

Nursing Interventions in the Prevention of Needlestick and Sharps Injuries: The Case of a University Hospital in Turkey

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ABSTRACT This study aimed to create an occupational safety program by reducing the rates of needlestick and sharps injuries in nurses. The universe of this experimental study was made up of nurses working in a university hospital and they were involved in a preliminary study before administering the sampling method. The data were collected through “Needlestick and Sharp Injuries Form” and “Clinical Observation and Evaluation Form”. As a result of this study, while the rate of needlestick and sharp injuries in nurses before the intervention was 31.2 percent, it was found to be 24.3 percent in the 9th month monitoring following the intervention, which yielded a significant difference. Needlestick and sharp injuries continued to occur. These results should be considered in the design of occupational safety programs to reduce the NSIs at the Hospital Center. It is also necessary to establish a monitoring system of needlestick and sharp injuries at a hospital level and a reporting system at the national level in Turkey.

INTRODUCTION

A 2015 analysis estimated the global health workforce to be slightly above 43 million workers, including 20.7 million nurses/midwives, 9.8 million physicians and approximately 13 million other healthcare workers (World Health Organization 2016). Every year, hundreds of thousands of healthcare workers are at risk of occupationally acquired bloodborne diseases (such as hepatitis B and C, and HIV) as the result of needlestick and sharps injuries (NSIs). It is reported in previous studies that nurses are the personnel most exposed to this situation (El-Hazmi and Al-Majid 2008; Martins et al. 2012; Cho et al. 2013; Sari et al. 2013; Akkaya et al. 2014; Jahangiri et al. 2016). For this reason, it is recommended in many descriptive studies that nurses should be trained on factors increasing contact with

blood and blood products and NSIs, prevention and what to do later on, and that it will be appropriate for nurses to undergo health screening at regular intervals (Habib et al. 2011; Ersin et al. 2016; Jahangiri et al. 2016). The factors increasing the NSIs have been highlighted in studies. Among these factors are clinic conditions, lack and inappropriateness of tools and equipment, lack of personnel, working conditions, lack of training and experience, lack of attention, and hastiness (Clarke et al. 2002; Omac et al. 2010; Jahangiri et al. 2016).

Although Turkey does not have a national database, studies have found that needlestick and other percutaneous injuries are an important problem for healthcare workers. Most of these injuries are not reported (Ayranci and Kosgeroglu 2004; Akkaya et al. 2014; Ersin et al. 2016), and the rate of injuries range between fifty percent and ninety-seven percent (Ayranci and Kosgeroglu 2004; Altiok et al. 2009; Akkaya et al. 2014). However, little information has been available on the intervention measures of NSIs among nursing worker in Turkey. Many descriptive studies have been conducted in the world and in our country to determine NSIs; however,

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the interventional studies aiming to prevent these health risks are limited.

Objectives of the Study

The objective of this study was to evaluate the rate of NSIs in nurses in a university hospital, reduce the exposures and create occupational safety programs following injuries.

METHODOLOGY

The universe of this experimental study carried out in a pre-test post-test order in a single group consisted of 763 nurses working in a university hospital. Six hundred and one (601) nurses volunteering to participate in the study were included in the sampling. The dependent variable of the study was the frequency of nurses' exposure to NSIs. The independent variables were nursing interventions involving education and monitoring. The data of the study were collected through "NSIs Information Form" and "Clinical Observation and Evaluation Form".

Needlestick and Sharps Injuries Information Form was created by the researchers inspired by the literature. This form consisted of 30 items questioning the socio-demographic characteristics of the nurses, their awareness about NSIs their exposure to these injuries, and the protocol following the injury.

Clinical Observation and Evaluation Form was also created by the researchers. It consisted of 12 items, and it was used for the post-interventional evaluation of the nurses in clinics. Both of the forms were submitted to three professors to get their opinions after they had been created, and they were piloted to a group of 15 nurses working in another university hospital. Incomprehensible items were revised and the final versions of the forms were obtained.

