Effect of Implementing Training Module on Competence of Internship Nursing Students Performance regarding Needle Stick and Sharp Injuries Safety Issues

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Abstract: Background: Needle stick and Sharp injuries pose a high risk to internship nursing students. They represent a major risk factor for transmitting blood borne pathogens as hepatitis B , C virus. Interns being vulnerable section are more prone for these injuries, so they need training module program to improve their skills. **Aim:** This study was conducted to evaluate the effect of implementing training module on competence of internship nursing students performance regarding needle stick and sharp injuries safety issues. **Design:** A quasi experimental research design was utilized. **Setting:** Data were collected from the Faculty of Nursing, Tanta University and Tanta Main University Hospital. **Subjects:** Random sample of (75) internship nursing students who were spent the internship period at Tanta Main University Hospital. **Tools**: Three tools were used to collect data: Tool (I); Structure Questionnaire Sheet regarding safety measures about NSI; Tool (II); Observation checklist for students' practice regarding safety measures about NSI. Tool (III): Challenges that affect follow up safety measures. **Results:** revealed that there were significant improvements in internship nursing students' knowledge and practice regarding safety measures of needle stick and sharp injuries post implementation of training module at $P < 0.05$. Also, the study revealed that the highest percentages of challenges those affect their follow up safety measures were; night shifts and lack of training**. Conclusion:** The study findings revealed that the implementation of training module were successful for improving nursing students' knowledge and practice regarding needle stick and sharp injuries. **Recommendations**: it is recommended to students instructions should be continually reinforced, and clinical supervision should be managed to ensure compliance in all clinical experiences regarding NSIs.

Key words: Needle stick and sharp injuries, Training module, Safety issues, Competence

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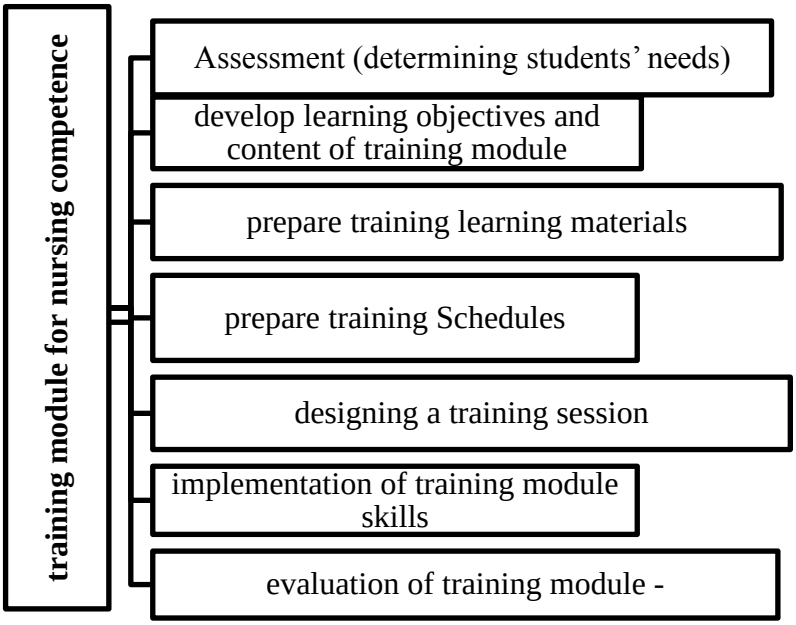
Introduction

Needle stick and sharp injuriy is one of the serious are international issues in every healthcare environment. It is defined as wounds caused by hazardous material such as needles and sharp instruments that accidently harm the skin during routine performance of their duties [1,2]. Each day thousands of health worker around the world, suffer from accidental occupational exposures to bloodborne pathogens resulting in infections such as HIV, hepatitis B , C virus during the course of their role of caring for patients. [3]. Needle stick and sharp injuries usually cause other many different risks among health care workers such as; bleeding, minor surface scratches and minor visible skin injuries, although the main risk is transmission of viral infections but scalpel-caused wounds need more attention in comparison with needle stick injuries [4].

World Health Organization reported that an annual rate of needle stick and sharp injuries per health care workers were 35 million, 2 million of them experience percutaneous exposure to infectious diseases each year and approximately 37.6% of hepatitis B, 39% of hepatitis C, and 4.4% of HIV/acquired immunodeficiency syndrome in healthcare workers around the world are due to NSIs [5,6]. and due to major underreporting (often less than 50%), the occurrence of NSIs significantly higher than the existing approximation [7]. According to many studies 11 to 50% of nursing students had history of exposure to infection related to sharp injuries during their undergraduate training period [8]. Late reviews suggest that the causes of needle stick and sharp injury happen either by recapping and overuse of the needle (18%), trailed by exchange of sharps (16%) and fifteen percent wounds while trading a body fluid (blood) to an example bottle, passing instruments from hand to hand, lack of awareness of hazard and lack of training[9].

Nursing is a practice profession, so nursing education must include both classroom and clinical practice education [10]. Internship nursing students are young professional health care workers who are probably for the first time in their professional real life come in contact with patients and during their training period face stressful clinical situations which may lead to the increased incidence of needle stick and sharp injuries during performace of various types of procedures which are involving sharps and subcutaneous needles [11]. However, internship nursing students must have special skills during handling needles and sharps safely [10]. The risk of injuries by needles and sharps were usually faced with various fronts including dissemination of safety protocols, educational program and training module of safer technologies that contribute to significant reduction of such incidents [12].

Training module is an instructional guide primarily used for teaching and learning step-by-step procedures. It is also can be used to present more factual information for the purpose of practical experience [13]. Training module was designed to enhance students' clinical competence standards. It consists of determining needs, develop learning objectives , content of training module, prepare training learning materials, prepare training schedules, designing a training session, implementation of training module skills and monitoring , evaluation of training module. In order to address these educational concerns, the institution of nursing education should have a training module about applying of safety measures regarding NSI in nursing program that motivates learning process [14-17, 4]. Occupational safety measures is 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 [18].



The implementation of training module program about safety devices measures is one of the main starting points for avoidance of accidental needle-stick and sharp injuries and keep health care workers away from infectious disease which is transmitted through unsafe practice. Uses of such safety devices should be accompanied with the necessary clinical training as part of a comprehensive sharps injury prevention and control program [19,20], which includes taining about some important aspects such as; uses of engineering controls (i.e, needles or syringes with safety devices), drawn blood with a vacutainer or protective cap that protects from the needle after it is removed, using instruments (not fingers) to grasp needles, load scalpels, and avoiding hand-to-hand passing of sharp instruments also preparing of medications especially removing cap, utilizing sterile procedure by an all-around prepared individual and disposes of it appropriately [21,22].

Education for preventing needle stick injuries is the most effective way to protect the nursing students from the infectious diseases caused by it. It is necessary to conduct an educational intervention for such students before their internship rotations before graduation [23]. Nurse internship require to be trained and supervised by expert nurses through different area in the hospital to work competently due to limited clinical experience and insufficient attention to personal safety. So nurse internship should spend an internship year in teaching hospitals because it is crucial for them to possess adequate competences regarding the procedures that require them to handle

sharp devices.[8,24]. From this view this study aimed to evaluate the effect of implementing training module on competence of internship nursing students performance regarding needle stick and sharp injuries safety issues.

