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Original article

Assessment of Injection Safety Awareness and Practice among Healthcare Workers: A Cross-Sectional Study at Cyrene Teaching Hospital in Shahhat, Libya

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Abstract
Needlestick injuries (NSIs) are a main occupational risk for health care workers (HCWs), especially nurses, who are frequently exposed to blood and other potential infections such as hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV). Injection safety remains an unrecognised concern in many low- and middle-income countries, while evidence on injection practice in Libyan hospitals remains limited. To assess the level of awareness and the practice regarding injection safety and to identify the factors associated with injection safety among the health care Staff working in Cyrene Teaching Hospital, Shahat City, Libya. A cross-sectional study was carried out in Cyrene Teaching Hospital from July 2025 to October 2025. A sample size of 90 medical laboratory technicians and Nursing was selected randomly. A questionnaire and observation checklist were used to gather the information. Nursing and medical laboratory technician education, work experience, and training on injection safety. A significant amount of valuable information was obtained from a total of 90 0f health staff, as shown. The plurality of participants (53.3%) the highest proportion wase observed among individuals aged 20–29 years, followed by 22.2% among those aged 30–39 years, 16.7% among those aged 40–49 years, and 7.8% in the 50– 59-year group. The mean age of the sharers is 31.94 years with a standard deviation of 9.434, showing that most of the sample is relatively young. The study found a good baseline level of awareness regarding the risk of disease transmission through needlestick injuries, with two-thirds (66.7%) of participants confirming this knowledge. More than half of the participants (54.4%) lacked awareness of the correct post-exposure prophylaxis procedures immediately following a potential exposure. Furthermore, the results demonstrated a statistically significant relationship between Educational Qualification and awareness of transmitted diseases (P = 0.039). Healthcare staff with a higher academic qualification (BScN, laboratory specialists) demonstrated better awareness scores compared to those with a professional diploma (PBN).
Keywords. Injection Safety, Awareness, Practices, Needle Stick Injuries, Nurses, Laboratory Technician, Shahhat.

Introduction

Administering injections is one of the key procedures used by healthcare workers to deliver parenteral drugs. But improper injection practice and the over-use of injections carry a significant risk of transmitting blood-borne pathogens, including HIV, Hepatitis B Virus (HBsAg) and Hepatitis C Virus (HCV) and this problem is commonly observed within health care systems in developing countries [1]. Injection is one of the most frequently practised medical procedures across both formal and informal health care systems in recent years. [2,3]. More than harming the patient, unsafe injection practices also endanger the safety of healthcare personnel [4]. According to a report from the United States, unsafe injection practices were linked to 18 outbreaks of viral hepatitis occurring between 2001 and 2011. Needle Stick Injury: an unintentional puncture of the skin caused by a needle or other edged medical instrument, commonly occurring among health workers during the provision of patient care [3,4].

According to estimates by WHO, approximately one in every ten HCWs experiences a needle stick injury each year [5]. Several diseases can be transmitted owing to NSI, including HIV, Hepatitis B and C, Malaria, etc. According to CDC reports, using safety-engineered devices can reduce the risk of needle-stick injuries, potentially preventing up to 76% of the incidents [6,7]. Safe injection practices refer to a set of precautionary measures designed to ensure that injections are administered to patients in the safest possible manner; these practices aim to protect the patients from harm while also minimising any risk of exposure to healthcare workers [8]. Safe injection practices are an important part of standard precautions that help protect patients and healthcare providers from infection and other potential risks, which requires proper management of an injection by an experienced healthcare provider under full sterile technique using a sterile instrument [9], with its proper disposal in a puncture-resistant sharps container.

The availability of a suitable container for the safe disposal of injection equipment is essential, not only to discourage the reuse of disposable syringes but also to minimise the risk of preventable occupational hazards among healthcare workers. The global gap between injection safety knowledge and actual practice among healthcare providers remains a critical challenge, often characterised by high theoretical knowledge but poor behavioural compliance**.** While most healthcare workers can identify the risks of blood-borne pathogen transmission (like HIV, HBV, and HCV), observational studies consistently reveal significant lapses in everyday practice, particularly regarding needle recapping, personal protective equipment utilisation, and sharps waste segregation [6].

