

Health Education Program on Prevention of Needle Stick Injuries among Health Care Workers

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ABSTRACT

Background: Needle stick injuries (NSIs) increasing day by day and globally a lot of health care workers suffer from infection per year through this route.

Objective: This study was aimed to assess knowledge, attitude, and practice of primary health care workers toward needle stick injury at Fakous district, Sharqia governorate.

Patients and Methods: This interventional study included a total of 104 personnel who were working in the of primary health care centers (PHCs), at Fakous district, Sharqia Governorate. This study was conducted between January 2020 to January 2021.

Results: There was highly statistically significant association between history of needle stick injury and history of HBV vaccination as positive history of HBV vaccination (Three doses) was associated with positive history of needle stick injury. There was high statistically significant improvement in knowledge of the study participants about standard precautions of infection control after intervention except for waste disposal. Before intervention, the highest proportion of adequate knowledge was about waste disposal (93.3%) while the lowest proportion of adequate knowledge was about sterile instruments and devices (15.4%).

Conclusion: It could be concluded that the effect of health education is remarkable in improving the development of knowledge and increasing awareness of health care providers about infection control guidelines.

Keywords: Needle stick injuries, Health Education, PHCs

INTRODUCTION

The World Health Organization (WHO) defines 'a safe injection' as one that does not harm the recipient, does not expose the provider to any avoidable risk, and does not result in any waste that is dangerous to the community. Irrational and unsafe injection practices are rife in developing countries. More than 80% of the needle stick injuries can be prevented through the use of safety devices and effective safety programs. Needle stick injuries can be prevented by applying "Universal precautions" as a safety measure ⁽¹⁾.

Needle stick injuries (NSI) are wounds caused by needles that accidentally puncture the skin, are truly an occupational hazard for medical personnel ⁽²⁾. These injuries are usually caused by hypodermic needles, blood collection needles, intravenous cannulas, etc. during use, recapping, transferring samples, post procedure cleaning, or disposal in non-puncture proof containers ⁽³⁾.

NSI increasing day by day and globally a lot of health care workers suffer from infection per year through this route ⁽²⁾.

Hence, health care workers (HCWs) are prone to acquisition of multiple pathogens, such as HIV/AIDS, hepatitis B and C, malaria, herpes, tuberculosis, brucellosis, spotted fever, and syphilis etc. Although, the occupational injuries can transfer any pathogen (Bacteria, Protozoa, Viruses etc.) but the transmission of the hepatitis B, hepatitis C and the HIV is most important and critical⁽³⁾.

They also cause social consequences, such as stigma and discrimination, and economic consequences associated with diagnostics and treatment ⁽⁴⁾. The risk of infection of the exposed person (from a single needle

stick injury—NSI, by a contaminated needle) is estimated to range between 10–30% for HBV, 1.8–10% for HCV, and 0.3% for HIV infection ⁽⁵⁾.

According to WHO, approximately 66000 HBV, 16000 HCV and 200-5000 HIV accidental infections occurs to HCWs each year ⁽³⁾.

The rate of occupationally acquired infections is significantly higher than those currently projected or reported. The non-reporting or low injury rate should not be termed as a nonexistent crisis. The studies related with the occupational injuries and associated infections are therefore warranted to strengthen the healthcare management system ⁽⁶⁾.

This study was aimed to assess knowledge, attitude & practice of PHC workers toward needle stick injury at fakous district and to evaluate health education program about how to prevent & manage of NSI, so as to improve HCWs safety and, hence improving their performance.

PATIENTS AND METHODS

This interventional study included a total of 104 personnel who were working in the of primary health care centers (PHCs), at Fakous district, Sharqia Governorate. This study was conducted between January 2020 to January 2021.

Inclusion criteria:

Health care workers (physicians, nurses, technicians) of both sexes, who are working in the PHC centers at Fakous district, Sharqia Governorate. Using OPEN-EPI, the sample size was calculated to be 104. Assuming that the total knowledge score before and

after health education were 54.54% and 81.57% respectively at 95% CI and 80% power of test ⁽⁷⁾.