Significance of the study:-

In Egypt, a study about safe injection practice among health care workers in Gharbiya Governorate, reported that 66.2% of health care workers had experienced needle stick and sharp injuries at least once and only 11.3% had received full course of hepatitis B vaccine [25]. Moreover many studies have shown internship nursing students having high rates of occupational exposures and high incidence of needle stick and sharp injury because of their inexperience, long working hours, high volume of inpatient procedure [26,27]. Internship nursing students safety measures is an important issue to be considered in the organization to provides a safe environment. Therefore, designed a training module prevention programme for student to minimize the risk of occupational regarding needle stick and sharp injuries was recommended.

Aim of the study:

Evaluate the effect of implementing training module on competence of internship nursing students performance regarding needle stick and sharp injuries safety issues.

Research hypothesis:

To fulfill the aim of the study, the following research hypotheses were formulated:

1- Post implementation of the training module, the internship nursing students exhibited improve in knowledge regarding needle stick and sharp injuries

2- Post implementation of the training module, the internship nursing students exhibited improve in practice regarding needle stick and sharp injuries

Operational definition:-

- Internship nursing students performance; It's defined as the knowledge and practice of the internship nursing students related to safety measures about needlestick and sharp injury.
- Safety issues; It refers to the control of recognized hazards in order to achieve an acceptable level of hazardous risk.

Subjects and methods:

Research design:

A quasi-experimental research design was utilized to conduct the study.

Setting:

The study was carried out at the Faculty of Nursing, Tanta University and Tanta Main University Hospital.

Subjects:

Proportion stratified random sample of (75) internship nursing students who were spent the internship period at Tanta Main University Hospital, they were divided as following; (13) students from medical department, (12) students from surgical department, (10) nursing students from intensive care units, (10) nursing students from outpatients, (10) students from dialysis unit, (10) students from neuorological departments and (10) students from operating theatre who are trained in Tanta Main University Hospital during internship clinical rotation. The sample size was estimated using Epi Info 7 Statistical Program, using the following parameters; Total target population size= 200 students, confidence level= 99.9%, expected frequency= 50%, accepted error= 5% and confidence co efficient =95%. The accepted sample size was 75 students.

Tools of data collections:

Three tools were used for data collection. These tools were aimed to evaluate the effect of implementing training module on competence of internship nursing students performance regarding needle stick and sharp injuries safety issues.

Tool (I): Structure Questionnaire Sheet regarding safety measures about NSI: It was developed by the researchers after reviewing of the related literatures [28-34]**.** It was comprised of two parts:-

Part (A): Socio- demographic characteristics of the students:

which includes; code, age, gender, clinical training areas, previous training about infection control, previous experience about needle stick injury, previous needle stick accident.

(B): Internship nursing students' Knowledge Assessment Sheet: It was included the following:-

Students' knowledge about about training module as definition, steps, task, story and how to applied during clinical practice which consisted of 8 questions.

Students' knowledge about needle stick and sharp injuries which includes; causes and injury type (as insufficient training, recapping of used needle, handling sharp instruments from hand-to-hand, cleaning of sharp objects, unexpected patient reactions, lack of safety devices ect…), characteristics of safer needle device and sharps disposal objects (as device must be needleless, device preferably works passively, device must have a rigid cover to protect hands from needle ect…) and sharps disposal objects which consisted of 28 questions,

Students' knowledge about safety measures regarding NSIs (precautions to avoid NSI accidents, first aid after needle

or sharp injury, size of sharps boxes ect….), and immediate and late response after NSI (don't scrub the wound or suck on the wound post NSI, After a needle stick injury the affected area should be washed, milk out more blood is not recommended post injured and immediately seek medical treatment post NSI) which consisted of 22 questions.

Scoring system of knowledge was as the following:

-Correct answer scored (1)

-Don't' know or incorrect answer scored (0)

The total scoring systems of students' knowledge were (58) and classified as the following:

-Good → > 60% of the total score

-Fair → ≥ 50% - 60% of the total score

- Poor → < 50% of the total score

Tool (II): Observation checklist regarding safety measures about NSI:

This tool was developed by the researchers based on relevant literatures [28-34] to evaluate students' practice before and after implementation of training module regarding needle stick and sharp injuries. it was included the following steps; needle stick injury safety measures before the procedure (12) steps, needle stick injury safety measures during procedure (14) steps and needle stick injury safety measures post-procedure (12) steps.

Scoring system for performance was as the following:

-Correctly done take (1).

-Incorrectly done or not done take (0).

The total scoring systems of nurses' practices score were (38) and classified as:-

-satisfactory → ≥ 60% of the total score

-Unsatisfactory → < 60% of the total score

Tool (III): Challenges that affect follow up safety measures:-

The questionnaire was developed by the researchers to elicit internship nursing students' views about challenges that affect follow up of safety measures from students in the clinical settings during procedure. **Scoring system**, respondents were asked to indicate their level of agreement using three points Likert type scale with fix values ranging from 1 to 3, possible responses per item: (1) disagree, (2) natural and (3) agree.

Ethical and Legal Consideration:

- Official letters from the Faculty of Nursing Dean were delivered to the appropriate authorities in the selected area to conduct the study.

- A written/ oral consent was obtained from every internship nursing student to

participate in the study. The researchers explained to the students that participation in the study is voluntary and they can withdraw from the study at any time without penalty.

- Confidentiality of the data and patient privacy were respected. A code number was used instead of name.

Methods of data collection:

1- All tools of the study were developed by the researchers after reviewing relevant literature and used to collect data of the study.

2-All tools were reviewed for content validity by a panel of (5) expertise professors in the field of Medical Surgical Nursing, Their opinions were elicited regarding tools format and consistency, it was calculated and found to be = (96%).

3- All tools were tested for reliability using Cronbuch`s alpha test; it was 0.937 for tool (1) part B and 0.970 for tool (II) and 0.910 for tool (III).

4- A pilot study was performed to test the practicality and applicability of the tools and to determine any obstacles that may be encountered during the period of data collection. It was conducted on (10%) from students accordingly, needed modification was done. Pilot study from nurses and patients was excluded from the study sample.

5- This study was conducted at the beginning of September 2019 to the December 2019.

6- Training Module was conducted for internship nursing students through many phases which include; assessment (determining students' needs), develop learning objectives and content of training module, prepare training learning materials, prepare training Schedules, designing a training session, implementation of training module skills and monitoring , evaluation of training module -

a- Assessment of the internship nursing student's needs;

- Assessment of internship nursing students' baseline data was carried out using tool I part (A) to assess socio-demographic characteristics, and part (B) to assess knowledge regarding NS/SI, and tool (II) that were used to assess students' practice regarding NS/SI pre application of training module to determine the needs of the students and number of the sessions. The knowledge questionnaire sheet was filled by the students within 20 minutes and observational checklist was filled by the researchers within 20 minutes.

b-Develop learning objectives and content of training module;

-It's important to come up with measurable learning objectives of the

study that were prepared based on the needs of the students to give training modules a sense of direction and make the trainees feel like they are working toward a concrete goal before actually get down to designing training modules.

