Occupational Safety Strategies for controlling and Management of Needle Stick Injuries among Nurses at Student University Hospital.

Eman El Ashmawy : Master Degree of Community Health Nursing

Faculty of Nursing Tanta University

Ikbal Fathalla EL-Shafie : Professor of Community Health Nursing

Faculty of Nursing Tanta University

Rabeaha Abd Rabo: Lecturer of community Health Nursing

Faculty of Nursing Tanta University

Abstract

Occupational exposure to blood born pathogens from needle sticks injuries (NSIs) is serious problem. NSIs are primarily associated with occupational transmission of hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV). This highlights the necessity for application of occupational safety strategies for controlling and management of needles stick injuries .**Aim of the study:** to identify the effect of application of occupational safety strategies for controlling and management of needle stick injuries on nurses. **Study design:** Aquazi experimental study design. **Setting**: this study was carried out in student university hospital affiliated to Tanta University Hospitals. **Sample**: All nurses in direct contact with the patients, having no training course on infection control were involved in this study (280 nurses) they were divided to study and control groups each group contain 140 nurses. **Tools of the study**: Three tools were used. **Tool (1):** Structured questionnaire. It was developed to assess the sociodemographic data and knowledge of nurses regarding NSI. **Tool II:** Observational checklist was developed to assess safe work practices for preventing NSI among nurses. **Tool I1I:** WHO NSIs prevention assessment tool (2005) for health care facilities to assess the hospital supplies. **Result:** The majority of the study and control groups (93.6%, 94.3% respectively) had previous exposure to NSI. There was significant improvement in the total score of knowledge and performance of the study group about occupational safety for controlling and management of NSIs. immediately and 3 months after the program application. There was significant positive correlation between knowledge and performance immediately and three months after strategy application**. Conclusion: -** the strategy was effective in improving nurses' knowledge and practices regarding NSIs prevention. **Recommendations**: each health facility needs to establish occupational health and safety clinic, provide health care facilities with adequate supplies and safety devices to prevent NSI, establish in service training and educational center for hospital staff and development of reporting and analysis system for managing of occupational exposure to NSIs.

Key words :-Management of needle stick injuries, Occupational Safety , Health Administration

Introduction

Needle stick injuries (NSIs) are defined as an accidental skin penetrating stab wound caused by hollow- bore needle. Every day, health care workers are exposed to dangerous and deadly blood borne pathogens through contaminated needle sticks and sharps. It is one of the greatest risks faced by the front line health care workers. Every percutaneous needle stick and sharp injury carries a risk of infection from blood borne pathogen as HBV,HCV, and HIV. Nurses are at most risk for needle stick injuries [1-3].

In general NSIs are caused by simple and preventable mistakes in handling sharps medical devices. According to the Center for Disease Control and prevention (CDC), the most common causes of NSIs are: lack of personal protective equipment, safety devices, and sharps disposal containers and lack of procedures for sharp injury reporting. Other causes include lack of awareness with occupational hazards, insufficiently trained staff, limited access to sharps disposal containers and shortage of staff, recapping of needles after use, and passing sharp instruments from hand to hand in the operating suite. Furthermore, unpredictable medical incidents and unexpected patient reaction can also cause these injuries [4-6].

In Egypt, there are about 1 million people employed in the health care field. A study about safe injection practice among health care workers in Gharbiya Governorate, Egypt (2005), assessed safe injection practices among 1100 health care workers in 25 health care facilities reported that 66.2% of health care workers had experienced NSI and only 11.3% had received full course of hepatitis B vaccine[7] .

The true magnitude of risk isn't known because of widespread underreporting of exposures ranging from 29% to 98%. Failure to report most commonly resulted from a belief that the exposure wasn't significant, and being too busy[8].Reducing the risk of needle stick injuries include education and training on safe handling and disposal of sharp devices, awareness campaigns. More recently preventative strategies have focused on needle protective devices which may reduce the rate of injuries. Introducing needle protective devices should be considered particularly in high- risk areas, in service training, education, evaluation and cost- benefit analysis.[9,10].

Occupational safety and health (OSH) is generally defined as the science of the anticipation, recognition, evaluation and control of hazards arising in or from the

workplace that could impair the health and well-being of workers, taking into account the possible impact on the surrounding communities and the general environment[11].

