ASSESSMENT OF SAFE INJECTION PRACTICES AND NEEDLESTICK INJURY AMONG NURSING STUDENTS AT MANSOURA UNIVERSITY

Somia Hassan Ibrahim[1], Nagwa Mahmoud Salem[2],
Sahar Mohammed Soliman[3]

[1] *Demonstrator in Community Health Nursing,* [2]*Assist. Prof. in Community Health Nursing*
[3] *Prof. in Community Health Nursing, Mansoura University.*

Abstract

Injections are the most common health care procedure worldwide.Risk of unsafe injection exposed health care providers to needle-stick injury that constitute a major hazard for the transmission of bloodborne diseases.The establishment of "Safe Injection Global Network (SIGN)" was a milestone towards safe injection practice globally. Safe injection is a vital component of infection prevention process without which many patients are at risk of being exposed to several non-curable and curable infectious diseases.This study aimed to assess nursingstudents' knowledge, practices, and attitude regarding safe injection practices and needlestick injury.A cross sectional study design was utilized to accomplish this study.Convenience sampling technique of community health nursing students were included in the sample.The study results revealed that the prevalence rate of needlestick injury (NSI)was 52.1% of among the studentsthrough last three levels of their academic study. The majority of the studied students had lack of knowledge and improperpractice regarding safe injection practices and needlestick injury.Conclusion: needle stick injuries was prevalent among more than half of studied nursing students. Majority of the nursing students had a poor score level of knowledge and improper practice regarding safe injection practices and needlestick injury.Finally, it is recommended continuous health education program and training courses regarding safe injection practices prior to starting clinical practice.

Keywords: *attitude, knowledge, needlestick injury,nursing students,practice, safe injection practices*

Injection is one of the most common healthcare interventions globally. Most medical injections are provided for curative reasons whereas some of the other reasons include vaccination injections, family planning and diabetic injections. It is estimated that at least 16 billion injections are delivered annually throughout developing and transitional countries. Majority of the injections are unnecessary and are not used safely(Zakar, Qureshi, Zakarand Rana, 2013).

Unsafe injection practices put patients and healthcare providers at risk of infectious and noninfectious adverse events, also carry socio-economic and psychological consequences on the individuals and the health system(Van Tuong, Phuong, Anh and Nguyen, 2017; Al Awaidy, Zayed, Ramadan andHsairi, 2018; Birhanu, Amare, Belay and Belay, 2019).

Unsafe injection has become a very common issue and is practiced in many countries. Unsafe injection is the major cause of transmission of diseases such as hepatitis B, hepatitis C and HIV. The World Health Organization (WHO) estimates that 50% of injections performed in developing countries are unsafe, and that as many as 20–80% of cases of hepatitis B virus infections are caused by unsafe injections(Pepin, Abou Chakra, Pepin, NaultandValiquette, 2014).

Badiee Aval et al., (2017), stated that needle-stick injuries are the second most common adverse incident and constitute a major hazard for the transmission of blood transmitted diseases. The incidence of needle stick is higher than the reported cases in different countries. Reporting of these exposures is often a challenge for health care workers (HCWs). They are a potential source of transmission of viral diseases and different pathogens that cause many diseases via blood including malaria, infectious mononucleosis, diphtheria, herpes, tuberculosis, syphilis, and spotted fever(Yazie, Chufa andTebeje, 2019).

Nurses are an important bridge between doctors and patients as they have the greatest degree of contact with patients. They represent the largest labor group in health care. Although nurses are clearly a high-risk subgroup for such events, nursing students may be at similar or even greater risk due to their limited clinical experience. Nursing students initially perform non-invasive procedures from their first year, under supervision, including giving injections via various routes, and measuring of patients' blood glucose using glucometer. As they advance in their levels of study, they start to perform invasive procedures(Balouchi, Shahdadi, AhmadidarrehsimaandRafiemanesh, 2015;Hada et al., 2018; Amukugo, ShitokelwaandNuuyoma, 2018).

WHO estimated that unsafe injections caused annually 21 million of hepatitis B virus (HBV) infections, two million of hepatitis C virus (HCV) infections and 260,000 of human immunodeficiency virus (HIV) infections.These infections caused to 49,000, 24,000, and 210,000 deaths, respectively. The 40% of the global burden of HBV and HCV infection among Health Care Workers (HCWs) is attributable to occupational exposure.Unsafe injections are responsible for millions of cases of HBV and HCV infection, and an estimated one-quarter of a million cases of HIV infection annually(Matsubara, Sakisaka, Sychareun, Phensavanhand Ali, 2020).