-Once the learning objectives prepared, the researcher start to prepare the content toward achieving those objectives which includes needle stick and sharp injuries safety measures. **Training module content** were prepared by the researchers based on the related literature [14-17, 35-39]. An illustrative structured booklet was prepared and supported by pictures as a guide for the students.

c- Prepare the training learning materials;

-The researcher prepared all of the listed resource materials that included; session task, skills and overview which contains purpose, story and learning objectives, classrooms, role-playing, case studies, focus groups, training-on-the safety measures, lectures, discussions, demonstration and redemonstration. Then prepare a list of all topics mentioned, typed out, copied and a booklet was given to each student during sessions to refresh their knowledge and practice. Choose methods for students learning as; computer-based training or instructor-led training, self-guided or self-based learning, learn better from reading.

d- Prepare training Schedules:

-The researchers determine day time / hours of the training, time dedicated to each of the sessions inputs, exercises, breaks and time dedicated to unforeseen events in any training workshop there will be unforeseen events.

E-Designing a training session:

-Training module were conducted for each group according to specific time of each department as following; (4) sessions within two weeks for each group, about two days per week, each session contained knowledge, skills, situation, learning objectives and learning activities according to session (knowledge or practice) and summary. The time of each session was about (1) hour. Researchers maintained integration between theoretical knowledge and practice during learning activities.

f- Implementation of training module:

-Training module was implemented by the researchers through schedule which were divided into four educational sessions that are provided for each group as the following: ***The First session:*** was included pretest for all internship nursing students, Then knowledge about training module as definition, steps, task and how to applied and knowledge about causes of needle

stick and sharp injuries, injury type, characteristics of safer needle device and sharps disposal objects and sharps disposal objects are given to the students, duration was 60 minutes. ***The second session:*** was included; knowledge about safety measures regarding NSIs, immediate and late response after needle stick and sharp injuries, duration was 60 minutes. ***The third session:*** was included demonstration and re-demonstration regarding needle stick injury safety measures before procedure and needle stick injury safety measures during procedure, duration was 60 minutes. ***The fourth session:*** was included demonstration and re-demonstration regarding needle stick injury safety measures post-procedure, duration was 60 minutes.

g- Monitoring and Evaluation of training module:

Evaluation was done by using tool (I) part (B) to evaluate internship nursing students' knowledge regarding training module and needle stick and sharp injuries. Tool (II) used to evaluate internship students' practice regarding safety measures about needle stick and sharp injuries, once pre implementing, and post completion of training module and Tool (III) used to assess challenges that affect follow up of internship nursing students safety measures after implementation of training module regarding needle stick and sharp injuries.

Methods of data analysis:

The statistical data were organized, tabulated and statistically analyzed using statistical package for social studies (SPSS) version 23. For categorical data the number and percent were calculated and the differences between subcategories were tested by chi square χ^2 . For numerical data the range, mean and standard deviation were calculated. Normality of data was tested using Kolmogorov-Smirnov test. Both descriptive and inferential statistics involving t - test and spearman test were used to present results. For each test, a p-value of <0.05 was considered statistically significant.

Results:

Table (1): showed the distribution of the studied internship nursing students according to their socio-demographic characteristics. As regard to age, the table showed that nearly three quarter of the students (69.3%) were in the age group (19-22) years/old. More than half (57.3%) of them were female. Regarding to clinical training areas it was observed that the distribution of students as following; (13) students from medical D, (12) students from surgical D, (10) nursing students

from ICU, (10) nursing students from outpatients, (10) students from dialysis unit, (10) students from neuorological D. and (10) students from operating theatre. Moreover Majority of students (69.3 and 77.3%) had no training about infection control or experience about needle stick injury respectively. In addition to (77.3%) of students Have not NSI previously.

Figure (1): Showed the distribution of the internship nursing students according to their knowledge about characteristics of the safer needle device pre and post training module. The figure revealed that there were statistical significant improvement in students' knowledge regarding characteristics of safer needle device from pre to post training module at $p < 0.05$.

Figure (1): Showed distribution of the internship nursing students according to their knowledge about immediate and late response after NSI pre and post training module. The figure revealed that there were statistical significant improvement in students' knowledge regarding immediate and late response after NSI from pre to post training module at $p < 0.05$.

Table (2): showed the mean score of the studied internship nursing students' knowledge regarding training module and safety measures about needle stick and sharp injury pre and post training module. Highly statistically significant difference in the mean score of knowledge regarding different items of safety measures about needle stick and sharp injury were observed from pre to post implementation of the training module with p-value < 0.05.

Table (3): Showed the total levels of students' knowledge about safety measures during NSIs practice pre and post intervention. The table showed that there were improvement among students' knowledge regarding safety measures during needle stick practice. Where the majority of the studied nurses (93.3%) had poor level of knowledge pre training module, whereas they scored good level of knowledge later after module for about (76%). So there was highly statistically significant difference between levels of students' knowledge throughout all intervention periods at $P< 0.05$.

Figure (3): Showed distribution of the internship nursing students according to their practice about needle stick injury safety measures post the procedure pre and post training module. The figure revealed that there were statistical significant improvement in students' practice regarding needle stick injury safety measures post the procedure at $p < 0.05$.

Table (4): Showed the mean score of the studied internship nursing students according to their practices about safety measures of needle stick pre and post

training module. Highly statistically significant difference in the mean score of practice regarding different procedures of needle stick injury safety measures were observed from pre to post implementation of the training module with p-value < 0.05.

Table (5): Showed the total level of students' practices about safety measures regarding needle stick pre and post training module. The table showed that there were statistically significant differences among total levels of students' practice. Where the majority of the studied students (98.7%) had unsatisfactory level of practice pre training module, whereas(97.3%) of them had satisfactory level of practice after module.

Table (6): showed the distribution of the studied students according to the challenges that affect follow up safety measures. The table showed that the highest percentages of challenges those face students and affect their follow up safety measures were; worked night shifts, lack of training, replacing needle caps most of the time, increase number of patients daily and sudden movement of a patient during injection for about (68.0, 73.3, 73.3, 45.3 and 66.7%) respectively.