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Materials and Methods

A cross-sectional study was conducted in Cyrene Teaching Hospital from July 2025 to October 2025. A sample size of 90 medical laboratory technicians and nurses was selected randomly. A questionnaire and observation checklist were used to gather the information. Nursing and medical laboratory technician education, work experience, and training on injection safety.

Field Study

The field study was conducted at Cyrene Teaching Hospital in Shahhat City, aiming to assess the level of awareness and practice towards injection safety among healthcare staff, and to identify the factors associated with needle stick injuries and reporting behaviours. The study sample included healthcare staff from different departments such as nursing, laboratory, and technical units. Data were collected using a structured questionnaire consisting of three main parts: awareness of injection safety, actual practice of safe injection procedures, and occupational exposure to needle-stick injuries and their causes. The questionnaires were distributed directly to participants after obtaining official approval from the hospital administration, ensuring confidentiality and the use of data solely for academic research purposes.

Results

In total, a good amount of information was obtained from a total of 90 0f health workers, as shown in Table (1), Distribution of the Study Sample According to Age.

Table 1. Illustrates the distribution of the Study Sample According to Age.

Age groups	Frequency	Percentage
20-29 years	48	**53.3%**
30-39 years	20	**22.2%**
40-49 years	15	**16.7%**
50-59 years	7	**7.8%**
Mean SD (31.94±9.434)		

Table 1 illustrates the distribution of the study sample according to age. The majority of participants (53.3%) are in the 20–29-year age group, followed by 22.2% in the 30–39-year group, 16.7% in the 40–49-year group, and 7.8% in the 50–59-year group. The mean age of the participants is 31.94 years with a standard deviation of 9.434, indicating that most of the sample is relatively young, with a moderate spread of ages across older groups. The calculated mean and standard deviation are consistent with the observed distribution, reflecting a higher concentration in the younger age categories.

Distribution of the Study Sample According to Gender

Table 2 shows the distribution of the study sample according to gender. The majority of participants are female (83.3%, n=75), while males constitute 16.7% (n=15) of the sample. This indicates a predominantly female workforce among the study participants, which may reflect the composition of staff in the hospital or the departments included in the study.

Table 2. illustrates the distribution of the Study Sample According to Gender

Gender	Frequency	Percentage
Male	15	**16.7%**
Female	75	**83.3%**

Distribution of the Study Sample According to Qualification

Table 3 presents the distribution of the study sample according to educational qualification. The largest proportion of participants are Nurses with a PBN degree, constituting 46.6% of the sample (n=42). This suggests that nearly half of the staff involved in direct patient care in the hospital have a basic nursing qualification, which may influence their awareness and practice regarding injection safety. Participants with a BScN degree represent 15.5% of the sample (n=14), indicating a smaller proportion of staff with higher academic preparation in nursing. This group may possess more advanced theoretical knowledge and potentially a higher level of formal training, which could impact their adherence to safe injection practices.

Table 3. illustrates the distribution of the Study Sample According to qualification.

Qualification	Frequency	Percentage
Nurse PBN	42	46.6%
Nurse /BScN	14	15.5%
Lab technician	34	37.7%

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Laboratory technicians account for 37.7% of the sample (n=34), highlighting the significant role of non-nursing staff in procedures involving needles and injections. Their inclusion emphasises the multidisciplinary nature of the workforce exposed to needle-stick risks and the importance of evaluating awareness and practice across all relevant staff categories. Overall, the distribution reflects a diverse professional composition in the hospital, with a predominant representation of basic-qualified nurses, a moderate proportion of laboratory technicians, and a smaller number of highly qualified nurses.

Distribution of the Study Sample According to Work experience in years

Table 4. Illustrates the distribution of the Study Sample According to Work experience in years

Work experience in years	Frequency	Percentage
0-4	34	**37.8%%**
5-10	29	**32.2%**
Above10 year	27	**30%**

Table 4 illustrates the distribution of the study sample according to years of work experience. The largest proportion of participants (37.8%, n=34) have 0–4 years of experience, indicating a considerable segment of relatively new staff in the hospital. This may have implications for their practical knowledge and adherence to safe injection practices, as less experienced staff might require more guidance and supervision. Participants with 5–10 years of experience constitute 32.2% of the sample (n=29), representing an intermediate level of professional exposure. This group likely possesses a moderate level of practical experience and may demonstrate more consistent adherence to established safety protocols compared to less experienced staff. Staff with more than 10 years of experience make up 30% of the sample (n=27), reflecting a substantial proportion of highly experienced personnel. These individuals are expected to have extensive practical knowledge and potentially greater confidence in performing procedures safely. The distribution indicates a well-balanced mix of junior, mid-level, and senior staff, which is essential for understanding the variations in awareness and practice regarding injection safety.