Adherence to safe injection practices and related infection control are part of all health workers' responsibility to prevent the transmission of risks associated with unsafe injection.In developing countries including Egypt, the studies have shown a very low compliance by professionals and students alike. For that reason, it should be a regular training and education of nursing students regarding safe injection practices, the prevention and management of NSIs, and it should be ensured that proper standard precautions are followed at all levels (Hassan, 2018).

Thus, safe injection practice is critically important, andit lack poses a major occupational health hazard for healthcare professionals. Because nursing students are more at risk of unsafe injection practices as they have less clinical experience ؛besides the researches on the level of knowledge, practices and attitude of nursing students regarding safe injection in Egypt are considered dearth. From this background, we planned this study with the following objectives.Assessment of knowledge, attitude and practices regarding safe injection practices needlestick injury amongst nursing students.

Aim of the Study

1. To assessstudents' knowledgeregarding safe injection practices and needlestick injury.

1. To assess students' practice regarding safe injection practices and needlestick injury.
2. To assess students'attitude regarding safe injection practices and needlestick injury.

Method

Design

A cross-sectional study designwas utilized to accomplish this study.

Setting

The study was carried out at skill lab of community health nursing, Faculty of Nursing, Mansoura University.

Participants

Undergraduate nursing students who were registered in community health nursing course at 1st term academic year 2019-2020, able to apply parenteral medication (injection) at clinical sitting.

Sampling

Convenient sampling technique was used in this study.

Sample size

The number of nursing students enrolled in community health nursing course in first term of academic year 2019-2020 was 240.When the population size= 240 students, desired precision= 5%, expected frequency of adherence to safe injection practices = 50% and design effect= 1, and the confidence level 95%, the minimal required sample size is 148 students by adding 10% for non-respondents, the total required will be 163students(Schaeffer, RL., Mendenhall, W., Ott, L., (1990).

Tools for Data Collection

After reviewing the relevant literature, five tools were used by researcherin this study for data collection.

Tool I:Sociodemographic data assessmentself-administered questionnaire.this tool included two parts :

*The first part.*It was used to assess demographic data of students (age, gender).

The second part.It was used to assess socioeconomic level of nursing students by using updating socioeconomic status scale (El-Gilany, El-Wehadyand El-Wasify, 2012; Fahmy and El Sherbini, 1983). This scale includes seven domains with total score out of 84. It classifies socioeconomic level into very low, low, middle and high levels depending on the quartiles of the score calculated as the following:

Very low socio-economic level.(0-20)
*Low socio-economic leve*l. (21-41)
Middle socio-economic level. (42-62)
High socio-economic level. (63-84)

Tool II: Needlestick injury history assessmentself-administered questionnaire. This tool was used to assess history of needlestick injury (NSI) including frequency, time of NSI, cause of NSI, place of NSI, management of NSI.

Tool III: Knowledge assessment self-administered questionnaire. This tool was used to assess knowledge of nursing students regarding safe injection practices such as standard precautions, safe injection, the seven steps of injection safety, infections transmitted by unsafe injections, needlestick injury, postexposure prophylaxis and disposal of injection wastes.

The tool composed of 121 questions and was classified into 15 categories. One mark awarded for each correct answer.

Scoring System; the total score of knowledge ranged from 0 to 121marks. According to the researcher's cut of point, the knowledge level was stated into three categories as:

Poor. Scores less than 50% of total scores (0- less than 60.5)

Fair. Scores 50% to less than 65% of total sores (60.5 less than 78.65)

Good. Scores more than 65% of total scores (78.65andmore)

Tool IV: Attitude assessment self-administeredscale. This tool used to assess nursing students' attitude toward safe injection practices and risk perception of needlestick injury.

This tool consisted of 22 statements requiring a response on four - point Likert- rating scale with four continuums (strongly agree, agree, disagree, and strongly disagree).

*Scoring system.*The total score of attitudes ranged from 0 to 66 marks.