Table (7): Showed the correlation between total score of knowledge pre and post training module and total score of practices pre and post training module. The table showed that there were statistical significant positive correlations among students' knowledge and practice from pre to post training module with p value 0.01

Table (1): Distribution of the studied internship nursing students according to their socio-demographic characteristics

Variables	The studied subjects (N=75)	
	N	%
Age in years		
▪ 19-22 year	52	69.3
▪ > 22 year	23	30.7
Sex		
▪ Male	32	42.7
▪ Female	43	57.3
Clinical training areas:		
▪ Medical area	13	17.3
▪ Surgical area	12	16.0
▪ Intensive Care Units	10	13.3
▪ Outpatient	10	13.3
▪ Dialysis	10	13.3
▪ Neurological area	10	13.3
▪ Operating theatre	10	13.3
Training about infection control		
▪ Yes	23	30.7
▪ No	52	69.3
Experience about needle stick injury		
▪ Yes	22	29.3
▪ No	53	70.7
Have needle stick accident		
▪ Yes	17	22.7
▪ No	58	77.3

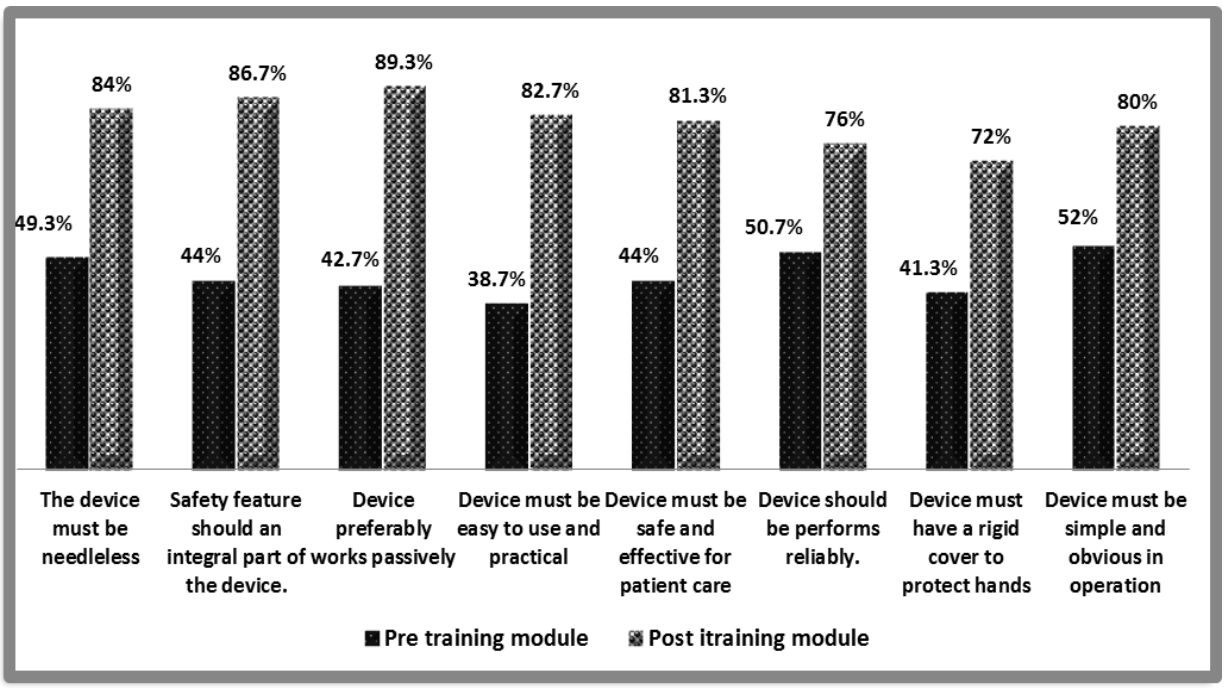


Figure (1): Distribution of the internship nursing students according to their knowledge about characteristics of safer needle device pre and post training module.

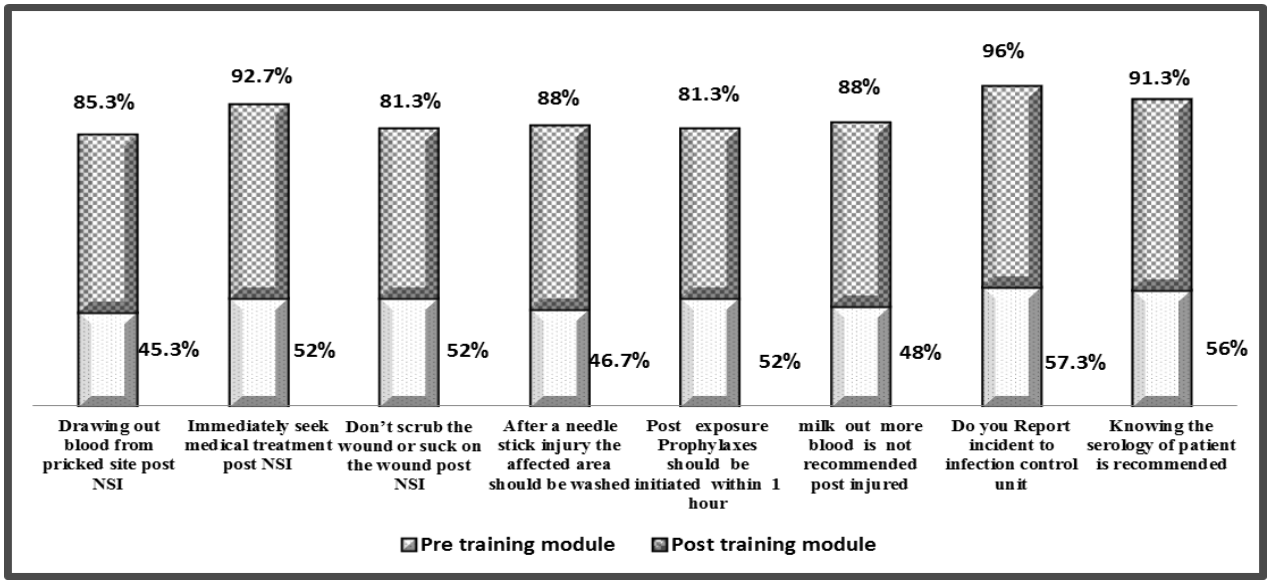


Figure (2): Distribution of the internship nursing students according to their knowledge about Immediate and late response after NSI pre and post training

Table (2): Mean score of the studied internship nursing students' knowledge regarding training module and safety measures about needle stick and sharp injury pre and post training module

Variables	The studied subjects (N=75)		
	Pre training module	Post training module	t p
Knowledge about training module	4.12±1.298	7.22±1.108	15.717 0.000**
Knowledge about causes and injury type	4.49±1.298	7.09±1.198	12.717 0.000**
Knowledge about characteristics of safer needle device	4.13±1.154	7.25±1.053	16.439 0.000**
Knowledge about sharps disposal objects	4.60±1.497	8.24±1.113	18.067 0.000**
Knowledge about safety measures regarding NSIs	5.89±1.438	10.64±1.311	20.209 0.000**
Knowledge about Immediate and late response after NSI	5.32±1.128	7.50±1.082	19.275 0.000**
Total score of knowledge	**24.44±3.429**	**40.22±3.211**	**28.705** **0.000****

***Significant at (p < 0.05)**

Table (3): Total levels of students' knowledge about safety measures during needle stick practice pre and post training module