Intervention

In the first stage of the research, a group of 13 volunteer nurses was formed. This study group came together once a week for two hours to discuss the problems experienced by nurses related to NSIs in clinics and their solutions, and some interventions were planned. The following forms were created: Prevention-Reporting and Observation Guidelines of NSIs, First

Steps Following NSIs, Reporting and Workflow, Reporting Form Following NSIs. After the meetings with volunteering nurses were completed, the individuals participating in the study were administered NSIs *Information Form* and *Clinical Observation and Evaluation Form* before the intervention. After the pre-test was conducted, the tools to be used in the study were prepared. To do this:

- ♦ All the clinics were provided with closed system (auto-holder) for blood collection in cooperation with hospital management.
- ♦ All clinics were provided with treatment trolleys as many as the number of nurses working in shift.
- ♦ The use of appropriate size non-sterile surgical gloves was provided in the units.
- ♦ Posters covering the issues such as ways of protection from NSIs, the first things to do in the event of injury, and flow charts for reporting were hung on the walls of each clinic.
- ♦ The nurses in all units (clinics, polyclinics and intensive care units) were trained by volunteer nurses on ways of prevention and reporting.

Training Application and Content

The 13 volunteer nurses selected to conduct this study were primarily trained to be trainers. After the completion of trainer training, each volunteer nurse was assigned to two or three clinics. The training sessions were carried out as 60 minute single sessions using audio-visual tools. The content of the training included the following topics:

- NSIs in the world and Turkey
- Risk management and prevention in NSIs
- The use of safe material (sharps and needle cases in clinics and use of gloves)
- Things to be done in the event of NSIs, reporting, vaccination and its importance

After the training sessions were completed, the nurses in the sampling group attended monthly meetings. Clinical Observation and Evaluation Form was filled in based on clinical observations in 3rd and 9th months. The post-tests were completed by having a total of 408 nurses fill in NSIs Data Form in the 9th month as there were leavers from the hospital (Fig. 1).

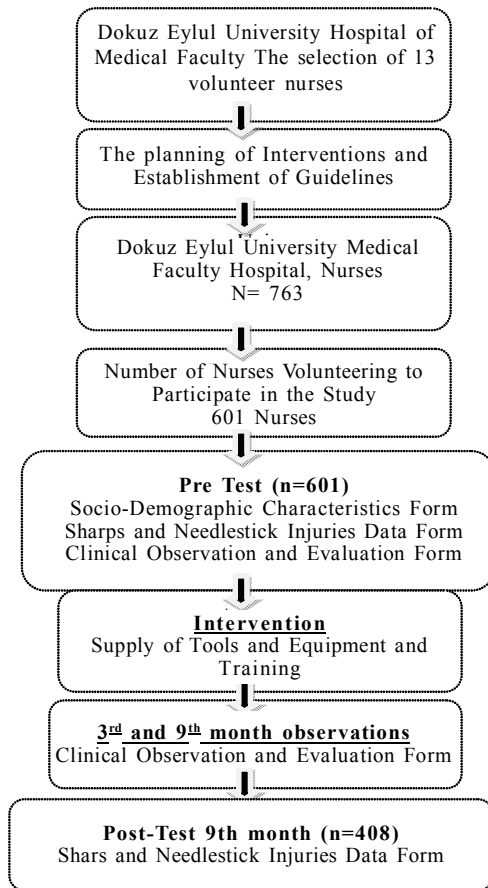


Fig. 1. The flow chart of the study

Source: Author

Data Analysis

Data were analyzed with SPSS 15.0 software, and descriptive statistics and chi-square test were used in the analysis of the data.

Ethical Considerations

Approval was obtained from the Dokuz Eylul University Hospital Director of Nursing Department, where the study was conducted. Informed consent was obtained from all the nurses who accepted to participate in the study.

RESULTS

The mean age of the nurses participating in the study was 32.74 ± 7.30 , and the mean em-

ployment duration was 10.48 ± 7.73 years. The majority (98.7%) of the nurses were female and 1.3 percent male. The majority that is, 70.5 percent of the nurses were graduates, 18.8 percent undergraduates, 6.5 percent postgraduates and 4.2 percent health vocational school graduates. The majority (52.9%) of the nurses reported hospital management was responsible for sharps and needles injuries, 74.5 percent occupational health and safety unit, 86.2 percent infection control committee, and 50.8 percent stated all these three units were accountable for the injuries.

Table 1 presents nurses' characteristics based on their exposure to NSIs. About twenty-nine percent of the nurses reported that they had NSIs in the last six months before the training. They stated that the injuries most frequently occurred during capping the syringe (41.3%), in the form of needlestick (71.5%), in the treatment room (52%) and planned procedures (60.5%). The injuries usually took place between the fifth and eighth hours (40.4%). It was stated that 67.2 percent of the nurses reported that they took preventive measures before the procedure, and that the most frequent measure was wearing gloves (87.1%). Only 54.1 percent cleaned the needlestick wound with disinfectant, and 48.2 percent washed it with soap and water. About six percent of the nurses applied nothing following the injury. An expected finding was that 79.3 percent stated they did not report the injury (Table 1). Furthermore, the major reasons for not reporting were thinking that the needle was sterile, learning that the serological test of the patient was negative, considering it unnecessary, and not having enough time. The frequent factors increasing the NSIs were acting hastily, workload, fatigue/inattention, sleeplessness, trying to cap the syringe, improper disposal of the waste, lack of training, and negligence. It was found that 5.32 percent nurses the place of reporting was infection polyclinic, emergency polyclinic, charge nurse.