(Three marks was given to strongly agree, two marks to agree, one mark to disagree and 0 mark to strongly disagree). If the statements were negative, the scoring system was reversed in SPSS as (0 mark was given to strongly agree, onemark given to agree, two marks to disagree, and three marks to strongly disagree) which made up a total score of 66 marks.

Tool (IV): Practice observation checklist. This tool used to assess nursing students' practice by using an observation checklist such as hand hygiene, wearing gloves, recap of needles, and sharp waste management.

The tool composed of 43 questions and was classified into seven categories. One mark awarded for each correct response.

Scoring System; the total score of practice ranged from 0 to 43. According to the researcher's cut of point, thepractice was consisted of two categories as:

Improper.Scores less than 75% of total scores (less than 32)

Proper.Scores more than 75 % of total scores (32 and more)

Procedure

This study was accomplished throughout two main phases:

Phase I: Preparatory Phase

Administrative stage. An official letter was submitted from Community Health Nursing Department and the vice dean of postgraduate studies and research to Vice Dean of Education and Students' affairs, Faculty of Nursing, Mansoura University and permission to conduct the study was obtained after explanation the aim of the study.

Ethical consideration. An ethical approval was obtained from Research Ethics Committee of Faculty of Nursing, Mansoura University.

Verbal informed consent was obtained from the participants. The researcher introduced herself and a simple explanation about the objectives of the study given to them. They assured that their participation in the study was voluntary. Students' information and responses were treated anonymously, only used for the purpose of the study and confidentiality was assured. The results were used as component of the necessary research as well as for further publications and education. Participants were informed that they have the right to withdraw at any time from the study without giving any reason.

Phase II: Operational Phase

Literature review. Review of national and international literatures on the safe injection practice, and needlestick injury were proposed from scientific published articles, internet search and textbooks.

Developing the study tools. The tools (II to IV) were developed by the researcher after reviewing the related literature.

Validity of the study tools. Content validity of the developed tools were tested by a jury of five experts in the field of community health nursing

and the required modification was carried out.

Face validity of the developed tools was tested by conducting pilot study. Accordingly; the required modification was done.

Reliability of the study tools. Reliability of the developed tools were tested by Cronbach's alpha, which revealed acceptable level that ranged from 0.7 to 0.8.

Pilot study. Pilot study was carried out on (10%) of study sample (16 students) who had been excluded from the studied sample to evaluate the clarity, reliability, applicability of the study tools, and to estimate the approximate time required for data collection. The modifications were made based on pilot results relevant to change in the structure of some questions.

Data collection. Once permission was granted to conduct the study, the researcher had initiated data collection.

Data collected from October 2019 to end of January 2020 in the available time at the end of clinical days.

Before distributing the questionnaire, the researcher introduced herself and a brief explanation about the objective of the study was given to the nursing students and oral consent was obtained. Questionnaires were distributed to the selected students who agree to participate in the study. The researcher waspresented during data collection to make any required clarifications about questionnaires to the subjects.

Self-administered questionnaires wereused to assess nursing students' socioeconomic level, needlestick injury history, their knowledge about safe injection practices and needlestick injury, their attitude regarding safe injection practice. The average time consumed for completing questionnaire ranged from 20-30 minutes.

Nursing students' practice was assessed by using an observational checklist. It was filled by the researchers within 30 minutes in community health nursing skill lab, faculty of nursing as ideal circumstances available to avert barriers of inadequate supply of injection safety material and resources in hospitals. Then, the researchers collected the questionnaire and make sure that questionnaires were being filled fully.

Data analysis. Statistical analysis was done according to the most currently reliable and valid statistical methods. The collected data were coded, entered and analyzed by personal computer using Stand for statistical product and service solutions (SPSS) program version 20. Descriptive statistics are used to analyze the response to individual items and the respondents' characteristics. Quantitative variables are described by the Mean, Standard Deviation (SD. Chi-square, fisher's exact and monte-Carlo test used to test association. They were tested for normality by Kolmogorov-Smirnov test. For correlation testing, spearmen test was used. All tests were performed at a level of significance (P-value) equal or less than 0.05 was considered statistically significant.

Results

Table(1)shows that 57.7% of the studiedstudents aged 22 years with a mean age of 21.88 (0.64), female represented80.4% of the studied group. Regarding their residence, 62.6% of the students lived in rural area, and 82.2% of them did not work in private hospitals. Regarding the students' socioeconomic level, 87.1% of them located in middle socioeconomic level while 5.5% of them were belonging to low socioeconomic level.As regards to the attendance of

training courses in infection control and safe injection practices, only 12.3% and 9.8% of the studied students attended it respectively.