Variables	The studied subjects (N=75)					
	Pre training module		χ^2 p	Post training module		χ^2 p
	N	%		N	%	
Good	**3**	**4**		**57**	**76.0**	
Fair	**2**	**2.7**	**67.213** **0.000****	**16**	**21.3**	**20.280**
Poor	**70**	**93.3**		**2**	**2.7**	**0.000****

****Significant at (p < 0.05)**

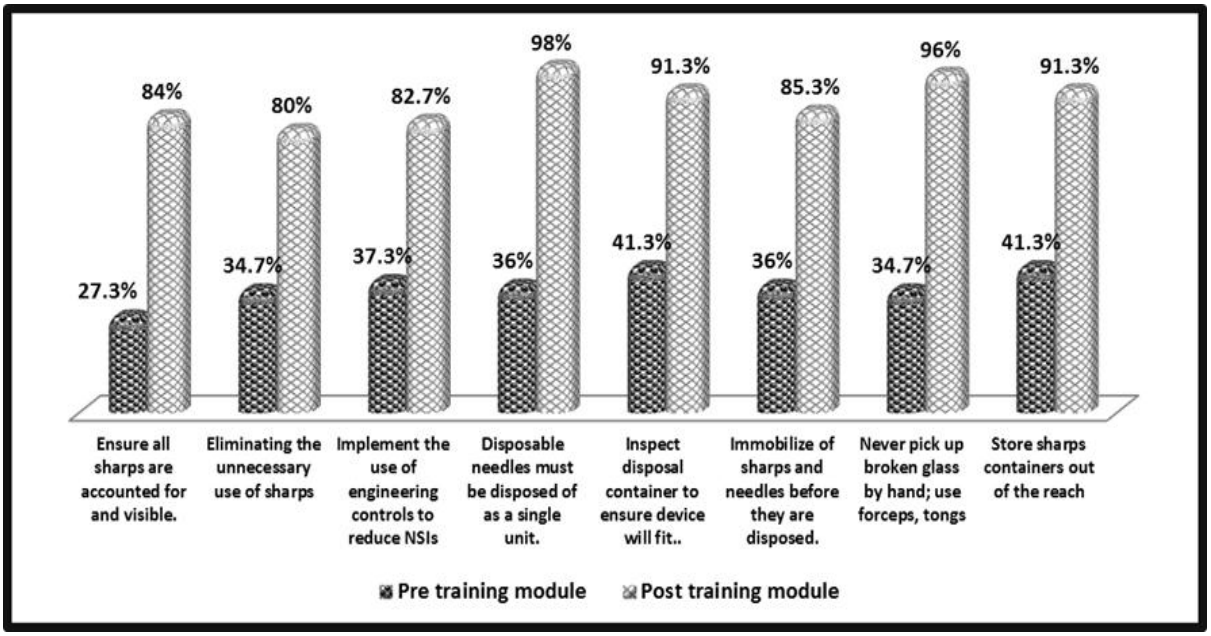


Figure (3): Distribution of the studied students according to their practice about Needle stick injury safety measures post the procedure pre and post training module

Table (4): Mean score of the studied internship nursing students according to their practices about safety measures of needle stick pre and post intervention

Variables	The studied subjects (N=75)		
	Pre training module	Post training module	t p
Needle stick injury safety measures before procedure	6.25±2.218	10.13±1.328	13.627 0.000**
Needle stick injury safety measures during procedure	6.25±2.218	12.08±1.548	20.630 0.000**
Needle stick injury safety measures post procedure	4.52±1.031	10.25±1.424	29.856 0.000**
Total score of practices	**17.02±4.644**	**32.46±3.180**	**25.502 0.000****

****Significant at (p < 0.05)**

Table (5): Total level of students' practices about safety measures regarding needle stick pre and post training module

Variables	The studied subjects (N=75)					
	Pre training module		χ^2 p	Post training module		χ^2 p
	n	%	71.053 0.000**	n	%	67.213 0.000**
Satisfactory	1	1.3		73	97.3	
Unsatisfactory	74	98.7		2	2.7	

*** Significant at P <0.05.**

Table (6): Distribution of the studied students according to the challenges that affect follow up safety measures

Challenges that affect follow up safety measures	The studied subjects (N=75)					
	Agree		Natural		Disagree	
	N	%	N	%	N	%
Working night shifts	51	68.0	8	10.7	16	21.3
Lack of training	55	73.3	16	21.3	4	5.3
Replacing needle caps most of the time	55	73.3	8	10.7	12	16.0
Not wearing gloves when working with needles.	16	21.3	27	36.0	32	42.7
Worked mixed shifts	28	37.3	15	20.0	32	42.7
Increase number of patients daily	34	45.3	32	42.7	9	12.0
Not participate in educational sessions	33	44.0	30	40.0	12	16.0
Work experience	33	44.0	31	41.3	11	14.7
Working in surgical wards.	20	26.7	11	14.7	44	58.7
Sudden movement of a patient during injection	50	66.7	18	24.0	7	9.3
Mean±SD	22.5867±2.72175					

Table (7): Correlation between total score of knowledge pre and post intervention and total score of practices pre and post training module

Variables	Total score of practices pre training module	Total score of knowledge post training module	Total score of practices post training module
	r p	r p	r p
Total score of knowledge pre-training module	0.319 **0.005	0.075 0.520	0.019 0.869
Total score of practices pre-training module	-	0.022 0.849	0.142 0.225
Total score of knowledge post training module		-	0.645 **0.000

**** Correlation is significant at the 0.01 level (2-tailed).**

*** Correlation is significant at the 0.05 level (2-tailed).**

Discussion

The susceptibility of internship nursing students to the risk of needle stick and sharp injury are increased due to lack of clinical experience, inadequate knowledge related to handling of sharp instruments and lack of instructional training [(40)]. Thus, training program for nursing students should focus on reducing risks and increasing awareness of preventive measures of needle sticks and sharp objects injuries among health care personnel [(41)]. So this study was aimed to evaluate the effect of implementing training module on competence of internship nursing students performance regarding needle stick and sharp injuries safety issues.

Concerning to socio-demographic data of the internship nursing students, the study results revealed that the majority of students were in the age group (19-22) years and more than half of them were female. Regarding to clinical training areas, the study results revealed that the students were from different areas as; medical, surgical, ICU, outpatients, dialysis, neuorological and operating theatre. Moreover the majority of the students had no training about infection control or experience about needle stick injury. These findings were in the same line with **Madhavan et al, (2019)** [(42)] who reported that in their study about needle‑stick injury that the mean age of internship nursing students were 24.38 ± 1.21 and (95.5%) from them were males.

Also **Seng et al, (2013)** [(43)] reported that the majority of internship students were female (90.36%) and age group ranged between 20-25 years. Also 57.57% of them got exposed to NSI in their of clinical posting. Moreover **Anupriya , Manivelan (2014)** [(44)] illustrated that two thirds of the internship nursing student experienced needle stick and sharp injuries and this number increased during clinical training. Also These results were in the same line with **Al-Momani et al, (2013)** [(45)] who clarified that there were still insufficient attention paid toward the infection control measures and prevention of needle stick and sharp injuries among nursing students during their clinical training in the hospitals. In addition to **Norsayani , Hassim (2003)** [(46)] reported that the mean age of the nursing students were 23.9 and most of them were female.