More than 80% of needle stick injuries can be prevented through the use of safer devices and effective safety programs. Therefore the United States Department of Labor Occupational Safety and Health Administration (OSHA) has added needlestick prevention to its agenda in an attempt to reduce the number of injuries that health care workers get from needles[12]. The legislation provides that an exposure control plan where employers develop a written plan to identify and select needleless systems or sharps systems with safety features , sharps injury log where employers would be required to keep containing detailed information about sharps injuries; and training of health care workers on the use of needleless technologies and systems [13]. Employers must review their exposure control plans annually to reflect changes in technology that will help eliminate or reduce exposure to blood borne pathogens.[14]

Aim of the study: to identify the effect of application of occupational safety strategies for controlling and management of needle stick injuries on nurses.

Materials and Method:

Study design: Aquazi experimental study design was used in this study.

Setting and sample: this study was carried out in student university hospital affiliated to Tanta University Hospitals. All nurses in direct contact with the patients, have no training course on infection control were involved in this study (280 nurses), they were divided to study and control groups each group contain 140 nurses.

Tools of the study: Three tools were used in order to obtain the necessary data.

Tool (1): Structured questionnaire.

It was developed by the researcher to assess the sociodemographic data and knowledge of nurses regarding NSI; it was including three parts as follows:

Part (1): It includes items related to sociodemographic data such as: department name, age, level of education, years of experience, and training on occupational safety.

Part (2): personal history about NSI, it included:

Occurrence of NSI and its frequency causes of NSI, nature of needle sticks injury, immediate post exposure management after sustained NSI, reporting of NSI, hospital management of post exposure to NSI.

Part (3) Nurses' knowledge about:

Definition, causes, risk factors and consequences of NSI, primary pathogens can be transmitted by NSI, role of vaccination, reporting, management and post exposure prophylaxis of NSI, factors affecting application of occupational safety strategy for prevention and management of NSI, and nurses' role to prevent NSI. Each correct correct answer was given one point and incorrect answer was given zero.

Tool II: Observational check list:

Observational check list was developed by the researcher to assess safe work practices for preventing NSI among nurses [1, 2,14]. It included: Before a procedure that involves the use of needle or other sharp device, during procedure, and post procedure. Each nurse was observed three times and the average number of correct practice was calculated.

Tool I1I: WHO.NSIs prevention assessment tool (2005) for health care facilities [24].

Health facility assessment tool: This tool aimed to assess work environment. The assessment estimated the frequency of unsafe injection practices. It determined whether a facility where injections are given meets the necessary requirements for equipment, supplies and waste disposal. It included three parts as follows:

Part I: Structured observations of equipment and supplies available at the facility.

Part II: Interview of injection provider, phlebotomy practitioner, and or IV insertion provider.

Part III: Interview of injection supervisor.

Method

1) Obtaining approval

Official permission was obtained from the Dean of Faculty of Nursing, Tanta University to conduct the study, also to the medical director of student hospital Tanta University and ethical committee approval was obtained before conducting the study.

2) Developing the tools

- Tools (I, II) of the study were developed by the researcher based on literature review [1, 2, and 24]. The developed tools were submitted to five experts in the field of nursing for testing face and content validity. Face and content validity of the developed tools were calculated and found to be 97%.

3) – The pilot study

A pilot study was carried out on 10 nurses to test the clarity, applicability, relevance and organization of the tools and to determine the time needed to fulfill it. Accordingly modification was done. Those nurses were excluded from the sample.

4) - Ethical consideration:

All participants were notified about time, methods and anticipated benefits of the study, as well as confidentiality of information and the right to terminate participation at any time was respected. Informed consent was obtained from nurses to participate in this study.

5) Conducting the study:

1- Assessment phase

- Each nurse was observed three times by the researcher either in the morning or afternoon shift to assess their performance regarding needles use procedure (using tool II). The average number of observations was considered for each nurse.

- Structured questionnaire sheet was administered individually to each nurse, after completing the observation to assess their knowledge about occupational safety strategy for prevention and management of needle stick injuries. (using tool I).

WHO NSIs prevention assessment tool for health care facility was used to assess the student hospital work environment (using tool III), through observing equipment and supplies availability, then interviews with injection providers and injection supervisors were done.

2-planning phase:- -Developing the occupational safety strategy:-

Occupational safety strategy was developed by the researcher based on the analysis of nurses' knowledge and practices as well as on literature review.

The following steps were adopted to develop the strategy:-

a) **Formulating objectives**.

- Goal of the strategy:

The goal of the strategy was to improve nurses' performance related to occupational safety in order to prevent and manage needle stick injury.

-Specific objectives: by the end of the implemented strategy, nurses will be able to:-

1-Determine importance of the occupational safety strategies.

2-Define NSIs .

3-Enumerates needle stick injury causes, and risk of infection.

4-Identify risk assessment of needle stick injury and primary pathogens that can be transmitted.

5-Discuss HBV vaccination, its importance, and dose.

6-Describe reporting of NSIs, its importance, forms and method of application.