Distribution of the Study Sample According to Training on Injection Safety

Table 5 illustrates the distribution of the study sample according to training on injection safety. The majority of participants, 60% (n=54), have received training on safe injection practices, while 40% (n=36) have not received any formal training. This distribution highlights that a significant portion of the staff is exposed to structured education and awareness programs regarding safe injection procedures, which is expected to positively influence their knowledge and adherence to safety protocols. On the other hand, the 40% of staff without training represent a notable gap that could affect the overall safety culture within the hospital.

Table 5. Illustrate the distribution of the Study Sample According to Training on injection safety

Training on injection safety	Frequency	Percentage
Received	54	**60%%**
Not received	36	**40%**

Distribution of the Study Sample According to Training on Immunisation against HBV

Table 6 shows the distribution of the study sample according to HBV immunisation. Only 21.1% (n=19) of participants are immunised, while the majority, 78.9% (n=71), are not. This indicates a low vaccination coverage among staff, which may increase their risk of exposure to HBV, especially during procedures involving needles. The finding highlights the need for improved vaccination programs and awareness about the importance of immunisation in ensuring occupational safety.

Table 6. illustrates the distribution of the Study Sample According to Immunization against HBV.

Immunisation against HBV	Frequency	Percentage
Immunized	19	**21.1%%**
Not immunized	71	**78.9%**

This section presents a description of participants' level of awareness regarding injection safety.

Table 7 illustrates the distribution of the study participants according to their awareness of various aspects of injection safety. The data reflect that awareness levels varied among the participants across different safety practices. A significant majority of respondents (66.7%) recognised that Diseases transmitted by Needle stick injury can occur, showing good understanding of the occupational risks associated with exposure to contaminated needles. However, (33.3%) of the participants demonstrated a lack of awareness regarding this issue, indicating the need for continuous education on bloodborne pathogen transmission.

Regarding Possible causes of Needle Stick Injury, (63.3%) of participants responded (Yes), indicating awareness of risk factors such as recapping, inattention, and haste during procedures. However, (36.7%) reported No, suggesting that over one-third of the sample remains unaware of the causes of NSI, which could increase exposure risk. Awareness of Measures

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to be taken after NSI was relatively low, with only (45.6%) of participants aware of correct post-exposure management procedures, while (54.4%) were not. This result highlights a critical gap in safety knowledge, emphasising the importance of institutional training on immediate post-incident actions. A large proportion of the participants (80%) reported adherence to recapping needles after use. Similarly, 80% practised hand washing before injection, reflecting positive hygiene behaviour that helps prevent cross-contamination. In addition, (76.7%) of the respondents confirmed use of gloves before injection, while (23.3%) did not, suggesting that most participants understood the importance of wearing gloves as a key infection control measure.

Almost all participants (90%) reported awareness of Appropriate disposal after use, and (88.9%) indicated awareness of Appropriate use of safety boxes, demonstrating strong compliance with standard waste management and sharps disposal protocols. However, the results for reuse of used syringes or needles. Finally, (90%) of the participants reported practising use of dry cotton for cleaning the area, while (10%) did not, showing good adherence to aseptic procedures during injection preparation. In conclusion, the table reveals that participants demonstrated moderate to high awareness in most aspects of injection safety, particularly in hand hygiene, glove use, and safe disposal, while knowledge gaps remain in post-exposure actions and syringe reuse prevention, which should be addressed through continuous professional training and institutional supervision.