The present study revealed that there were highly statistically significant difference in the mean score of knowledge regarding training module, causes of needle stick and sharp injuries, injury type, characteristics of safer needle device , sharps disposal objects , safety measures regarding NSIs, immediate and late response after NSI

were observed from pre to post implementation of the training module. Inadequate knowledge about safety measures of NSI may be attributed to lack of experience about risky habit like separating or disassembling used needles prior to disposal, factor identified to be associated with occurrence of NSIs, standard practice of needle use. Also may be due to that, these students need more pay attention preventive measures, safety devices, how to deal with the contaminated needle, and adhering to the practice of universal precautions.

These findings were in the same line with **Lukianskyte et al, (2012)** [47] who reported, it is essential that the internship nursing students should be trained to develop their knowledge and hand skills before starting clinical practice. Moreover **Swe et al, (2016)** [38] **and Zhang et al, (2008)** [48] reported that in their study on health science students in northern china, the nursing students displayed a general lack of knowledge of occupational exposure standards, also the transmission risk of HIV was rated correctly by only 9% of students. On the other hand **Talas (2009)** [49] reported that about two thirds of the nursing students included into their study were determined to have lack of knowledge and training regarding NSSIs, and the rate of the training given rises with the increasing number of years.

Also **Acharya et al, (2014)** [50] reported that nearly all (98%) medical interns had good knowledge about diseases that are transmitted by unsafe injections, namely HIV, hepatitis B, and hepatitis C. In addition to **Shariati (2007)** [51] reported that internship is a period where knowledge is important through using training module and opportunity is given to acquire clinical skills. At the same time, there is need to safeguard interns against avoidable occupational hazards including universal precautions, injection safety. Moreover **Yang et al, (2007)** [52] reported that about 40% of the nursing students were familiar with the rules of NSIs notification, registration, observation and prevention, however, 92.0% of all NSIs among them were unreported, because they did not think that it was important. **Also Joardar et al, (2008)** [53] reported that high awareness was reported among students nurses in both study hospitals as regards measures to be taken after NSI (96% and 92.8%) and blood-borne diseases transmitted by unsafe injection practice

The present study revealed that there were highly statistically significant difference in the mean score of practice regarding different items about needle stick injury

safety measures before, during , after procedure were observed from pre to post implementation of the training module. Lack of internship nursing students practice regarding needle stick and sharp injuries before training module might be due to inadequate curriculum training in the faculty of nursing and training department and improvement of practice post module may be due to training module was highly effective in enhancing practice of students regarding prevention of needle stick injury, which in turn, help the students to improve the quality of life by controlling the spread of various blood borne pathogens and thus prevents various fatal infectious diseases transmission when the students promote the safety practice.

These findings were in the same line with **Hambridge (2011)** [(54)] who reported that safety training to prevent NSIs is essential for improving clinical skills during nursing students' training, it should focus on high-risk procedures such as various types of injections, needle disposal, removing needle caps, and opening ampoules and vials. Moreover **Al-Rawajfah , Tubaishat (2015)** [(55)] reported that enhanced practice on occupational safety among nursing students is expected to reduce the risk of NSIs. This may be done through many systems model that serves as the theoretical framework to improve practice.

Also **Kulkarni et al, (2013)** [(56)] reported that the students have practice regarding universal precaution measures, but regarding needle recapping; only 50.3% gave correct answer. It could be concluded that the availability of disposal bin near the procedure encouraged the students to recap the needle back.

From this view **Saji (2017)** [(57)] revealed that 70% of nursing students sustained needle stick injuries and there was lack of practice among students nurses regarding prevention and management of needle stick injury. Moreover **Kataria (2008)** [(58)] reported that there were many needle stick injuries among nursing student, this is because of inadequate practice regarding handling and disposal of needles so these students needs training module and program to decrease NSI incidence. This also was supported by **Kebede et al, (2012)** [(59)] who recommended that effective training, ongoing awareness on the risk of hazards, preventive measures such as engineering control are essential to reduce the risk of such injuries between health care workers.

The present study revealed that the most challenges those face students and affect their follow up safety measures during clinical training were; night shifts, lack of training, replacing needle caps most of the time, increase number of patients daily and

sudden movement of a patient during injection these results may be explained by lack of sleep and pressure during work that are resulting in inattention and less ability to concentrate when these students are providing treatments. These findings were in the same line with **Qin et al, (2015)** [(60)] who found that the risk of NSIs during nursing procedures was significantly associated with many factors such as student gender, age, night-shift frequency, injection frequency lack of safety training, knowledge of safety management policies, and lack of personal protective equipment use.

Also **Lihan et al, (2013)** [(61)] reported that long working hours increase the risk of sharp and needle stick injury, age which less than twenty-four years, less than four years of nursing work experience, working in the surgical intensive care unit are considered from major risk factors. Moreover **Ayas et al, (2006)** [(62)] reported that interns reported that injuries more frequently occur during the night shift than in the day. In addition to **Hambridge (2011)** [(63)] reported that repeated night-shift frequency, as a risk factor for NSIs among nursing students. This study suggested nursing students who reported three or more night shifts per week were nearly six times more likely to experience NSIs than those who did not work night shifts.

The study result showed that there were statistical significant positive correlations among internship nursing students' knowledge and practice from pre to post training module. These findings were in the same line with **Reda et al, (2010)** [(64)] who mentioned that there were positive relation between nursing students' knowledge regarding improving clinical training of preventive and precautions to prevent blood-borne infection diseases and needle-stick and sharp injuries. Also **Al tawil (2013)** [(65)] revealed that knowledge is positively related to compliance and negatively related to environment, but these relations are not statistically significant. There is statistically significant negative correlation between knowledge and clinical practice for these students.

Conclusions:-

In the light of the current study, it can be concluded that:

There were statistical significant improvements of internship nursing students' knowledge and practice regarding needle stick and sharp injuries safety measures from pre to post implementation of training module. Also the study results revealed that the most challenges those affect their follow up safety measures were; night shifts, lack of training,

replacing needle caps, increase number of patients daily and sudden movement of a patient during injection. Moreover there were statistical significant positive correlations among students' knowledge and practice from pre to post training module with p value 0.01.

Recommendation

Based on the results of the present study recommendation are suggested that;

1- A general workshop followed by practical training sessions on universal standard precautions should be conducted during the preparation period for internship nursing students by the Faculties of Nursing.

2-Continuous education for student and staff nurses about importance of application of standard infection control precautions and ensure that HCW are properly trained regard the safe use and disposal of needles.

3- Internship nursing students should be provided with appropriate information regarding correct occupational health habits, HIV prevention، and risk behaviors as a part of their requisite preclinical preparation.

4- Internship nursing students instructions should be continually reinforced, and clinical supervision should be managed to ensure compliance in all clinical experiences regarding NSIs.