The rate of nurses stating there were cases preventing the use of gloves was 29.3 percent (Table 1). Among the frequent cases reported by the nurses preventing the use of gloves were lack of appropriate size and adequate amount of gloves, allergies, difficulty experienced during procedures, emergent procedures, and time limitations. As shown in Table 1, 56.9 percent of the nurses reported they threw the syringes away into the waste bin directly, and that 0.5 percent

Table 1: The distribution of some of nurses' characteristics based on their exposure to sharps and needlestick injuries in the last 6 months before training (n=601)

Characteristics	Yes	
	Number	%
<i>Exposure to Injuries</i>	174	29
<i>Injured While</i>		
doing an invasive procedure capping the injector	35	20.6
picking up the used material	71	41.3
Other (breaking ampoule, preparing treatment)	49	28.7
Other (operating room, blood collection room)	61	10.1
<i>Object Type Causing Injury</i>		
Needle	123	71.5
Scalpel	18	10.4
Branule	17	9.9
Glass	54	31.4
Other (lancet...)	6	0.9
<i>Injured in</i>		
Patient room	55	32.2
Treatment room	90	52
Dressing station	1	0.6
Nurse Station	16	9.3
Other (operating room, blood collection room)	27	4.49
<i>Case of Injury</i>		
Emergency procedures	60	34.9
Planned procedures	104	60.5
Emergency procedures + Planned procedures	8	4.7
<i>Time of Injury</i>		
0-4 hours	38	22.2
5-8 hours	69	40.4
9-12 hours	59	34.5
13-16 hours	4	2.3
0-4 hours +9-12 hours	1	0.6
<i>Preventive Measures Taken Before the Procedure</i>	119	67.2
<i>Preventive Measures Taken</i>		
Gloves	101	87.1
Sharps and needles case	39	33.6
Shielded branule	6	5.2
Auto holder	2	1.7
Other (ampoule crusher, isolating the ampoule with cotton)	4	0.7
<i>Post Injury Procedures</i>		
I had the needlestick wound bleed	61	36.1
I cleaned the needlestick wound with disinfectant	92	54.1
I washed the needlestick wound with soap and water	82	48.2
I learned the patient's serology	63	37.1
I did nothing	10	6
Other (cleaned with batticon, used alcohol swab, covered with dressing)	20	3.3
<i>Reporting</i>	36	20.7
<i>The Place of Reporting (infection policlinic, emergency policlinic, charge nurse...)</i>	33	5.32

Table 1: Contd...

Characteristics	Yes	
	Number	%
<i>The Existence of Conditions Preventing Glove Use</i>	173	29.3
<i>How are Used Syringes Disposed to the Waste Bin?</i>	340	56.9
Throwing away directly		
Capping and throwing away	135	22.7
First separating the syringe and needlestick, then throwing away	203	34.2
Bending the needle to prevent needlestick, then throwing away	3	0.5
<i>Where are Sharps and Needles Disposed?</i>		
1,2 liter waste bin (small waste bin)	221	37
Big waste bin	393	66.1
waste bin made by us	23	3.9
Infection waste bin	28	4.7
<i>When Should the Sharps Waste Bin Be Changed? When it is</i>		
1/2 full	12	2
1/3 full	17	2.9
2/3 full	357	60.1
full loaded	208	35
<i>Is Vaccination Important in Prevention?</i>	576	96.6
<i>Vaccination Status</i>	534	88.9
<i>Vaccine Types</i>		
Hepatitis A	53	9.1
Hepatitis B	508	86.7
Tetanus vaccine	359	61.3
<i>Trained on Sharp and Needlestick Injuries</i>	194	32.7
<i>The Place of Training on Sharps and Needlestick Injuries</i>		
Conference	8	3.9
Symposium	12	5.9
In-service training	131	64.2
Orientation	44	21.6
Other (previous hospital, books...)	33	5.49

first bent the needle, and then threw it away to avoid needlestick.