7-Discuss post exposure management measures of needle stick injuries.

8-Performe one hand technique for prevention of needle sticks injuries.

9-Realize the importance of nurses' role to prevent and control needle stick injuries.

b-Development of the strategy content:-

A review of the current available literatures covering the various aspect of the problem was done to assist in the development of the intervention strategy. The contents of the intervention plan were organized in seven consecutive sessions; the duration of each cession was 60 minutes.

Session 1: Program orientation and expectations as well as establishment of relationship with the participants and conducting pre test.

Session 2: An overview of needle sticks injury and its consequences.

Session 3: Risk assessment and blood born pathogens.

Session 4: Vaccination role and facts about HBV vaccination.

Session 5: Reporting of needle stick injury.

Session 6: Management and post exposure prophylaxis NSI.

Session 7: Case study presentation and post test.

c) Selecting teaching strategies and audio visual aids:

Appropriate teaching methods were used as: interactive lectures, group discussions, case studies, demonstration and role play. Power point presentations, videos, handouts and real materials as syringes, gloves, and safety boxes were used as teaching aids. A booklet was designed by the researcher and given to the nurses at the end of the sessions to refresh their knowledge and as future reference

3-Implementation phase

The field work of the study was done from May to September 2015, nurses were divided into 14 groups (10 nurses in each group).Seven teaching sessions were implemented for each study group.

4) – Evaluation phase

Assessment was done as follows:

- First time: Before implementation of the, occupational safety strategies to all subjects (using tool 1 part 3 and Tool II).

- Second time; immediately after the implementation of the occupational safety strategies to the selected number of nurses (study group) using tool part3, tool II).

- Third time; three months after the implementation of the occupational safety strategies to all the study subjects of nurses who was received the nursing intervention (using tool I part3, tool II).

6) Analysis of data

a) Statistical analysis

The collected data was organized, tabulated and statistically analyzed as

using mean, standard Deviation, unpaired student t-test, paired student t-test, linear correlation coefficient, ANOVA and chi-square tests by SPSS v.20 and.5% was used as a level of significance

Result

Table (1) represents the distribution of the studied and control group of nurses according to their sociodemographic characteristics. It shows that the means age of the study and control group were nearly equal (39.7 ± 9.14 years ,and 39.7 ± 8.4 years respectively). Regarding the place of work more than half of the control and study groups (54.3%) were working at in patient departments .The majority of the study and control groups were graduated of secondary nursing school (72.9%, 81.4% respectively).The mean of the years of experience for the study and control group were (19.5 ± 9.17 years and19.9 ± 8.12 years respectively).

Table (2): shows the distribution of nurses according to their history about NSI. The table shows that 93.9% of the study and control groups reported previous exposure of NSI. As for number of previous exposure to NSI , 58.2% of the nurses in the study and control groups reported 1-3 times . The main cause of previous exposure to NSI for both groups was recapping of the needles (89.8%).

The majority of the study and control group reported exposure to NSI during IV procedures (86.3% , 90.2% respectively) . As for incidence of injury, 80.2% of study group reported NSI after needle use compared to 90.9% of the control group. Around three quarters of the study group (74.8%) reported applying pressure on the site of injury as first aid carried out after NSI compared to (90.9%) of the control group.

Table (3): shows the distribution of the nurses according to their responses regarding the reporting system of NSI at the hospital. The table shows that 71.4% and 67.4%of the study and control groups reported absence of well known reporting system at the hospital. As regard to the presence of report nearly half (55.7% and 49.3%) of the study and control group respectively reported there was no report form. The majority (91.6% & 85.6%) of the study and control group respectively did not report NSI. Among those who reported, 63% of the study group reported after few days compared to 84.2% of the control group reported immediately. About 73.68% of the nurses at both groups with history of NSI reported there was no action taken after reporting.

Table (4): shows the distribution of observed occupational safety practices for prevention and management of needle stick

injuries at the study setting (Student hospital)

Regarding availability of safety syringes the table shows that they were never available in all unites it was sometimes at one unit available. Nurses at all units practiced reusing of syringe or needles for sometimes .As regard to vascular access items, safety vascular access were never available in all units as well as the blood drawing devices with integrated safety features, while blood collection vacuum tubes with plastic tubes were sometimes available in all units. Safety devices used in surgery as retracted blades were never available in all units. Safety boxes in areas where injections are given were always available in all units and some- times over flowing, open sharp boxes were available in all units and sometimes used sharps were available around the health departments in all units. While waste disposal facility (incinerator) were always available for all units. Exposure control plan (ECP) was never available in all units.