Table 7. Distribution of the Study Sample According to Awareness of Injection Safety

Awareness of participant's		Frequency	Percentage
Diseases transmitted by Needle stick injury	Yes	60	66.7%
	No	30	33.3%
Possible causes of Needle Stick Injury	Yes	57	63.3%
	No	33	36.7%
Measures to be taken after NSI	Yes	41	45.6%
	No	49	54.4%
Recapping of needles after use	Yes	72	80%
	No	18	20%
Hand washing before injection	Yes	72	80%
	No	18	20%
Use of gloves before injection	Yes	69	76.7%
	No	21	23.3%
Appropriate disposal after use	Yes	81	90%
	No	9	10%
Appropriate use of safety boxes	Yes	80	88.9%
	No	10	11.1%
Reuse of used syringes or needles	Yes	0	0%
	No	90	100%
Use of dry cotton for cleaning area	Yes	81	90%
	No	9	10%

Table 8 regarding Exposure to Needle Stick Injury, half of the respondents (50%) indicated that, on the whole, they had never experienced needle stick injuries. However, (25.6%) reported at least one time, and (24.4%) had been exposed two to five times. These results suggest that nearly half of the sample had faced occupational exposure at least once, highlighting a considerable risk in clinical practice environments. Concerning the cause of needle stick injury (NSI), 42.2% of participants attributed the cause to Recapping needles, demonstrating the persistence of this unsafe habit among healthcare personnel. Only (8.9%) reported Lack of precaution in IV insertion as a cause, while the largest proportion (48.9%) identified hasty work as the main reason, emphasising how workload and time pressure contribute to unsafe needle handling and increase exposure risk. As for Applied preventive measures, the findings show a relatively balanced distribution: (48.9%) of participants reported having applied such measures, whereas (51.1%) indicated not applying them. This near-equal split indicates inconsistency in following safety protocols and points to the need for reinforcing standard precautions training among healthcare workers.

About reported NSIs to the institution, none of the participants (0%) had reported incidents, while all (100%) stated not reported. This total lack of reporting behaviour reveals serious deficiencies in institutional safety culture and communication systems. Possible explanations include a lack of knowledge about reporting mechanisms or an absence of clear policies encouraging incident documentation. In conclusion, the data in Table (8) indicate that although exposure to NSI is relatively moderate, unsafe practices, inconsistent preventive measures, and the absence of incident reporting remain major occupational safety challenges. This section presents a description of participants' level of practice regarding injection safety.

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Table 8. Distribution of the Study Sample According to occupational exposure and causes of needle-stick injury.

Parameters (Characteristics)	Frequency	Percentage
Exposure to Needle Stick Injury		
Not at all	45	**50%**
At least one time	23	**25.6%**
Two to five times	22	**24.4%**
Cause for Needle Stick Injury (NSI)		
Recapping needles	38	**42.2%**
Lack of precaution in IV insertion	8	**8.9%**
Hasty works	44	**2.7%**
Applied preventive measures		
Applied	44	**48.9%**
Not applied	46	**51.1%**
Reported NSI to institution		
Reported	0	**%0**
Not reported	90	**%100**

Table 9. Distribution of Participants Based on Their Practice Toward Injection Safety

Awareness of participant's		Always	Frequently	Sometimes	Never
Recapping needles	Frequency	61	3	15	11
	%	67.8%	3.3%	16.7%	12.2%
Reusing the same syringes and needles	Frequency	0	0	0	90
	%	0%	0%	0%	100%
Washing hands before injection	Frequency	57	8	17	8
	%	63.3%	8.9%	18.9%	8.9%
Wearing gloves before injection	Frequency	54	6	20	10
	%	60%	6.7%	22.2%	11.1%
Using dry cotton for cleaning the area	Frequency	65	4	16	5
	%	72.2%	4.4%	17.8%	5.6%

The findings presented in (Table 9) reveal notable variations in participants' practical adherence to safe injection procedures. A considerable proportion of respondents (67.8%) reported that they always recap needles, while 16.7% do so sometimes, and 12.2% reported never engaging in this practice. This indicates that despite global safety guidelines discouraging needle recapping due to its high risk of needle-stick injury, a large number of participants continue to perform this unsafe practice, reflecting an area that requires immediate corrective training regarding the practice of reusing the same syringes and needles; all participants (100%) indicated never, which demonstrates highly positive compliance with basic injection safety standards. In terms of washing hands preceding injection, about 63.3% reported doing so always, whereas smaller proportions indicated frequently (8.9%), sometimes (18.9%), or never (8.9%). Although most participants demonstrate good hygienic practice, the percentage not consistently performing handwashing suggests the need for reinforcing infection prevention measures.