When the use of 1.2 liter sharp and needles waste bin (small waste bin) at invasive procedures at bedside was examined, 45.8 percent of the nurses reported they did not use waste bin. They stated that the reasons why they avoided using the bin were inadequacy of the small waste bins, improper size of the available ones, lack of habit, and excess workload. The nurses most frequently used the large size waste bin to throw away sharps and needles. While 60.1 percent of the nurses changed the bin when it was 2/3 full,

thirty-five percent changed it when it was completely full (Table 1). As shown in Table 1, 96.6 percent of the nurses considered vaccination was important in protection, and eighty-nine percent had vaccination. They had Hepatitis B vaccination most often. While 67.3 percent of the nurses reported they did not have training on NSIs, those who were trained stated the most frequent training was in-service training (64.2%) (Table 1).

According to the clinical observation and evaluation, it was determined that 49.1 percent of the nurses used safe material during procedures before training, and that eighty-six percent used gloves during invasive procedures. While 65.4 percent of the nurses used safe material as revealed in the 3rd month observation following the training, this rate increased to 93.9 percent in the 6th month observation. While the use of gloves during invasive procedures was 98.1 percent in the 3rd month observation, it was 95.9 percent in the 6th month observation. 66.7 percent of the nurses found the size of the gloves appropriate before the intervention, whereas this rate increased to 94.2 percent and 81.6 percent in the 3rd and 6th month observations respectively. The rate of nurses' access to sufficient amount of gloves increased in the 3rd and 6th months in comparison with that of pre-intervention. The rate of keeping 1.2 liter sharps and needles waste bin on the treatment tray before invasive procedures at bedside was 53.8 percent in the 3rd month and 46.9 percent in the 6th month when compared to that of pre-intervention. In addition, the rate of existence of sharps and needles on the sharps and needles waste bin gradually decreased during the observations. The rate of nurses stating sharps and needles box was located in a proper place was 94.2 percent and ninety-eight percent in the 3rd and 6th month observations respectively. It was reported that the rate of appropriate placement of sharps and nee-

dles waste bins and the availability of sufficient amount increased during the study. The rates of leaving the sharps and needles box on the ground, on patient bed, by the window and on the treatment tray were 12.3 percent, 7.7 percent, and 10.2 percent. The rate of nurses' out of purpose sharps and needles use decreased during the observations. The rate of appropriate classification of the wastes was 94.2 percent in the 3rd month observation and 83.7 percent in the 6th month observation. While 94.2 percent of the nurses stated the fullness rate of sharps and needles waste bin complied with the rules in the 3rd month, this rate was determined to be 85.7 percent in the 6th month observation (Table 2).

Table 3 presents state of nurses' NSIs experiences based on pre-test and post-test results. While the NSIs rate of 408 nurses in this study in the last 6 months before the intervention was 31.2 percent, it was 24.3 percent in the 9th month observation, and the difference between the two was determined to be statistically significant ($p = .009$). The number of the individuals experiencing NSIs in 2011 was 40 (6.6%), whereas it was 5 in 2012 (0.8%) (Table 3).

DISCUSSION

Healthcare workers face the risk of catching various infectious agents from their work environment and patients they are in contact with. It was determined in the study that twenty-nine percent of 601 nurses had NSIs in the last 6 months before the intervention, and that the injuries were frequently needlestick and occurred during planned procedures and capping the syringe in the treatment room. It is reported in the literature that nurses have been subject to NSIs most among other healthcare workers (El-Hazmi and Al-Majid 2008; Altioek et al. 2009; Ersin et al. 2016; Jahangiri et al. 2016). It is also found in studies conducted in Turkey that NSIs have been

Table 3: The state of nurses' sharps and needlestick injury experiences based on pre-test and post-test results (9th month) (n=408)

Pre-test	Post-test (9 th Month)				Total	Mc Nemar	p	
	Yes		No					
	Count	%	Count	%				
Yes	59	46.5	68	53.5	127	31.2	-	.009
No	40	14.2	241	85.8	281	68.8		
Total	99	24.3	309	75.7	408	100.0		