Figure (1) shows that 52.1% of the students exposed to needlestick injury in the last three levels of their academicstudy.

Table (2) clarifies that 65.6% of the exposed students to NSI exposed once in their clinical settings whereas 29.4% and 4.7% of them exposed twice and three times respectively. Adding that 57.7% of them reported that NSI occurred in second level, 47% of them reported that NSI occurred during recapping, and 25.9% of them reported that NSI occurred during drawing blood. Concerning management of the NSI, 25.9% of the students who exposed to NSI washing the site with water and soap, 82.3% of them didn't report it to the head nurse nor the clinical instructor and 80% of them didn't conduct any blood screening for HBV nor HCV.

Table (3) indicates that 79.8% of the studied students had poor score level of knowledge about safe injection practices with a mean 1.306 (0.651) in addition to 74.2% of them had poor score level of knowledge about injection waste disposal with a mean 1.331 (0.609). Concerning to needlestick injury, 97.5% of the studied students had poor score level of knowledge about needlestick injury management and prevention with a mean 1.049 (0.310). Moreover, the mean of total score level of knowledge was 37.417 (19.821).

Table (4) represents that 80.4% and 85.3% of the studied students had improper score level of practice regarding preparation of injection procedure and injection administration respectively. In addition to 76.1% of them had improper score level of practice regarding waste management activities. Generally, 85.9% of the students had improper total practice score with a mean 17.356 (10.540).

Table (5) shows that 42.3% of the studied students strongly agreed that injections is best treatment for the patients, 39.9% of them strongly agreed that injection safety measures are protective and 41.1% of them strongly agreed that nursing students' training about injection safety is important. In addition to the students who agreed that hand washing before and after injection is necessary were 44.2% and students who agreed that safe handling of the needle may reduce the risks of injury were 58.3%. Regarding perception the risk of NSI 57.1% of the students agreed that every nursing student is prone to get NSIand 47.9% of them agreed that increase workload may increase exposure to NSIwith a mean of total positive attitude was 50.024 (6.965).

Table (6) presents that 38.7% of the studied respondents agreed that wearing gloves during busy schedule is not possible, 41.1% of them agreed that changing the needle makes a syringe safe for reuse. In addition to the students who agreed that post exposure follow-up after NSI only induces anxiety and worry were 52.1% and students who agreed that post exposure prophylaxis (PEP) does not influence the probability of HIV/hepatitis were 49.1% with a mean of total negative attitude were 17.865 (4.237), in addition to that the mean of total attitude were 69.889 (11.797).

Table (7) clarifies the association between students' total score level of knowledge, students' total score level of practice, and socioeconomic level,sex, courses attendance. Related to students' socioeconomic level, there were statistically significant association

between socioeconomic level, and students' total score level of knowledge P= 0.000, while there was no statistically association between socioeconomic level, and students' total score level of practice P= 0.069.

Related to sex, there was no statistically association between sex, and students' total score level of knowledge nor their total score level of practice P= 0.817 and P= 0.770 respectively .

Related to courses attendance, there were statistically significant association between courses attendance, and students' total score level of knowledge, and their total score level of practice P= 0.000 and P= 0.000 respectively.

Table (8) reveals that there was statistically significant association between exposure to needle-stick injury among nursing students and working in nursing field, students' total score level of knowledge, students' total score level of practice P= 0.000, 0.003, 0.000 respectively. Moreover, there was not statistically association between exposure to needle-stick injury and sex P= .902.

Table (9) indicates that there was positive correlation between students' total scores level of knowledge and total score of practice.

Table (10) indicates that there was negative correlation between exposure to NSI and students' working in private hospitals, in addition to there was negative correlation between exposure to NSI and students' total scores level of knowledge andtheir total score of practice.

Discussion

Nursing students perform various types of nursing procedures, such as injection, and handle different types of instruments. As nursing students have

less experience in clinical settings are often exposed to various infections during their clinical education as health care workers. They have a huge responsibility to protect themselves, their families, and their patients from infection risk(Atalla, Aboalizmand Shaban, 2016).