Table (5) shows the distribution of the studied sample according to their total knowledge score during different phases of the study . It shows improvement of total knowledge score of the study group during different phases of the strategy application as 86.4% of nurses had poor knowledge score before the application of the strategy and improved to good knowledge score (98.6% , 97.9%) immediately and 3

months post strategy application respectively with statistical significant difference (P < 0.001) .

Table (6) shows the means and standard deviation of total performance score during different phases of the study. It shows improvement of total performance score of the study group before and 3 months after strategy application (3. 6 ± 1.3 and 15.5 ± 2.9 respectively) with significant P value (P = < 0.001) .The control group had the same mean of total performance score (2.7 ± 1.0) with no significant statistical difference.

Table (7) shows the correlation between total knowledge and performance scores of the study group of nurses through the study period. It revealed that there was significant positive correlation between knowledge and performance immediately after and three months after strategy application.

Table (1): Distribution of the studied and control groups according to their socio demographic characteristics of studied and control groups (n= 280)

Items	Study group n= 140		Control group N= 140		Tests	
	N	%	N	%	X^2/t	P-value
Age						
<30	28	20.0	19	13.6		
30-40	46	32.9	53	37.9	X^2=2.248	0.325
>40	66	47.1	68	48.6		
Range	21-56		21-59		T=0.633	0.527
Mean±SD	39.07±9.14		39.7±8.4			
Place of work						
In patient	76	54.3	76	54.3		
Cardiothoracic surgery	26	18.6	25	17.9		
O.R	2	1.4	2	1.4	X^2=0.040	0.998
Out patient clinic	12	8.6	12	8.6		
Dialysis	24	17.1	25	17.9		
Educational level						
Secondary nursing school	102	72.9	114	81.4		
Nursing technician	15	10.7	7	5.0	X^2=3.957	0.138
Bachelor of nursing	23	16.4	19	13.6		
Years of experience						
<5	18	12.9	14	10.0		
5-<15	15	10.7	8	5.7		
15-<25	60	42.9	78	55.7	5.541	0.136
25 and more	47	33.6	40	28.6		
Mean±SD	19.5±9.17		19.9±8.12			
Previous attendance of occupational health and safety program						
Yes	11	7.9	11	7.9	X^2=0.000	1.000
No	129	92.1	129	92.1		

Table (2): Distribution of nurses according to their history about NSI (n= 280).

NSI history Items	Study n=140		Control n=140		Total n=280		Chi-square	
	No	%	No	%	No	%	X^2	P-value
Previous exposure to NSI.								
Yes	131	93.6	132	94.3	263	93.9	0.063	0.802
No	9	6.4	8	5.7	17	6.1		
Number of previous exposure to NSI.								
1-3	79	60.3	74	56.1	153	58.2		
4-5	9	6.9	4	3.0	13	4.9	3.330	0.189
more than 5 times	43	32.8	54	40.9	97	36.9		
Causes of previous exposure to NSI[*]	N=131		N=132		N=263			
-Recapping of the needle	117	89.3	114	86.4	231	87.8	0.535	0.464
-Binding the needle	6	4.6	11	8.3	17	6.5	1.532	0.216
-Entering the needle into test tube	41	31.3	30	22.7	71	27.0	2.450	0.117
- During waste disposal	26	19.8	37	28.0	63	24.0	2.417	0.120
-Sudden patient movement	10	7.6	25	18.9	35	13.3	7.285	0.007*
Procedures[*]								
I.M	43	32.8	54	40.9	97	36.9	1.842	0.174
I.V	113	86.3	119	90.2	232	88.2	0.958	0.328
wound suturing	7	5.3	2	1.5	9	3.4	2.916	0.088
central line insertion	7	5.3	7	5.3	14	5.3	0.000	0.988
Subcutaneous injection	9	6.9	11	8.3	20	7.6	0.200	0.654
Incidence of injury[*]								
During use of needles	23	17.6	24	18.2	47	17.9	0.017	0.895
After needles use	105	80.2	120	90.9	225	85.6	6.154	0.013*
During waste management	42	32.1	33	25.0	75	28.5	1.608	0.205
First aid you carried out after NSI[*]								
Apply pressure on the site of injury	98	74.8	120	90.9	218	82.9	12.017	<0.001*
Let the blood drain spontaneously	33	25.2	12	9.1	45	17.1		

*More than one answer was allowed

Table (3): Distribution of the nurses according to their responses regarding the reporting system of NSI at the hospital (n= 280).