References

1. **Waqar S, ulSiraj M, Razzaq Z, Malik Z, Zahid M.** Knowledge, Attitude and Practices about NeedleStick Injuries in Healthcare Workers. Pakistan Journal of Medical Research, 2011; 50 (3):66.
2. **Ann-Marie A.** Change Management Approach to Improving Safety and Preventing Needle Stick Injuries. Journal of Infection Prevention,2017; 1(6):1.
3. **Gupta A, Anand S, Sastry J, Krisagar A, Basavaraj A, Bhatt S.** High risk for occupational exposure to HIV and utilization of post exposure prophylaxis in a teaching hospital in Pune , India. BMC Infect Dis, 2008;8:142.
4. **Abd El-Hay S.** Prevention of Needle Stick and Sharp Injuries during Clinical Training among Undergraduate Nursing Students: Effect of Educational Program, IOSR Journal of Nursing and Health Science, 2015; 4(4):19-32.
5. **Juni M, Aiman A. Nabilah A, Wong S, Ibrahim F.** Perception Regarding Needle Stick and Sharp Injuries among Clinical Year Medical Students, International Journal of Public Health and Clinical Sciences, 2015; 2(1): 33.

6. **Madhavan A, Asokan A. Vasudevan A, Maniyappan J, Veena K.** Comparison of knowledge, attitude, and practices regarding needle-stick injury among health care providers, Journal of Family Medicine and Primary Care, 2019; 8 (3).
7. **Makary M, A-Attar A, Holzmueller C, Sexton J, Syin D, Gilson M**. Needlestick injuries among surgeons in training. N Engl J Med 2007;356(26):2693–9.
8. **Abd-Ellatif Z, Radi F, Abdel Mowla H,** Prevention ofNeedle Stickand Sharp Objects Injuries amongInternship Nursing Students duringtheir Clinical Exposure: An Educational Program atAssiut University Hospitals, Egypt, Journal of Nursing and Health Science, 2018; 7 (2): 93-100.
9. **Zia M, Afzal M, Sarwar H, waqas A, Gilani S**, Knowledge and Practice of Nurses about Needle Stick Injury at Lahore General Hospital, Saudi J. Med. Pharm. Sci.; 2017; 3 (6) :571-581.
10. **Cheung K, Ching S, Chang K.** Prevalence of and risk factors for needlestick and sharps injuries among nursing students in Hong Kong. American Journal of Infection Control, 2012**;** 40, 997-1001.
11. **Vijay C, Joe A, Ramesh N.** Knowledge of needle sticks injuries and its prevention among interns and post graduate students working at a tertiary health care centre, Bangalore, International Journal of Community Medicine and Public Health, 2017;4(7):2443-2448.
12. **Younus M, Balen Omer B, Abdulrahman A.** needle stick injuries among dental students in ishik university faculty of dentistry and hawler medical college, international journal of Research, 2019;7 (4).
13. **Walter D.** Training On the JOB: Step-by-Step Guidance Worksheets, Checklists, Case Examples Everything You Need to Succeed, https://www. oreilly.com/library/view/training , 2019.
14. **Nababan T, Saragih E.** esigning Training Module to Improve Nursing Clinical Competence Based on Needs Analysis: A Developmental Study, Asian Journal of Scientific Research, 2018;11 (3): 319-328.
15. **Kim K, Lee L, Eudey L, Dea M.** Improving clinical competence and confidence of senior nursing students through clinical preceptorship. Int. J. Nurs, 2014;1: 183-209.
16. **Lee S, Kim K**. The effects of Korean medical service quality and satisfaction

on revisit intention of the United Arab Emirates government sponsored patients. Asian Nurs. Res, 2017. 11: 142-149.

17. **Levett-Jones, T. Gersbach C, Roche J.** Implementing a clinical competency assessment model that promotes critical reflection and ensures nursing graduate's readiness for professional practice. Nurse Educ. Pract, 2011;11: 64-69.
18. **Lin X, Oingyan W, Hong K, 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;1(11).
19. **Wicker S, Ludwig A, Gottschalk R, Rabenau H**. Needle-stick injuries among health care workers: occupational hazard or avoidable hazard? Wien Klin Wochenschr, 2008;120: 486-492.
20. **Tan L, Hawk J, Sterling M.** Report of the Council on Scientific Affairs: preventing needle-stick injuries in health care settings. Arch Intern Med, 2001; 161: 929-936.
21. **World Health Organization**. WHO best practices for injections and related procedures toolkit. WHO best practices for injections and related procedures toolkit, 2010.
22. **Barbara A.** Guidelines for compliance in health care facilities: The OSHA handbook. 2002; 16(39):502-600.
23. **Yang Y, Liou S, Chen C, Yang C, Wang C, Chen C, Wu T.** The effectiveness of a training program on reducing needlestick injuries/sharp object injuries among soon graduate vocational nursing school students in southern Taiwan, J Occup Health. 2007;49(5):424-9.
24. **Cheung K, Ching S, Chang K.** Prevalence of and risk factors for needlestick and sharps injuries among nursing students in Hong Kong. American Journal of Infection Control, 2012; 40: 997-1001.
25. **El Ashmawy E, EL-Shafie I, Abd Rabo R.** Occupational Safety Strategies for controlling and Management of Needle Stick Injuries among Nurses at Student University Hospital, Tanta Scientific Nursing Journal, 2017; 12 (1): 7.
26. **Gupta A, Anand S, Sastry J, Krisagar A, Basavaraj A, Bhatt S.** High risk for occupational exposure to HIV and utilization of post exposure prophylaxis in a teaching hospital in Pune , India. BMC Infect Dis 2008;8:142.

27. **Chacko J, Isaac R.** Percutaneous Injuries among Medical Interns and Their Knowledge and Practice of Post exposure prophylaxis for HIV. Indian J Public Health 2007;51(2):127-9.
28. **Occupational Safety and Health Administration (OSHA),** prevent needle stick injuries, www.premierinc. com/needlestick, 2007; 1-10.
29. **Royal college of nursing**, Sharps safety RCN Guidance to support the implementation of The Health and Safety (Sharp Instruments in Healthcare Regulations), RCN Online www.rcn.org.uk , 2013;5-15.
30. **Blackwell L, Bolding J, Cheely E.** Nursing Students' Experiences with Needle Stick Injuries, Journal of Undergraduate Nursing Scholarship, 2007; 9: 1.
31. **Deisenhammer S, Radon K, Nowak D.** Needle Stick Injuries among Medical Training, Journal of Hospital Infection, 2006; 63: 263-7.
32. **Wilburn N, Eijkemans G.** Protecting Health Workers from occupational exposure to HIV, hepatitis and other bloodborne pathogens; from research to practice. African Newsletter on occupational Health and Safety, 2007; 17, 34.
33. **Saini R.** Knowledge and awareness of needlestick injury among students of Rural Dental College Maharashtra, India. Ann Nigerian Med, 2011;5:12-4.
34. **Green B, Griffiths C.** Psychiatric consequences of needlestick injury. Occupational Medicine. 2013;63(3):183–8.
35. **Amini R, Soltanian A, Ebrahimkhani A.** Investigating the use of safe injection guidelines after needle stick and sharp instruments injuries in Nursing , Midwifery students of Hamadan University of Iran. Journal of Medical Research. 2016; 5(1): 8-014.
36. **Hassane El-sol A, Mohammed H, Mohmmed R.** Effects of Intervention Training Module Regarding Hospital Nurse's Preparedness for Patient's Blood Transfusion, International Journal of Novel Research in Healthcare and Nursing, 2017; 4 (1): 102-116.
37. **Mohmmed S, Ibrahim K.** "Effect of Health Educational Program on Nurses Knowledge and practice Regarding Infection Control in Neonatal Intensive Care Unit at Pediatric Hospitals in Khartoum State, Sudan, 2015; 2 (3): 20-27.
38. **Swe K, Somrongthong R, Bhardwaj A, Lutfi Abas A.** The Effectiveness of Needle Sticks Injury Prevention Intervention Model on Medical