For wearing gloves before injection, 60% reported always, 6.7% frequently, and 22.2% sometimes, while 11.1% stated never. This variation implies partial compliance with protective practices, potentially due to limited availability of gloves or perceived inconvenience during certain procedures. Finally, concerning using dry cotton for cleaning the area, 72.2% of participants reported always, with smaller percentages (4.4%, 17.8%, and 5.6%) distributed across frequently, sometimes, and never, respectively. This indicates a generally strong adherence to basic injection site preparation, though minor gaps persist that could be addressed through periodic refresher training. Overall, the results indicate a moderate to high level of compliance with injection safety practices; however, unsafe behaviours such as needle recapping remain a critical concern that undermines occupational safety and requires institutional intervention and behavioural reinforcement. Association Between Demographic/Professional Factors and Awareness of Injection Safety Among Staff.

Research Hypothesis (H1)

There is a significant association between demographic and professional factors and staff awareness regarding injection safety among staff at Cyrene Teaching Hospital. To test the research hypothesis related to staff awareness, the Chi-square (χ^2) test was used, as it is appropriate for examining the association between categorical variables such as demographic and professional factors (gender, qualification, work experience, training, and immunisation) and the level of staff awareness. This test helps determine whether the differences in awareness levels among groups are statistically significant or occurred by chance.

Table 10 presents the association between demographic and professional factors and staff awareness of diseases transmitted by needle-stick injuries (NSI) using the Chi-Square test. The hypothesis (H1) proposed that demographic and

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professional characteristics, including gender, qualification, work experience, training on injection safety, and immunisation against HBV, are significantly associated with staff awareness. From the results, no significant association was observed between gender and staff awareness (χ^2 = 3.273, p = 0.195), indicating that male and female staff had comparable levels of awareness. A statistically significant association was found between qualification and awareness (χ^2 = 10.101, p = 0.039). Staff with higher qualifications, such as Nurse/BScN and lab technicians, demonstrated higher awareness compared to Nurse PBN, suggesting that educational level plays an important role in knowledge of NSI-related diseases. Awareness did not differ significantly across work experience categories (χ^2 = 4.460, p = 0.347), indicating that the duration of professional experience alone may not influence knowledge of NSI. Although training on injection safety showed higher awareness percentages among trained staff than untrained staff, the association was not statistically significant (χ^2 = 2.953, p = 0.228). No significant relationship was found between HBV immunisation status.
and awareness (χ^2 = 3.398, p = 0.183). The findings partially support the hypothesis H1. While most demographic and professional factors did not show a statistically significant association with staff awareness, qualification emerged as a significant predictor. This suggests that higher educational levels may enhance awareness of diseases transmitted by NSI.

Table 10. illustrates Staff Awareness of Diseases Transmitted by NSI by Demographic and Professional Factors (Chi-Square Test)

Parameters (Demographic and Professional Factors)	yes(n/%)	No (n/%)	Pearson Chi-Square	P.value
Gender				
Male	13(86.7%)	3(13.3%)	3.273[a]	0.195
Female	47 (63.5%)	27 (36.5%)		
Qualification				
Nurse PBN	22 (52.4%)	20 (47.6%)	10.101[a]	0.039
Nurse /BScN	12 (85.7%)	2 (14.3%)		
Lab technician	27 (79.4%)	7 (20.6%)		
Work experience in years				
0-4	20 (58.8%)	14 (41.2%)	4.460[a]	**0.347**
5-10	20 (69%)	9 (31%)		
a bove10years	21 (77.8%)	6 (22.7%)		
Training on injection safety				
Received	39 (65.0%)	14 (48.3%)	2.953[a]	**0.228**
Not received	21 (35.0%)	16(55.2%)		
Immunization against HBV				
Immunized	16 (26.7%)	4 (13.3%)	3.398	**0.183**
Not immunized	44 (73.3%)	26 (86.7%)		

Table 11. Illustrates staff awareness of possible causes of needle-stick injury by Demographic and Professional Factors (Chi-Square Test)