Items	Study n= 140		Control n= 140		Total		Chi-square	
	No	%	No	%	No	%	X^2	P-value
Presence of well known reporting system at the hospital								
Yes	9	6.4	9	6.4	18	6.4		
No	100	71.4	95	67.9	195	69.6	0.501	0.778
I don't know	31	22.1	36	25.7	67	23.9		
Presence of report form								
Yes	7	5.0	4	2.9	11	3.9		
No	78	55.7	69	49.3	147	52.5	2.550	0.279
I don't know	55	39.3	67	47.9	122	43.6		
Reporting of previous NSI	N= 131		N= 132		n= 263			
Previous reporting of NSI:								
Yes	11	8.4	19	14.4	30	11.4	2.340	0.126
No	120	91.6	113	85.6	233	88.6		
Time of reporting NSI:	N=11		N=19					
Immediately	4	36.4	16	84.2	20	66.7		
After few days	7	63.6	3	15.8	10	33.3	7.177	0.007*
After a month	0	0.0	0	0.0	0	0.0		
After a year	0	0.0	0	0.0	0	0.0		
Action taken by the hospital after reporting	n= 11	n= 11	N= 19	n= 19				
Yes	1	9,9	5	26.3	6	20.0	1.292	0.256
No	10	90.9	14	73.68	24	80.0		

Table (4): Distribution of observed Occupational safety practices and availability of resources for prevention and management of needle stick injuries at the study setting (Student hospital) n=5

Occupational safety practices and availability of resources	availability		
	always	Sometime	Never
Injection			
1- Availability of Safety syringes (as safety-designed pre-filled syringes)	-	1	4
2-Reuse of syringes or needles	-	5	-
3- Availability of swabs used for skin preparation that are dirty, bloodstained or kept wet	5	-	-
Vascular Access:			
4-Hospital implemented safety vascular access catheters that provide a protective shield.	-	-	5
5- Presence of blood-drawing devices with integrated safety features designed to prevent percutaneous injury.	-	-	5
6- Hospital replaced glass blood collection vacuum tubes with plastic tubes.	-	-	5
Surgery			
7- Availability of safety devices (as-blunt-tip suture needles, scalpel blades with safety features, round-tipped scalpel blades and retracting-blade and shielded-blade).	-	-	5
Disposal of sharp medical wastes			
8-Presence of safety boxes in areas where injections are given.	5	-	-
9- Presence of overflowing, pierced, or open sharp box(es)	-	5	-
10-Sharps in plastic bottles, or open containers exposing staff to needle-stick injury	-	-	5
11-Evidence of used sharps around the health centre and/or the disposal site	-	5	-
12-Availability of waste disposal facility (Incinerator) used for the disposal of the majority of sharps	-	-	5
EXPOSURE CONTROL PLAN (ECP)			
13-Hospital has a written exposure control plan.	-	-	5
14-ECP includes a list of all jobs and tasks with potential for exposure to blood or bodily fluids.	-	-	5
15-ECP is accessible to workers.	-	-	5
16- ECP is reviewed and updated at least annually	-	-	5

Table (5): Distribution of the studied sample according to their total knowledge score during different phases of the study. (n=280)

		Knowledge							
		Before		After		After 3 mon.		Chi-square	
		No	%	No	%	No	%	X^2	P-value
Study (n=140)	Poor	121	86.4	1	0.7	0	0.0	379.790	<0.001*
	Fair	14	10.0	1	0.7	3	2.1		
	Good	5	3.6	138	98.6	137	97.9		
Control (n=140)	Poor	129	92.1			139	99.3	8.706	0.003*
	Fair	11	7.9			1	0.7		
	Good	0	0.0			0	0.0		

*significant at P<0.05

Table (6): Means and standard deviation of total performance score during different phases of the study. (n=280)

Total Practice	Study			Control			T-test	
	Mean	±	SD	Mean	±	SD	T	P-value
Before	3.6	±	1.3	2.7	±	0.8	7.806	<0.001*
After 3 mon.	15.5	±	2.9	2.7	±	1.0	49.583	<0.001*

*significant at P<0.05

Table (7) Correlation between total knowledge and performance scores of study group through the study period (n= 140)

Linear correlation coefficient		Knowledge	
		r	P-value
Practice	Before	0.011	0.855
	Immediately after	0.447	0.032*
	After 3 mon.	0.897	<0.001*

*significant at P<0.05

Discussion

Needle stick and sharp injuries (NSIs) are accidental skin penetration wound caused by sharp instruments (needles) in medical setting which can lead to transmission of pathogens causing infection and resulting in hazardous consequences for the health care workers .Hepatitis B, Hepatitis C , and human immunodeficiency virus (HIV) are of utmost concern because they can cause significant morbidity or death .It is estimated that half of injections infused in developing countries are unsafe for both patient and health care provider[1] .