Students in Melaka, International Journal of Collaborative Research on Internal Medicine , Public Health، Malaysia: Randomized Controlled Trial, 2016; 8 (1).

39. **Janjua N, Hamza H, Islam M, Tirmizi S, Siddiqui A, Jafri W, Hamid S**. Health care risk factors among women and personal behaviors among men explain the high prevalence of hepatitis C virus infection in Karachi, Pakistan , Journal of Viral Hepatitis, 2010;17(5):317–326.
40. **Nawafleh H, Abozead S, Al Momani M.** Investigating needle stick injuries: Incidence, knowledge and perception among South Jordanian nursing students. Journal of Nursing Education and Practice. 2018; 8(4): 59.
41. **Massaro T, Cavone D, Orlando G.** Needlestick and sharps injuries among nursing students: an emerging occupational risk. G. Ital. Med. Lav. Ergon. 2007; 29(3): 631-632.
42. **Madhavan A. Asokan A. Vasudevan A. Maniyappan J. Veena K.** Comparison of knowledge, attitude, and practices regarding needle stick injury among health care providers, Journal of Family Medicine and Primary Care, 2019; 8 (3).
43. **Seng M, Lim J, Sng J, Kong W, Koh D.** Incidence of needlestick injuries among medical students after implementation of preventive training. Singapore Med J 2013;54(9):496–500.
44. **Anupriya A, Manivelan S.** study on the assessment of needlestick injuries and occupational safety among health-care workers. International Journal of Medical Science and Public Health. 2014; 4(3).
45. **Al- Momani S, Hdaib M, Najjar Y.** Sustained Reduction in Needle Stick and Sharp Injuries among Nursing Students: An Initiative Educational Program, Educational Research, 2013; 4(9): 654-658.
46. **Norsayani M, Hassim I.** Study on incidence of needle stick injury and factors associated with this problem among medical students. J Occup Health 2003; 45: 172-178.
47. **Lukianskyte R, Gataeva J, Radziunaite L.** Needle sticks and sharps injuries experienced by staff nurses and nursing students and their prevention. International Journal of Infection Control , 2012; 8: 3-9.
48. **Zhang Z, Moji K, Cai G, Ikemoto J, Kuroiwa C.** Risk of sharps exposure among health science students in northeast China. Biosci Trends. 2008; 2(3):105-11.

49. **Talas M.** Occupational exposure to blood and body fluid Turkish nursing students during clinical practice training: frequency of needlestick/sharp injuries and hepatitis B immunization. Journal of Clinical Nursing, 2009; 8: 1-9.
50. **Acharya A, Khandekar J, Bachani D.** Assessment of Knowledge and Practices regarding Injection Safety and Related Biomedical Waste Management amongst Interns in a Tertiary Care Teaching Hospital, Delhi, International Scholarly Research Notices, 2014.
51. **Shariati A, Shahidzadeh-Mahani T. Oveysi H.** "Accidental exposure to blood in medical interns of Tehran University ofMedical Sciences," Journal of Occupational Health, 2007; 49 (4): 317–321.
52. **Yang Y, Liou S, Chen C.** The effectiveness of a training program on reducing needlestick injuries/sharp object injuries among soon graduated voacational nursing school students in southern Taiwan. J Occup Health 2007; 49: 424-429.
53. **Joardar G, Chatterjee C, Sadhukhan S, Chakraborty M, Das P, Mandal A.** Needle sticks injury among nurses involved in patient care: a study in two medical college hospitals of West Bengal. Indian J Public Health. 2008;52(3):150–2.
54. **Hambridge K.** (2011). Needlestick and sharps injuries in the nursing student population. Nursing Standard, 2011; 25(27): 38-45.
55. **Al-Rawajfah O, Tubaishat A.** Nursing students' knowledge and practices of standard precautions: A Jordanian web-based survey. Nurse Educ Today, 2015; 35: 1175-1180.
56. **Kulkarni V, Papanna M, Mohanty U, Ranjan R, Neelima V.** Awareness of medical students in a medical college in Mangalore, Karnataka, India concerning infection prevention practices. Journal of Infection and Public Health 2013; 6: 261-268.
57. **Saji V.** A quasi-experimental study to assess the effectiveness of self-instructional module on knowledge regarding prevention of needle stick injury among B.Sc. Nursing 2nd year students, International Journal of Advanced Scientific Research, 2017; 2 (4): 01-04.
58. **Kataria J.** A study to develop and validate a protocol related to needle stick injury for health team members (staff nurses) working in selected hospital. Nightingale Nursing Times 2008; 4(8):34-44.

59. **Kebede G, Molla M, Sharma H.** Needle Stick and Sharps Injuries among Health Care Workers in Gondar city, Ethiopia, Safety Science,2012; 50 : 1093–1097.
60. **Qin Q, Smith M. K, Wang L, Su Y, Wang L, Guo, W, .Wang N.** (2015). Hepatitis C virus infection in China: An emerging public health issue. Journal of Viral Hepatitis, 2015; 22: 238-244.
61. **Ilhan M, Durukan E, Aras E, Türkçüoglu S.** Long working hours increase the risk of sharp and needlestick injury in nurses: The need for new policy implication. J AdvNurs, 2013; 56: 563-568.
62. **Ayas N, Barger L, Cade B, Hashimoto D, Rosner B.** Extended work duration and the risk of self-reported percutaneous injuries in interns. Jama; 2006; 296(9): 1055-1062.
63. **Hambridge, K.** (2011). Needle stick and sharps injuries in the nursing student population. Nursing Standard, 25(27), 38-45.
64. **Reda A, Fisseha S, Mengistie B, Jean-Michel V**. Standard Precautions: Occupational Exposure and Behavior of Health Care Workers in Ethiopia. PLoS ONE | www.plosone.org,.2010; 5(12) :14420.
65. **Al tawil F**. Knowledge, environmental factors, and compliance about needle stick injuries among nursing students, Life Science Journal 2013;10(4), 246.