Sampling technique:

Through a multistage sampling technique, Fakous health district was selected randomly to represent Sharqia governorate (which administratively divided into 17 major cities according to Sharkia.gov.eg, 2018). The study was conducted at primary health care centers (PHCs) of Fakous district which were 37 centers. This study was done in 3 urban and 17 rural primary health care centers. According to the number of health care workers which were 556 the sample size was 104. The sample was collected by simple random sample technique (Health care workers including physicians, nurses and technicians).

Operational Design:

All subjects included in this study were interviewed and the questionnaire sheet was filled for each one of them, including personal data, knowledge of the study participants about standard precautions of infection control, attitude of the study participants towards infection control and infection control practice, to assess their knowledge, attitude towards needle stick injury and to assess the prevalence of needle stick injury then health education program was structured and applied on the studied health care workers focusing on definition, type of NSI, prevention and post exposure prophylaxis, common diseases transmitted by NSI, how to deal if NSI has been happened, universal precautions specially hand hygiene and its importance, how to hand wash, how to hand rub, personal protective equipment and its importance.

The visits to each selected center were done at different days in order to ensure complete week coverage. The observation was done after taking permission from each participant. The researcher started to fill the items of personal data & knowledge by asking the participants. All studied subjects were interviewed, and the questionnaire sheet was filled in by them to assess their knowledge, attitude towards needle stick injury and to assess the prevalence of needle stick injury then health education program about needle stick injury

was introduced to them, after 3 months we repeated the questionnaire to evaluate the effect of health education program. Filling the checklist took 10 – 30 minutes for each participant.

Ethical considerations:

Approval was obtained from an Institutional Reviewing Board at faculty of medicine Zagazig University (IRB): 5907-22-1-2020. Permission from the health directorate at Fakous district was taken. Informed consent from the participant was taken after explaining the purpose of the study.

They were reassured about the strict confidentiality of any obtained information, and about that the study result would be used only for purpose of search. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Statistical analysis

The collected data were coded, processed and analyzed using the SPSS (Statistical Package for Social Sciences) version 22 for Windows® (IBM SPSS Inc, Chicago, IL, USA). Data were tested for normal distribution using the Shapiro Walk test.

Qualitative data were represented as frequencies and relative percentages. Chi square test (χ^2) to calculate difference between two or more groups of qualitative variables. Quantitative data were expressed as mean \pm SD (Standard deviation). Independent samples t-test was used to compare between two independent groups of normally distributed variables (parametric data). P value < 0.05 was considered significant.

RESULTS

This study showed that the mean age of the study participants was 37.3 years old, 77.9% were females, 58.7% were nurses, 53.8% had nursing school diploma, mean experience years was 14.4, 52.9% had training courses on infection control, 17.3% had positive history of needle stick injury and 73.1% had three doses of HBV vaccine (Table 1).

Table (1): Demographic characteristics and history of NSI related data of the study participants:

| Demographic characteristics | Study participants (n=104) |
|--|--|
| Age (years): Mean ± SD Range | 37.3 ± 8.3 25.0 – 58.0 |
| Sex, n (%): Male Female | 23 (22.1%) 81 (77.9%) |
| Occupation, n (%): Physician Dentist Nurse Technician | 13 (12.5%) 12 (11.5%) 61 (58.7%) 18 (17.3%) |
| Qualification, n (%): Bachelor degree Nursing school diploma Technical institute | 30 (28.9%) 56 (53.8%) 18 (17.3%) |
| Experience years: Mean ± SD Range | 14.4 ± 8.6 0.2 – 38.0 |
| Training courses on infection control, n (%): Yes No | 55 (52.9%) 49 (47.1%) |
| History of needle stick injury, n (%): Positive Negative | 18 (17.3%) 86 (82.7%) |
| History of HBV vaccination, n (%): Never One dose Two doses Three doses | 21 (20.2%) 7 (6.7%) 0 (0.0%) 76 (73.1%) |

Table (2) shows that there was high statistically significant improvement in knowledge of the study participants about standard precautions of infection control after intervention except for waste disposal. Before intervention, the highest proportion of adequate knowledge was about waste disposal (93.3%) while the lowest proportion of adequate knowledge was about sterile instruments and devices (15.4%).