The findings of this study revealed that, the majority of the studied nurses had history of NSI and there was noticeable shortage of the necessary safety requirement for prevention and management of NSIs. The strategy application was effective and improved the nurses' knowledge and practice in management and control of needle stick injuries at student hospital through significant improvements in the total knowledge and performance scores of the study subjects, immediately after strategy implementation and 3 months after.

Regarding sociodemographic characteristics of the studied sample. The findings of the present study revealed that around half of the nurses aged more than forty years in the study and control groups,

around three quarters of them graduated from secondary nursing school and nearly half of the study sample had from 15<25 years of experience. This may explain the high rate of NSIs because of long duration of work and lack of recent knowledge and skills of professional practice. This is in contrast with the finding of Hussein Y.(2015),in a study conducted in maternal and child health centers in El-Minia governorate who reported that 53% of nurses' age was ranging from 30-40 years and more than half of them their years of experience ranged from 10-20 years , and all nurses had secondary school degree[15].

As regard to nurses' history about NSIs this study revealed that the majority of both the study and control group had previous exposure to NSI, and more than half of them had 1-3 times NSI in the previous year (table 2). This result comes in agreement with the finding of Mitra S.(2010),in a study conducted in India about injection safety : perception and practice of nursing student in tertiary care hospitals, who reported that the majority of the study sample had accidental needle stick injuries[16]. These results are also in agreement with Gholami A. et al, (2013), who conducted a study in Iran about risk factors of NSIs and sharps injuries among health care workers and found that 54.8% of health care worker reported having

sustained one injury and 45.2%reported more than one injury [17]. These results indicate high prevalence of NSIs and the lack of implementation of effective occupational safety strategies.

As regards to causes of NSIs, the present study revealed that the majority of the study and control groups had NSIs because recapping of the needle during IV procedure and after use of needles (table 2) .This result come in agreement with Arafa A . et.al (2012), in a study conducted in governmental hospital in Cairo about injection practices among health care workers and risk factors for hepatitis B virus, who found that the highest percentage of injuries occur during recapping of the needles[18] .These results highlight the lack of knowledge of nurses at the present study and their poor practices regarding the safe handling of needles and the need for in-service training and education.

As regard the first action carried out after NSI at the present study, the majority of nurses at study and control groups reported applied pressure on the site of injury which indicate the lack of knowledge and performance about post exposure management. This result come in agreement with Azab A. (2005), in a study conducted in Ankara about occupational exposure to blood and body fluids among health care workers who found that (67%) of the studied sample didn't seek any medical advice after injury.[19]

The finding of this study illustrated a high rate of under – reporting , absence of reporting system at the hospital and weakness of post exposure procedure (prophylaxis) among both groups of the study (table 3). This may be explained by the staff and hospitals' administrations were lacking the knowledge and awareness of the seriousness of NSIs. Under reporting may lead to inaccurate information regarding the overall risk of exposure to pathogens. Full documentation of exposure injuries would guide improvement in the prevention strategies. Post exposure prophylaxis has been shown to be effective after these injuries so that system should be introduced to ensure that all health care workers especially nurses know about where to seek medical treatment after occurrence of NSIs. The implementation of occupational safety strategy for prevention and management of NSIs may be due to the hospital administration wrong perception about the high cost of application of such measures. It should be enforced that actually the cost of application of NSI prevention strategies is much less than the cost of treating and managing complications of NSIs.

This current result comes in agreement with Lin et al. (2014),in a study carried out in China about the epidemiology of NSI , who found that more than half of the studied sample was gone to underreporting and poor post exposure treatment. [20] Another study of Makary M. (2007) , studied needle stick injuries among surgeons in training estimated that underreporting was about 50%of the study sample[21] .

Regarding the observed safety injection practices at the observed units, the present study revealed that among all the observed units sometimes syringes and needles were reused (table 4). This is in agreement with Loges S. et al.(2004), in a study conducted in Magnolia about rapid assessment of injection practices, who reported that needles were left in the septum of the multidose medication vials to be reused in the subsequent reconstitutions [22]

The present study revealed that always presence of safety boxes at the study departments all times (table 4). This is related to the effort of infection control committee which was established and actively working since a period of time. Meanwhile, there was no exposure control plan (ECP) in all departments .This highlight the need for the occupational and safety department to work actively to establish ECP. The urgent presence of ECP

and training of staff on it is very important as it considered the main way to the control and proper management of NSIs through providing HCWs with measures that must be taken after exposure to NSIs according to the risk of infection and the patient status.