Table 2: The results of the nurses' clinical observation and evaluation

<i>Clinical observation and evaluation form</i>	<i>Baseline</i>				<i>3rd month observation</i>				<i>6th month observation</i>			
	<i>Yes</i>		<i>No</i>		<i>Yes</i>		<i>No</i>		<i>Yes</i>		<i>No</i>	
	<i>Count</i>	<i>%</i>	<i>Count</i>	<i>%</i>	<i>Count</i>	<i>%</i>	<i>Count</i>	<i>%</i>	<i>Count</i>	<i>%</i>	<i>Count</i>	<i>%</i>
Is safe material being used during a procedure (auto-holder, automatic butterfly needle, safety pin, shielded bramble)?	28	49.1	29	50.9	34	65.4	18	34.6	46	93.9	3	6.1
Are gloves being used during invasive procedures?	49	86.0	8	14.0	51	98.1	1	1.9	47	95.9	2	4.1
Are the glove sizes appropriate for the user?	38	66.7	19	33.3	49	94.2	3	5.8	40	81.6	9	18.4
Are there enough gloves for each unit?	48	84.2	9	15.8	49	94.2	3	5.8	48	98.0	1	2.0
Is there a 1.2 liter sharps and needles waste bin on the treatment tray in bedside invasive procedures?	21	36.8	36	63.2	28	53.8	24	46.2	23	46.9	26	53.1
Are there sharps and needles on the sharps and needles waste bins?	12	21.1	45	78.9	9	17.3	43	82.7	8	16.3	41	83.7
Are the sharps and needles waste bins located in appropriate places?	44	77.2	13	22.8	49	94.2	3	5.8	48	98.0	1	2.0
Is there a sufficient amount of sharps and needles waste bin in your clinic?	51	89.5	6	10.5	50	96.2	2	3.8	49	100.0	-	-
Are there sharps and needles on the ground, on patient bed, by the window and on the treatment tray?	7	12.3	50	87.7	4	7.7	48	92.3	5	10.2	44	89.8
Are the sharps and needles used out of purpose?	6	10.5	51	89.5	3	5.8	49	94.2	2	4.1	47	95.9
Are the wastes classified appropriately?	42	73.7	15	26.3	49	94.2	3	5.8	41	83.7	8	16.3
Does the fullness rate of the sharps and needles waste bin comply with rules?	53	93.0	4	7.0	49	94.2	3	5.8	42	85.7	7	14.3

an important problem of healthcare workers and that the injury rate has ranged between fifty percent and seventy percent (Ayranci and Kosgeroglu 2004; Sari et al. 2013; Akkaya et al. 2014). Ersin et al. (2016) reported 30.6 percent of nurses indicated that they were exposed to sharp and needlestick injuries before the training and 20.8 percent after the training. It is thought that nurses have been the group subject to NSIs most among other healthcare workers in Turkey depending on such causes as the excessive number of patients per nurse, extra responsibilities of nurses apart from their professional duties, and lack of time. It is reported in studies with findings in line with the results of this study that the needles have been the frequent cause of the injuries and they have occurred during capping the injector and in the treatment room (Altiok et al. 2009; Zafar et al. 2009; Honda et al. 2011; Jahangiri et al. 2016). It is thought that the inadequate number of safe medical material such as injectors with retractable needles or syringes with sliding head over the needle and their availability in certain units increase the incidence of NSIs in the hospital where this study was carried out. Lavoie et al.'s (2014) review concludes that there was no clear evidence that the introduction of safe injection devices changed the NSI rate. Tarigan et al. (2015) a meta-analysis study reported that training combined with safety-engineered devices can substantially reduce the risk of NSIs.

More than half of the injuries in this study took place during planned procedures and between the 5th and 8th hours of the shift. Jahangiri et al. (2016) reported that nurses experienced more cases of NSIs (57.8%) in the morning shift than other shifts and a high work load has an effect on the performance and safety of the nurses. This state is important in terms of showing that nurses have busy treatment hours and injuries increase at times when their attention reduces. The nurses involved in this study frequently stated that the factors increasing NSIs were acting hastily, workload, fatigue/inattention, and lack of sleep. In many studies, extreme working conditions and long working hours, clinics, lack of tools and equipment and inappropriateness, lack of personnel, working conditions, inadequate training and experience, lack of attention, hastiness have been reported to be factors increasing NSIs (Clarke et al. 2002; Ilhan et al. 2006; Omac et al. 2010; Jahangiri et al. 2016).

As in this study, the most preferred preventive measure taken while dealing with infectious diseases and injuries is using gloves (Muralidhar et al. 2010; Omac et al. 2010). In a study conducted in Saudi Arabia, it was determined that half of the workers used single layer gloves during sharps and needlestick injuries, whereas five percent used double layer gloves (Tarantola et al. 2003). Mohammadi et al. (2011), reported in their study that 81.1 percent of the nurses used gloves in highly risky procedures. On the other hand, Manzoor et al. (2010), determined that 64.9 percent of the nurses did not use gloves while administering injection. The nurses in this study said they did not use gloves because of such reasons as insufficient number and inappropriate size of gloves, and the emergency of the case. The findings obtained suggest that there is a necessity for the regulation of working conditions of nurses in the health system and health policies. The studies emphasize the need to identify new policies for healthcare workers as well as the importance of training targeting solutions for the problem (Ilhan et al. 2006; Jahangiri et al. 2016).