The current study revealedthat majority of the studied studentswere female, the age of them was between 21-23 years old. This finding is at the same line with the studies conducted on community health nursing students in Egypt and Iranwhich found thatabout less than two thirds of the students aged 22 years oldIbrahim, Soliman and Abd el-Moaty (2019); Amini, Soltanian, Ebrahimkhaniand Beigyan (2016)

Regarding previous training courses attendance, the current finding revealed that most of the studied students didn't have training courses on safe injection practices and infection control, this may bedue to heavy academic schedule of the students. It was agreed with Egyptian studyof Abdelaziz, DoghamandElcockany (2019) reported that two thirds of their subjects didn't have previous infection control training program.

Needle stick injury is an important fundamental factor of poor injection safety practices by health careworkers. In the present study more than half of nursing students reported that they experienced needle stick injuries at least once during their training at clinical setting. High prevalence rate of injuries among nursing students may be due to limited clinical experience and underdeveloped skills, insufficient training, inadequate supervision and arenot sufficiently familiar with the procedures or equipmentThis was in accordance with the studies conducted in India, Mexico by Prasuna et al., (2015)

and Garcia and Radon (2017) who reported that occurrence rate of NSI was 39.76%, 58.2% respectively. Also, it was reported in a Turkish study of Arliand Bakan (2018) high prevalence 57.1% of NSI exposures among nursing students.

The present study revealed that most injuries occurred during recapping, followed by drawing blood with and commonly occurred in medical surgical units. On the same line, Atalla (2019) study's in Tanta University, Egypt reported that most injuries reasoned for IV injection, followed by IM injection and recapping needle as most students used to recap the needle after use that frequent occurred at the outpatient clinic and medical units.Additionally, a Turkish study reports that about half of the nurses got injured while they were recapping and breaking the ampules ArliandBakan (2018) and Handiyani, Kurniawidjaja, Irawatyand Damayanti (2018).

By highlighting on nursing students' score level of knowledge regarding safe injection practices and needle-stick injury, the findings of this study revealed that majority of them had poor knowledge. This current study's findings might be due to the insufficient injection safety training courses in the undergraduate nursing program. These findings correspond with the finding of Abd El-Hay (2015) study' s who assess the effect of educational program on knowledge and practice of undergraduate nursing students toward prevention of needle stick and sharp injuries, mentioned that undergraduate nursing student's poor knowledge about needle stick and injection safety. The studies carried out in India, Ethiopia by Datta, Nag, Karmakarand Chakraborty (2018) who assess knowledge, attitude and practice of injection safety among health

care personnel in a tertiary care hospital of Tripura and Birhanu, Amare, Belay and Belay (2019) that reported that majority of their participants had poor knowledge.

Regarding, students' practice regarding injection safety and application of infection control measures during injection, the study revealed that the majority of the studied students had improper practice this may be due to short training hours in the lab and hospital during clinical training and increase workload in the morning shift in the hospital which is the time of students training. This finding was consistent with Indian, Yemeni and Nigerian studies that documented poor practice among their participants as they used to recap the used needles prior disposal and didn't wash their hands before and after injection Kulkarni, GiriandGangwal (2016); Alwabr (2018); Abubakar et al., (2019). However, the data from the current study were in contrast with Ijachi, AuduandAraoye (2016) study assessed knowledge, attitude and practice of injection safety among healthcare professionals concluded that their overall practice scores was appropriate.

With regarding to nursing students' attitude toward safe injection practices and needle-stick injury, the current study found that majority of studentsagreed that injection safety measures are protective and acknowledged the necessity of applying aseptic technique during handling, preparing, administeringparenteral medications. The result is similar to the results of study conducted in India which reported that majority of health care professionals perceived the importance and protection offered by the injection safetyDatta et al., (2018).

Upon the importance of wider educational promotions on injection safety and NSI prevention that three fourth of the respondents agreed that learning courses on injection safety may reduce the incidence of NSI among students. These findings are in agreement with the Jordanian study of Nawafleh, El Abozead, Al Momani, and Aaraj (2017) assessed knowledge and perception among South Jordanian nursing students regarding NSI, revealed that most of them agreed that Health education on universal precaution from NSI may reduce the incidence of NSI among students.