Regarding the disposal of sharp medical wastes the present study illustrated that most waste management activities still need improvement in most of the departments of the study, also availability of swabs used in skin preparation that are blood stained were always present at these units (table 4). This comes in agreement with Ismail N.A (2007), in a study conducted in Gharbiya governorate, Egypt, about safe injection practice among health care workers, who reported that most waste management activities were unsafe in most of the health care facilities as sharps were found lying down and not disposed in the proper container and also waste incineration was reported in a small proportion of health care facilities at that study [23] . This result may be because of the recent application of infection control program in the study setting and the need for follow up of waste disposal by the authorized organization in the government and community.

Concerning the total knowledge score of the studied sample during different phases

of the study the present study revealed that there was significant improvement of the mean knowledge score of the study group immediately after and after 3 months of strategy implementation (table 5), while among the control group there was no improvement in their mean total knowledge score. This could be explained by that nurses need training and direct supervision and follow up of their work to improve its quality. This finding is supported by Saleh D.(2009),in a study conducted in Cairo and Giza governorates, about improvement of knowledge, attitudes and practices of health care workers towards the transmission of blood borne pathogens: an intervention study, who reported that there was significant improvement of the participants' total knowledge score 3 months after the implementation of the educational program and application of the health education intervention which was successful in raising the knowledge of the nurses regarding transmission and prevention of blood born pathogens, improving the risk perception about NSIs [24].

Regarding the total performance score, the present study showed that there was significant improvement in the performance of the study group immediately after strategy implementation and 3 months after (Table 6). This finding

is supported by Javadi A. et al (2007), in a study conducted in Asfahan province about evaluation of needle stick injuries among health care workers, who reported that implementing a suitable education program regarding NSI improves the participants' performance. [25] .This finding is also in agreement with Mobasherizadeh S. et. al., (2005), in a study conducted in Iran, about intervention study of needle stick injuries, who reported that educational health program improved the performance of the participants to avoid NSIs with the use of safety devices [26].

The present study revealed that there was significant positive correlation between knowledge and performance of the study group immediately and three months after strategy application (table7).This finding highlights the need of knowledge as a pre-requisit for practice improvement. This finding is supported by Saleh D. (2009), who reported an increase in the mean cumulative knowledge, attitude and practice score post intervention program application[24].The reported positive correlation are explainable by the theory of reasoned action. A person's intention to a specific behavior is function of their attitude toward that behavior[27]. Furthermore, the attitude toward the behavior is determined by the person's belief that given outcome will occur if the

person will perform the behavior. It is concluded that adequate knowledge can lead to appositive attitude, resulting in good practices [37-39] .

Finally, the present study highlights that NSIs still constitute a major challenge for hospital staff occupational safety. Hospitals need to take serious actions towards adopting effective strategies for prevention and management of this problem .A multi-disciplinary team implementing strategy for education, training, immunization, proper engineering control measures is highly needed. Nurses by their positions in hospitals are prepared to take an important role in this team.

Conclusion, Based on the findings of the present study, it can be concluded that the strategy application was effective and improved the studied nurses' knowledge and practice toward management and control of needle stick injuries in health care setting. There was a significant improvement in the knowledge and performance scores of the studied subjects about occupational safety strategies for controlling and management at three months after intervention.

Based on the finding of the present study the following recommendations were suggested:

1- Health care facilities should establish multidisciplinary injury-prevention teams with representatives of most departments as administration, pharmacies, nursing unit management, staff safety, quality management and infection control team.

2- Health care facilities should have written exposure control plan, it should be reviewed and updated routinely.

3- All employees at risk for occupational exposure to NSI should receive interactive training about occupational strategy strategies.

4- Establish in service training and education center in the health care facilities for appropriate training in order to increase awareness of health care workers with regard to this preventable occupational health hazard.

5- Health care settings must provide visible support and sufficient resources and necessary equipment's and safety devices to control and prevent NSI among health care workers.

6- Apply obligatory immunization program against hepatitis B. for all health care workers in health care facilities.

7- Application of strict regulations and supervisions and even application of specific reward and punishment a

schemes to encourage and / or enforce health care workers to follow up the occupational safety strategies.

8- Yearly screening of health care workers should be done in order to detect infection early and take early preventive and therapeutic measures well in time.

References

1- Centers for Disease Control and Prevention. Work book for designing, implementing, and evaluating a sharp injury prevention program; 2008.

2- American Nurses Association (ANA). Needle sticks prevention Guide. 2002. Available at: http://www. nursing world.org/ accessed at 10-8-2014.

3- James D. A New look at Nursing Safety. The American Society of safety engineers. The Journal of SH & E research. 2005. (1) (2): 1-18.

