.^{7,12} It appears that the increased frequency of injurious incidents in internal wards is on the one hand related to the type and nature of nursing profession and their increasing presence in routine medicinal cares, assault procedures, and close and repeated contact with surgical instruments for the purpose of injecting, taking blood sample and giving intravenous injections, and having to examine the patients' body for various symptoms.

This study also showed that inexperienced personnel were more likely to injure themselves when handling surgical instruments as compared to the more experienced personnel. These findings were in accordance with similar findings in Africa where the frequency of injurious incidents was 23.4% for the experienced personnel who had 6 to 10 years of work experience, and Ghofranipour in Iran who reported a frequency of 34.2% among the personnel enjoying under five years of work experience, and Dement who reported a frequency of 47.8% in personnel with less than four years of work experience.^{4, 7,13} This may be due to lack of awareness on the part of inexperienced personnel and so lack of familiarity with consequences of inflicting

accidental self-injuries when performing their duties. On the other hand, the reason for low frequency of injurious incidents amongst highly experienced staff may be that they have managerial positions, so they do not do routine healthcare work. We may safely argue that the increasing use of sharp and penetrating objects in the medicinal procedures is a major contributing factor to the problem which is defined as occupational hazard. This should be added to employing cheap, untrained and inexperienced staff for the sake of saving money by cutting down education and training expenditure.

CONCLUSION

It is estimated that 26.07% of the nursing personnel employed at the paediatric hospitals affiliated to Tehran University of Medical Sciences sustain injury when handling sharp and penetrating objects at work which is low compared with the rate of similar accidents in other countries. One important reason for this low level of needle stick injuries could be reluctance of personnel that sustain such injuries to report these incidents. Therefore it is suggested that an integrated and efficient system for reporting such incidents at workplace be planned and implemented as soon as possible.

Moreover, considering the high level of incidents among less experienced nurses and assistant nurses it is recommended that sustainable training courses with an emphasis on health and safety at work and prevention of accidents from happening while working under hazardous conditions, such as catheter and IV access, be arranged for newly employed nurses and other healthcare workers. Regarding the high level of accidents with needle sticks and IV catheter/injection kits the introduction of safer instruments, equipment and facilities for performing duties at hospitals and clinics is suggested.

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