On other hand, the results of this study revealed that two thirds of the nursing students agreed that no harm in two handed recapping needles after use and agreed that post exposure follow-up after NSI only induces anxiety and worry. This is consistent with the report from Mondal, Baidya and Dasgupta (2018) and Karbakhsh, Motlagh, and Khansari (2012) which evaluate the knowledge and attitude regarding safe injection practices accentuated that three fourth of medical students agreed post exposure follow-up only induces anxiety and worry and agreed that PEP does not influence the probability of acquiring hepatitis or HIV.

In the present study an association was found between the knowledge scores, practice scores and the selected demographic variables such as age, socioeconomic level, training courses attendance, there was statistically significant association between socioeconomic level, training courses attendance and students' knowledge scores while there were statistically significant association between exposure to NSI and working in private hospitals, students' knowledge scores, students' practice scores. This is meant that demographic variables are influential factor on students' knowledge regarding safe injection .

These findings correspond with results of other studies Van Tuong, et al., (2017); Gyawali et al., (2016); Yusefzadeh, DidarlooandNabilou (2018); Aly, Mohamed and Mahmoud (2019); Amini, et al., (2016) which revealed that knowledge was significantly influenced by gender, and work experience of nurses, there was a statistically significant relationship between nurses' specific knowledge regarding NSIs and exposure to NSI and there was a statistically significant relationship between age, years of experience and exposure to NSI.

On the context that nurses' level of knowledge affects their practice of safe injection, there was positive correlation between students' knowledge scores and practice scores. This study result was in the same line with the studies of Zia et al., (2017); Vijay, Joe and Ramesh (2017) which found that there was significant association between knowledge and practice.

Conclusion

Based on the results of the present study, it can beconcluded that nursing students in their clinical training setting are at risk of unsafe injection practices and needle-stick injuries.Needlestick injuries was prevalent among more than half of studied nursing studentsas well as high rate of under-reporting. Majority of the nursing students had a poor score level of knowledge regarding safe injection practices and needlestick injury and majority of studied students had improper practice regarding safe injection practices.

Recommendations

Based on the findings and conclusions drawn from the study, the following recommendations are suggested:

1. Continuous health education program and training courses regarding safe injection practices and needlestick injury should be conducted prior to starting clinical practice.
2. Develop web-based learning module about safe injection practices and needlestick injury for undergraduate nursing students.
3. Develop a good effective reporting system among undergraduate nursing students to facilitate reporting needle-stick injury.
4. The need to implement counselling programmed to support students who experience needlestick injury in clinical settings for helping students to adhere to post exposure treatment and to cope with emotional stress after the trauma.
5. Replication of the study on a large probability sample acquired from different universities in Egypt to figure out the main aspects of unsafe injection practices and needle-stick injuries problem among nursing students.

Acknowledgement

Table 1: Students' sociodemographiccharacteristics

Item	n=163	%
Age:		
21years	44	27
22 years	94	57.7
23 years	25	15.3
Mean (SD)	**21.88 (.64207)**	
Gender:		
Male	32	19.6
Female	131	80.4
Residence:		
Rural	102	62.6
Urban	61	37.4
Socioeconomic Level:		
Low socio-economic level	9	5.5
Middle socio-economic level	142	87.1
High socio-economic level	12	7.4
Mean (SD)	**53.47 (6.91)**	
Working in private hospitals:	29	17.8
Training course in infection control:	20	12.3
Training course in safe injection practices:	16	9.8
Personal computer possession:	112	68.7
Previous experience in web-based learning:	57	35
Interest in web-based learning:	130	79.8
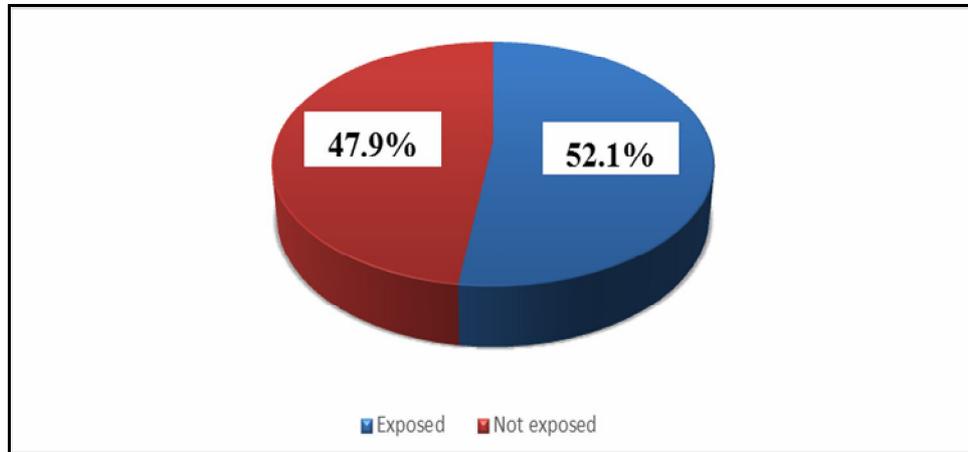
Figure 1: Perveance of needlestick injury among students