Table (2): Knowledge of the study participants about standard precautions of infection control:

| Knowledge items | Before intervention | | After intervention | | MN | P |
|--|---------------------|--------------|--------------------|--------------|--------|--------------|
| | No. | % | No. | % | | |
| Hand hygiene: Adequate Inadequate | 31 73 | 29.8 70.2 | 94 10 | 90.4 9.6 | 60.1 | <0.001 HS |
| Sharps safety: Adequate Inadequate | 41 63 | 39.4 60.6 | 89 15 | 85.6 14.4 | 45.1 | <0.001 HS |
| Sterile instruments and devices: Adequate Inadequate | 16 88 | 15.4 84.6 | 87 17 | 83.7 16.3 | 68.1 | <0.001 HS |
| Waste disposal: Adequate Inadequate | 97 7 | 93.3 6.7 | 98 6 | 94.2 6.8 | fisher | 0.9 |
| Clean and disinfected environmental surfaces: Adequate Inadequate | 20 84 | 19.2 80.8 | 90 14 | 86.5 13.5 | 67.1 | <0.001 HS |
| Total knowledge level: Adequate Inadequate | 33 71 | 31.7 68.3 | 92 12 | 88.5 11.5 | 56.1 | <0.001 HS |

Table (3) shows that there was high statistically significant improvement in some items of attitude including using of PPE, avoid recapping of needles, adherence to hand hygiene and importance of HB vaccine of the study participants towards infection control after intervention. Before intervention, the highest proportion of positive attitude was about usage of a new syringe every time and safety boxes (100%) while the lowest proportion of positive attitude was about adherence to hand hygiene (48.1%).

Table (3): Attitude of the study participants towards infection control:

| Attitude items | Before intervention | | After intervention | | MN | P |
|---|---------------------|------|--------------------|------|--------|---------------------|
| | No. | % | No. | % | | |
| Use of personal protective equipment (e.g. gloves): | | | | | | |
| Positive | 88 | 84.6 | 103 | 99.0 | 13.2 | <0.001 HS |
| Negative | 16 | 15.4 | 1 | 1.0 | | |
| Use a new syringe every time: | | | | | | |
| Positive | 104 | 100 | 104 | 100 | NA | NA |
| Negative | 0 | 0.0 | 0 | 0.0 | | |
| Use safety boxes: | | | | | | |
| Positive | 104 | 100 | 104 | 100 | NA | NA |
| Negative | 0 | 0.0 | 0 | 0.0 | | |
| Avoid recapping of needles before disposal: | | | | | | |
| Positive | 54 | 51.9 | 101 | 97.1 | 44.1 | <0.001 HS |
| Negative | 50 | 48.1 | 3 | 2.9 | | |
| Avoid risk of infection while dealing with patients: | | | | | | |
| Positive | 103 | 99.0 | 104 | 100 | fisher | 0.99 |
| Negative | 1 | 1.0 | 0 | 0.0 | | |
| Adherence to hand hygiene: | | | | | | |
| Positive | 50 | 48.1 | 99 | 95.2 | 46.1 | <0.001 HS |
| Negative | 54 | 51.9 | 5 | 4.8 | | |
| Importance of HBV vaccine: | | | | | | |
| Positive | 79 | 76.0 | 98 | 94.2 | 17.2 | <0.001 HS |
| Negative | 25 | 24.0 | 6 | 5.8 | | |
| General attitude: | | | | | | |
| Positive | 85 | 81.7 | 102 | 98.1 | 14.2 | <0.001 HS |
| Negative | 19 | 18.3 | 2 | 1.9 | | |

Table (4) shows that there was high statistically significant improvement in infection control practice in all items of infection control policies of the study participants after intervention. Before intervention, the highest proportion of satisfactory practice was about sharps safety (93.3%) while the lowest proportion of satisfactory practice was about sanitary waste disposal (26.0%).