Parameters (Demographic and Professional Factors)	yes(n/%)	No (n/%)	Pearson Chi-Square	P value
Qualification				
Nurse PBN	30(52.6%)	12 (36.4%)	3.749[a]	0.153
Nurse /BScN	6 (10.5%)	8 (24.2%)		
Lab technician	21 (36.8%)	13 (39.4%)		
Work experience in years				
0-4	22 (38.6%)	12 (36.4%)	1.435[a]	0.488
5-10	16 (28.1%)	13 (39.4%)		
a bove10years	19 (33.3%)	8 (24.2%)		
Training on injection safety				
Received	39 (68.4%)	15 (45.5%)	4.593[a]	0.028
Not received	18 (31.6%)	18 (54.5%)		
Immunisation against HBV				
Immunized	15 (26.3%)	4 (12.1%)	2.529[a]	0.112
Not immunized	42 (73.7%)	29 (87.9%)		

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Table 11 presents the association between demographic and professional factors and staff awareness of possible causes of Needle Stick Injury (NSI) using the Chi-square test. The hypothesis (H2) proposed that demographic and professional characteristics, including gender, qualification, work experience, training on injection safety, and immunisation against HBV, are significantly associated with staff awareness of possible causes of NSI. From the results, awareness did not differ significantly across qualification categories ($\chi^2 = 3.749$, $p = 0.153$), indicating that staff with different qualifications had comparable knowledge regarding the causes of NSI. Similarly, no significant association was observed between work experience and staff awareness ($\chi^2 = 1.435$, $p = 0.488$), suggesting that the duration of professional experience alone does not substantially affect knowledge about NSI causes. A statistically significant association was found between training on injection safety and staff awareness ($\chi^2 = 4.593$, $p = 0.028$), indicating that staff who received training had higher awareness of the possible causes of NSI compared to those who were not trained. No significant relationship was observed between HBV immunisation status and staff awareness ($\chi^2 = 2.529$, $p = 0.112$). The findings partially support the hypothesis H2, showing that among the demographic and professional factors, only training on injection safety emerged as a significant predictor of awareness of NSI causes. This emphasises the importance of implementing regular and structured training programs to enhance staff knowledge and reduce the risk of needle stick injuries, while other demographic factors may not have a substantial impact on awareness.

Table 12. illustrates Staff Awareness on (Measures to be taken after NSI) by Demographic and Professional Factors (Chi-Square Test)

Parameters (Demographic and Professional Factors)	yes(n/%)	No (n/%)	Pearson Chi-Square	P.value
Qualification				
Nurse PBN	17 (41.5%)	25 (51.0%)	1.226[a]	**0.542**
Nurse /BScN	8 (19.5%)	6 (12.2%)		
Lab technician	16 (39.0%)	18 (36.7%)		
Work experience in years				
0-4	11 (26.8%)	23 (46.9%)	7.445[a]	**0.024**
5-10	12 (29.3%)	17 (34.7%)		
a bove10years	18 (43.9%)	9 (18.4%)		
Training on injection safety				
Received	30 (73.2%)	24 (49.0%)	5.443[a]	**0.020**
Not received	11 (26.8%)	25 (51.0%)		
Immunisation against HBV				
Immunized	14 (34.1%)	5 (10.2%)	7.683[a]	**0.006**
Not immunized	27 (65.9%)	44 (89.8%)		

Table 12 shows the results of the Chi-Square Test for the association between demographic and professional factors and staff awareness of measures to be taken after needle stick injuries (NSI) at Cyrene Teaching Hospital. The results indicate that there is a statistically significant association with work experience (P = 0.024), training on injection safety (P = 0.020), and immunisation against HBV (P = 0.006), suggesting that these factors influence the level of awareness regarding the correct measures to be taken after NSI. On the other hand, qualification (P = 0.542) showed no significant difference, indicating that educational level may not play a major role in this aspect of awareness. Therefore, the research hypothesis stating that there is a significant association between demographic and professional factors and staff awareness of measures to be taken after NSI is accepted.