Table 2: *Students'Needle-stick injury (NSI) history*

Item	n=85	%
Exposure to NSI:		
Once	56	65.9
Twice	25	29.4
Three times	4	4.7
NSI occurrence during the academic level:		
1st Level	29	34.1
2nd Level	49	57.7
3rd Level	7	8.2
Situation during which NSI occurred: *		
Administering injections	4	4.7
By broken glass and vials	5	5.8
Drawing blood	22	25.9
During recapping	40	47
During suturing and surgery procedure	11	12.9
Lancets	10	11.8
Sudden movement of patients	15	17.6
Place at which NSIoccurred:		
Emergency units	26	16
Medical surgical units	53	32.4
Operation room	6	3.7
Taken actions after NSI:		
Washing the site with water and soap:	63	74.1
NSI reporting:	15	17.6
Blood investigation for HBV, HCV:	17	20

* *The total number can be more than 85 as more than one answer was awarded.*

Table 3: *Students' score level of knowledge regarding safe injection and needlestick injury*

Item	n=163	%	Mean (SD)
Safe injection practices (68 items)			
Poor	130	79.8	1.306 (0.651)
Fair	16	9.8	
Good	17	10.4	
Sharp waste disposal (11 items)			
Poor	121	74.2	1.331 (0.609)
Fair	30	18.4	
Good	12	7.4	
Needlestick injury (42 items)			
Poor	159	97.5	1.049 (0.310)
Good	4	2.5	
Total knowledge (121items)			
Poor	143	87.7	37.417 (19.821)
Fair	12	7.4	
Good	8	4.9	

Note. Poor = scores less than 50% of total scores
Fair = scores 50% to less than 65% of total scores
Good = scores 65% and more of total score

Table 4: *Students' score level of practice regarding safe injection practices*

Item	n=163	%	Mean (SD)
Preparation of injection procedure (5 items):			
Improper	131	80.4	1.889 (1.663)
Proper	32	19.6	
Injection administration (13 items):			
Improper	139	85.3	4.619 (3.688)
Proper	24	14.7	
Multidose vial, Intravenous Solution and Lancets Use (15 items):			
Improper	140	85.9	6.528 (4.081)
Proper	23	14.1	
Waste Management Activities (10 items):			
Improper	124	76.1	4.748 (3.202)
Proper	39	23.9	
Total practice (43 items):			
Improper	140	85.9	17.356 (10.540)
Proper	23	14.1	

Note. Improper = scores less than 75% of total scores
Proper = scores more than 75% of total score

Table 5: *Students' positive attitude regarding safe injection practices (n=163)*

Positive attitudes' categories	Strongly Agree		Agree		Disagree		Strongly Disagree	
	N	%	N	%	N	%	N	%
Injections is best treatment for the patients	69	42.3	59	36.2	22	13.5	13	8
Injection safety measures are protective	65	39.9	64	39.3	10	12.3	14	8.6
Nursing students' training about injection safety is important	67	41.1	58	35.6	20	12.3	18	11
Applying aseptic technique during handling, preparing, administering parenteral medications is important.	78	47.9	26	16	47	28.8	12	7.4
Hand washing before and after injection is absolutely necessary	74	45.5	72	44.2	9	5.5	8	4.9
Used needles and sharps should be disposed in puncture proof container	73	44.8	70	42.9	11	6.7	9	5.5
Safe handling of the needle may reduce the risks of NSI	50	30.7	95	58.3	5	3.1	13	8
Lack of awareness of risks associated with unsafe injections lead to reuse of injection equipment	37	22.7	93	57.1	16	9.8	17	10.4
Every nursing student is prone to get NSI	45	27.6	93	57.1	15	9.2	10	6.1
Nursing students are at risk of acquiring a blood-borne disease	66	40.5	61	37.4	9	5.5	27	16.6
Increase workload may increase exposure to NSI	47	28.8	78	47.9	17	10.4	21	12.9
Learning courses about injection safety may reduce the prevalence of NSI among students	73	44.8	50	30.7	15	9.2	25	15.3
NSI should be reported.	52	31.9	44	27	41	25.2	26	16
Mean (SD)							**50.024 (6.965)**	