Table (4): Infection control practice of the study participants:

| Practice items | Before intervention | | After intervention | | MN | P |
|--|---------------------|------|--------------------|------|--------|--------------|
| | No. | % | No. | % | | |
| Hand hygiene: | | | | | | |
| Satisfactory | 52 | 50.0 | 99 | 95.2 | 46.1 | <0.001 HS |
| Unsatisfactory | 52 | 50.0 | 5 | 4.8 | | |
| Use of PPE: | | | | | | |
| Satisfactory | 95 | 91.3 | 103 | 99.0 | Fisher | 0.04 S |
| Unsatisfactory | 9 | 8.7 | 1 | 1.0 | | |
| Sharps safety: | | | | | | |
| Satisfactory | 97 | 93.3 | 104 | 100 | Fisher | 0.04 S |
| Unsatisfactory | 7 | 6.7 | 0 | 0.0 | | |
| Sterilization of instruments and devices: | | | | | | |
| Satisfactory | 95 | 91.3 | 104 | 100 | Fisher | 0.04 S |
| Unsatisfactory | 9 | 8.7 | 0 | 0.0 | | |
| Sanitary waste disposal: | | | | | | |
| Satisfactory | 27 | 26.0 | 98 | 94.2 | 68.1 | <0.001 HS |
| Unsatisfactory | 77 | 74.0 | 6 | 5.8 | | |
| Clean and disinfected environmental surfaces: | | | | | | |
| Satisfactory | 63 | 60.6 | 87 | 83.7 | 21.2 | <0.001 HS |
| Unsatisfactory | 41 | 39.4 | 17 | 16.3 | | |
| Total practice level: | | | | | | |
| Satisfactory | 60 | 57.7 | 100 | 96.2 | 37.1 | <0.001 HS |
| Unsatisfactory | 44 | 42.3 | 4 | 3.8 | | |

DISCUSSION

The number of needle stick injuries was tested before and after implementing the interventions for all healthcare workers included in the study. No significant differences were found at baseline between before and after intervention in regard to the NSI counts, but significant differences were found between before and after intervention in regard to knowledge, attitude and practice. This was nearly agreed with **Khraisat et al.**⁽⁸⁾ study as there were no significant differences were found at baseline between the three intervention hospitals in regards of the NSI counts, but there was a significant difference between the control hospital and the intervention hospitals. Understanding these baseline differences is important because if they were not taken into consideration they can affect the results and conclusions about the effectiveness of intervention strategies.

In a previous study from China, it was reported that a significant decrease in needle stick injuries occurred after the provision of educational intervention (P< 0.005) **Yao et al.**⁽⁹⁾, the education was provided the through two-day workshop on needle stick injuries among nursing students and the data collected through a questionnaire. Similarly, a study in the Netherlands used a three-armed clustered randomized controlled trial to reduce needle stick injuries; two intervention hospitals and a control hospital ⁽¹⁰⁾. The two interventions were a traditional workshop, and using needle safety device with a traditional workshop, these

interventions reduced needle stick injuries significantly among nurses, although combining the two interventions provided better results (P = 0.046). Another study was conducted in Switzerland in which an education program was organized through four traditional workshops to implement the intervention⁽¹¹⁾. The needle stick injuries decreased from 13% to 11.2% (P=0.3), which is also consistent with the findings of this study. Another study was conducted in China to confirm the effect of occupational safety training and education programs (OSTEP) on needle stick injuries **Yao et al.**⁽¹²⁾, no control group was used in this study but the educational intervention reduced NSIs rapidly to 0.16 events/nurse (P< 0.005). These findings are consistent with the findings of this study.