4- U.S. Department of Health and Human Services. C.D.C. National Institute for occupational safety and health (N1OSH). Preventing Needle stick injuries in Health care settings, publication No. 2000-108 Available at: Http//www.cdc.gov/niosh/estimat, accessed at: 5-8-2014.

5- Barry S. & David H & Sherry L and sokas R. Occupational and environmental health, recognizing and

preventing disease and injury fifth edition Tokyo: lipincott, 2006; 366-370.

6- Sharps Injury, Risk prevention in infusion therapy. Available at: www.bbraun.com .

7- Ministry of Health and Population. National Guidelines of infection control. Part 1, preventive sector, infection control department. Egypt: yat Advertising 2008; 24-42.

8- Barry S. & David H & Sherry L and sokas R. Occupational and environmental health, recognizing and preventing disease and injury fifth edition Tokyo: lipincott, 2006; 366-370.

9- Sharps Injury, Risk prevention in infusion therapy. Available at: www.bbraun.com .

10- Centers for Disease Control and Prevention (CDC). The step sticks campaign: safety culture. Available at: www.cdc.gov/niosh/stopsticks/safetycu ltrure.htm L.

11- The joint commission, sentinel Event Alert, Issue 22- August 1, 2001. Available at: http://www.joint commission. Org/sentinel Events/ sentine Event Alert/ sea 22.htm.

12- Value of Technology: Needle sticks and sharps injuries and safety-Engineered Medical Devices, April 2013. Medical Technology Association

of Australia (MTAA). Available at: http://www.: mtaa. Org.au. Accessed at: 10-8- 2014.

13- Hoishg P. Management of Needle sticks injuries in health care setting. Ethics Journal of the American Medical Association, 2005 ;(7) (10). Available at: www.virtualmemtor.org. Accessed at: 15-8-2014.

14- Fried M. Essential elements of a comprehensive sharp injury prevention program.   American Nurse Today, 2012; (7).(9): 1-4.

15- Hossein Y-standard precaution and incidence of needle stick injury during children vaccination among nurses working in maternal and child health centers in EL-Miniagoveronrate. International Journal of Advanced Nursing studies. 4 (1) (2015): 1-6 at: www. Science cepubco. Com/ index-php/ 1 JANS. Accessed 20-4-2015.

16- Mitra S.,MalekS. RoyA.Injection safety :perceptionand practice of nursing students in tertiary setting.2010 indian j .prev.soc.Med.vol 41 No.3,4 2010.

17- Gholami A.,Borji A.and AsghariA.Risk factors of needlestick injuries among health care workers 2013.International journal of hospital research 2013,2(1) :31-38

18- Arafa A.,Mohammad M.Injection practices among health care workers and risk factors for hepatitisB.virus in agovernmental hospitals 2012.Med.J.Cairo Univ.vol80,2, 2012:191-196.

19- Azab A.Ergonal O.Ocupational exposure to blood and body fluids among health care workersin Ankara ,Turkey.American journal of infection control 2005;33:48-52

20- Lin X., Oingyan W., Hong K. and Si-Yon T. the epidemiology of needlestick and sharp injuries in central sterile supply department of hospitals in human province, china International Journal of infection control (IFIC) 2014, vol: 1-11 at www.ijic.infa.

21- Makary M, Al-Attar A, Holzmuller C. Needle stick injuries among surgeons in training. N Engl J Med 2007; 356: 2693-2699. At : http://dex.doi .org/10.1056/NE J Moa 070378.

22- Logez S. et al. Rapid assessment of injection practices in Mongolia. American Jorunal of infection control, 2004, 32 (1): 31-7.

23- Ismaiel N.and ELshabrawy W. Safe injection practice among health care worker in Gharbia governorate, Egypt. Eastern Mediterranean Health Journal, 2007 ;(13) (4):893-904.

24- Saleh. D., Elghorory L., Shafik M., and EL Sherbini E. improvement of knowledge, Attitudes and practice of health care workers towards the

transmission of blood borne pathogens: An intervention study. J. Egypt public health Associ. Vol. 84. N. 5. 2009 Pages 423-441.

25- Javadi AA., Mobasherizaded S., Mermarzadeh M., Tavokdi A. Evlauation of nedlestick injury among H.CW In Js fahan province. Islamic Republic of Iran. Eastern Mediterranean Health Journal 2007; 13: 209-10.

26- Mobasherizadeh S., Abne-Shadi SA.,. Abzarif. Intervention study of needlestick injury in Iran. Saudi Medical Jorunal 2005; 26: / 225-7.

27- Singh A and Purohit B., Knowledge's, attitude and practice toards infection control Measures and its correlation among dental student in Bophal city central India. Int. J Infect control, 2010, 7 (1): 1-9.