Table 6: *Students' negative attitude regarding safe injection practices (n=163)*

Negative attitudes' categories	Strongly Agree		Agree		Disagree		Strongly Disagree	
	N	%	N	%	N	%	N	%
Wearing gloves during busy schedule is not possible.	13	8	63	38.7	53	32.5	34	20.9
Wearing gloves means you do not need to wash your hands.	6	3.7	61	37.4	68	41.7	28	17.2
Changing the needle makes a syringe safe for reuse.	10	6.1	67	41.1	60	36.8	26	16
No harm in two hands recapping needle after use.	24	14.7	63	38.7	60	36.8	16	9.8
Professionals have to reuse injection equipment's to reduce waste and costs.	9	5.5	65	39.9	67	41.1	22	13.5
Post exposure follow-up after NSI only induces anxiety and worry.	19	11.7	85	52.1	51	31.3	8	4.9
Post Exposure Prophylaxis does not influence the probability of HIV/Hepatitis.	12	7.4	80	49.1	46	28.2	25	15.3

Mean (SD) 17.865 (4.237)
Total attitude
Mean (SD) 69.889 (11.797)

Table 7: *Association between students' socioeconomic level, gender, in addition to courses attendance and their total scores level of knowledge and their score level of practice about safe injection practices (n= 163)*

Items	Total score level of Knowledge						Test of significance	P	Total score level of practice				Test of significance	P
	Poor		Fair		Good				Improper		Proper			
	N	%	N	%	N	%			N	%	N	%		
Socioeconomic level														
Middle	138	84.7	8	4.9	5	3.1	MC	0.000*	132	81	19	11.7	FE	0.069
High	5	3.1	4	2.5	3	1.8			8	4.9	4	2.5		
Sex														
Male	27	84.4	3	9.4	2	6.2	MC	0.817	28	87.5	4	12.5	FE	0.770
Female	116	88.5	9	6.9	6	4.6			112	85.5	19	14.5		
Courses attendance														
No	129	79.1	1	.6	0	0	MC	0.000*	123	75.5	7	4.3	FE	0.000*
Yes	14	8.6	11	6.7	8	4.9			17	10.4	16	9.8		

Note. MC: Monte Carlo test
FE: Fisher Exact test
* (P) Significant (p ≤ 0.05)

Table 8: *Association between exposure to NSI and sex, working in private hospitals, students' total scores level of knowledgeandpractice about safe injection practices (n=163)*

Items	Exposure to NSI				χ^2	P
	Yes		No			
	N	%	N	%		
Gender						
Male	17	10.4	15	9.2	0.015	0.902
Female	68	41.7	63	38.7		
Working in private hospitals						
Yes	1	.6	28	17.2	33.52	0.000*
No	84	51.5	50	30.7		
Students' total score levelof knowledge						
Poor	81	49.7	62	38		
Fair	4	2.5	8	4.9	11.579	0.003*
Good	0	0	8	4.9		
Students' total score level of practice						
Improper	85	52.1	55	33.7	29.182	0.000*
Proper	0	0	23	14.1		

Note. χ^2: Chi-square test
* (P) Significant (p ≤0.05)

Table 9: *Correlationbetween students' total scores level of knowledge and total score of practice about safe injection practices (n=163)*

Predictor	Scores level of knowledge	
	R	P
Scores level of practice	.577	0.000*

Note. r: for spearman correlation
* (P) Significant (p ≤0.05)

Table 10: *Correlation between exposure to need-stick injury among students, working in private hospitals, and their total scores level of knowledgeandpractice about safe injection practices (n=163)*

Predictor	Exposure to NSI	
	R	P
Working in private hospitals	- .454	.000
Scores level of knowledge	-.248	.001
Scores level of practice	-.423	.000

Note. r: for spearman correlation
* (P) Significant (p< 0.05)
(-) negative correlation

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