In the current study, the mean age of the studied HCWs was 37.3 ± 8.3, ranged 25 - 58 years old, males represented 22.1% of participants and females represented 77.9% (Table 1) In the current study, physicians represented 12.5%, dentists 11.5%, nurses were 58.5% and technicians were 17.3% of studied personnel (Table 1) and this was in agreement with **El-Hazmi and Al-Majid**⁽¹³⁾ study that included 133 HCWs who reported NSIs, where nurses have been reported to be the major occupational group in their study (45%).

In our study, mean experience years was 14.4, 52.9% had training courses on infection control (Table 1). In the current study, 28.9% of participants had Bachelor degree, 53.8% had Nursing school diploma and 17.3% had Technical institute (Table 1)

However in **Rapisarda et al.**⁽¹⁴⁾ study that included 3250 HCWs in Italy, where 32% had Bachelor degree, 35% had Master's degree and 15% had PhD.

In the current study, 18 person (17.3%) had positive history of needle stick injury, while 86 person(82.7%)had negative history of needle stick injury.

A recent study conducted by **Salminen**⁽¹⁵⁾ who reported that the prevalence of needle stick injuries among health care workers was 25.3% in three different health care center of Helsinki regions.

In the current study, there was high statistically significant improvement in knowledge of the study participants about standard precautions of infection control after intervention ($P<0.001$) except for waste disposal. Before intervention, the highest proportion of adequate knowledge was about waste disposal (93.3%) while the lowest proportion of adequate knowledge was about sterile instruments and devices (15.4%) (Table 2).

In agreement with our study, another similar study, which examined the impact of occupational safety and training protocol among the nursing students, observed tremendous decrease (from 4.65 to 0.16 events/std. nurse) during post intervention period in comparison to pre-intervention (4.65). The protocol implemented five intervention measures; seminars, regular lecture sessions, training, multimedia approach and peer education approach⁽¹⁶⁾.

In the current study there was high statistically significant improvement in attitude of the study participants towards infection control after intervention. Before intervention, the highest proportion of positive attitude was about usage of a new syringe every time and safety boxes (100%) while the lowest proportion of positive attitude was about adherence to hand hygiene (48.1%) (Table 3).

Brusaferrero et al.⁽¹⁶⁾ study, that implemented quality improvement project among the HCWs in a form of multifaceted educational approach by conducting educational session, interactive session, monthly meeting on ongoing issues, and celebration of infection control weeks, poster competition and workshop on standard precaution. This comprehensive educational program showed remarkable positive impact on the reduction of NSIs among the HCWs and major decline was observed among nurses, 13 to 5 incidences of NSIs among 100 nurses.

Shortage of educational program sessions and hospital policies was also found as a risk factor for NSIs. Although education reduces the rate of NSIs, it has been proved to be not as effective as provision of safety devices⁽¹⁷⁾.

In the current study there was high statistically significant improvement in infection control practice of the study participants after intervention. Before intervention, the highest proportion of satisfactory practice was about sharps safety (93.3%) while the lowest proportion of satisfactory practice was about sanitary waste disposal (26.0%) (Table 4).

Brusaferrero et al.⁽¹⁶⁾ study which evaluated the effect of teaching and training programs for different level of health care workers, claimed 11% to 4% reduction of NSIs. Similarly, another study, which was also focused on implementing educational activities, noted 50% reduction of NSIs among the soon graduate vocational nurses.

Habib et al.⁽¹⁷⁾ study compared the effectiveness of two interventions; introduction of needle safety devices and workshop reported that combination of training or education activities along with the introduction of safety-engineered devices was more effective in comparison only education approach.

CONCLUSION

In conclusion, the risk of exposure to NSIs is still high among health care workers. This underlines the importance of more comprehensive educational sessions in order to decrease the risk of acquisition of job-related blood-borne diseases.

Unsafe injection is one of the major risk factors in the occurrence of needle stick injury. Increased working hours, night shifts and negligence of universal precautions were also independent risk factors for NSIs.

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