More than half of the nurses participating in this study, similar to those in other studies, cleaned the needlestick wound after the injury and washed the wound with soap and water (Manzoor et al. 2010; Muralidhar et al. 2010; Jahangiri et al. 2016). In parallel with other studies, the majority of the injured did not report the injury (Ayranci and Kosgeroglu 2004; Ersin et al. 2016). It was found that in Turkey's study rate of those who reported after the injury was 31.8 percent before the training and 76.7 percent after the training (Ersin et al. 2016). It was determined in another study that nearly half of the needlestick injuries (48.2%) occurred while looking after patients whose condition was unknown, and the rate of not knowing what to do exactly after the injury was 94.2 percent (Ayranci and Kosgeroglu 2004). The majority of the nurses in this study stated that they did not report the case as they thought the needle involved in the injury was sterile and the serological test of the patient was negative. In addition to the findings of this study, other studies found that healthcare workers did not report the injuries as they did not know where to report, they had time constraints and there was not a reporting system (Muralidhar et al. 2010; Habib et al.

2011). Creating an injury reporting culture, awareness of the importance of the problem, following HIV vaccination as a preventive application are important applications in protecting healthcare workers.

It was found in this study that the majority of the nurses considered vaccination important in the prevention of diseases and, in line with the literature, the rate of hepatitis B administration was high (Ayranci and Kosgeroglu 2004; Manzoor et al. 2010; Mohammadi et al. 2011). This shows that healthcare workers are sensitive to hepatitis B disease. However, it was reported in another study conducted in Turkey that 44.5 percent of all healthcare workers did not complete hepatitis B virus vaccination (Inan et al. 2005). There is not a routine application in Turkey to identify hepatitis and HIV infection in inpatients, so the infection condition of the patients is not known. Therefore the vaccination status and post exposure prophylaxes of healthcare workers must be monitored closely.

CONCLUSION

NSIs are an important and continuing cause of exposure to these agents among healthcare workers, continuing education and specific programs for hospital staff are recommended. Training can reduce NSIs and change practical behavior markedly among nursing in Turkey. The training of the nurses in this study aiming the prevention of NSIs was effective. The results of the observations carried out in clinics indicated that there was an increase in positive attitudes. The use of safe material during procedures increased from 49.1 percent to 93.9 percent in the 9th month. Similarly, the rate of glove use during invasive procedures also increased and the rate of keeping adequate number of waste bins reached hundred percent. NSIs decreased at a statistically significant level. The existence of volunteer nurses, peer training by volunteer nurses, and motivating role of the volunteers all helped obtain positive results in this study. In addition to this, the nursing department and the head of the university hospital turned the proposed changes into applications and this also accelerated obtaining positive results. The findings of this study can increase awareness and reduce the occupational risks from NSIs.

RECOMMENDATIONS

In conclusion, nurses should be monitored for NSIs as they make up a risk group facing NSIs. Safety protocols should be formed, preventive strategies should be developed, and needlestick injury reporting should be compulsory. Preventive measures should be taken and planned for safe material use, reporting and recording of injuries, training all healthcare workers especially nurses, discharge and transport of sharps, and establishing an employee safety unit. It is necessary that hospitals, infection control unit managers, and all healthcare workers should be in closer cooperation in the use of products and material preventing NSIs. This approach could be more economical and effective than trying to treat the injured healthcare workers. There are not enough studies on the casual factors of NSIs. There must be research on the causal factors of NSIs, which is among the high level occupational risks, and it may be useful to emphasize the importance of the issue.

In line with the findings obtained in this study, it is necessary that the frequency of NSIs in hospitals should be determined, the causes should be investigated, safe material use should be promoted, and that healthcare workers should be informed on the prevention of injuries through in-service training. Establishing an actively working unit for reporting NSIs is highly important in taking required measures after injuries.

LIMITATIONS FOR THE STUDY

There were some limitations in this study. The nature of subjective or self-reporting of collected data, the small sample size, may not allow actual causative conclusions to be made. Furthermore, since the current research was conducted with a group of 13 volunteer nurses, bias in the collected data may have affected the results obtained.

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