Table 13. illustrates staff awareness of "Use of gloves preceding injection" by Demographic and Professional Factors (Chi-Square Test)

Parameters (Demographic and Professional Factors)	yes(n/%)	No (n/%)	Pearson Chi-Square	P value
Qualification				
Nurse PBN	32 (46.4%)	10 (47.6%)	0.363[a]	0.834
Nurse /BScN	10 (14.5%)	4 (19.0%)		
Lab technician	27 (39.1%)	7 (33.3%)		
Work experience in years				
0-4	24 (34.8%)	10 (47.6%)	1.808[a]	0.405
5-10	22 (31.9%)	7 (33.3%)		
Above 10 years	23 (33.3%)	4 (19.1%)		

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Training on injection safety				
Received	38 (55.1%)	16 (76.2%)	2.992[a]	0.084
Not received	31 (44.9%)	5 (23.8%)		
Immunisation against HBV				
Immunized	17 (24.6%)	2 (9.5%)	2.208[a]	0.137
Not immunized	52 (75.4%)	19 (90.5%)		

(Table 13) presents the Chi-Square Test results examining the association between demographic and professional factors and staff awareness of the use of gloves preceding injection at Cyrene Teaching Hospital. The findings reveal that none of the factors shows a statistically significant association, as all P-values exceed the 0.05 significance level: qualification (P = 0.834), work experience (P = 0.405), training on injection safety (P = 0.084), and immunisation against HBV (P = 0.137). This indicates that awareness regarding glove use before injection is relatively consistent among staff regardless of their demographic or professional background. Therefore, the research hypothesis proposing a significant association between these factors and staff awareness of glove use before injection is rejected.

Table 14. Illustrates staff awareness of (Appropriate disposal after use) by Demographic and Professional Factors (Chi-Square Test)

Parameters (Demographic and Professional Factors)	yes(n/%)	No (n/%)	Pearson Chi-Square	P.value
Qualification				
Nurse PBN	37 (45.7%)	5 (55.6%)	1.843[a]	0.398
Nurse /BScN	14 (17.3%)	0 (0%)		
Lab technician	30 (37.0%)	4 (44.4%)		
Work experience in years				
0-4	28 (34.6%)	6 (66.7%)	3.794[a]	0.150
5-10	28 (34.6%)	1 (11.1%)		
a bove10years	25 (30.9%)	2 (22.2%)		
Training on injection safety				
Received	48 (59.3%)	6 (66.7%)	0.185[a]	0.667
Not received	33 (40.7%)	3 (33.3%)		
Immunisation against HBV				
Immunized	18 (22.2%)	1 (11.1%)		
Not immunized	63 (77.8%)	8 (88.9%)		

Table 14 presents the Chi-Square Test results showing the association between demographic and professional factors and staff awareness of appropriate disposal after use. The results indicate that all P-values are greater than 0.05, including qualification (P = 0.398), work experience (P = 0.150), training on injection safety (P = 0.667), and immunisation against HBV (P > 0.05), suggesting no statistically significant associations. This means that awareness regarding the proper disposal of injection materials after use does not significantly differ according to staff demographic or professional characteristics. Therefore, the research hypothesis proposing a significant association between these factors and staff awareness of appropriate disposal after use is rejected. H2: There is a significant association between demographic and professional factors (gender, qualification, work experience, training on injection safety, and immunisation against HBV) and staff practice toward injection safety among staff at Cyrene Teaching Hospital. To test the research hypotheses related to staff practice, both the Independent Samples T-test and the One-Way ANOVA test were used. The T-test was applied to examine differences in mean practice scores between two groups (such as gender or training status), while the ANOVA test was used to compare the mean practice scores among more than two groups (such as qualification levels or years of experience). These tests were chosen because they are suitable for identifying statistically significant differences in practice levels across demographic and professional categories.

Table 15. Differences in Injection Safety Practice According to Gender, Immunisation Status, and Training on Injection Safety (Independent Samples T-test)

Factor	Group	N	Mean	Std. Deviation	T	Sig. (2-tailed)
Gender	Male	15	2.3067	0.48324	1.156	0.243
	Female	75	2.1493	0.47087		
Training on Injection Safety	Received	54	2.1889	0.49817	0.333	0.740
	Not Received	36	2.1556	0.44107		

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Immunization Status	Immunized	19	2.0000	0.35901	-2.205-	0.034
	Not Immunized	71	2.2225	0.49170		

(Table 15) presents the differences in injection Safety Practice according to gender, training on injection Safety, and immunisation status using an independent-samples t-test. The results show that the mean practice score for males (M = 2.3067, SD = 0.48324) was slightly higher than for females (M = 2.1493, SD = 0.47087), but this difference was not statistically significant (t = 1.156, p = 0.243). Similarly, the difference in practice between staff who received training (M = 2.1889, SD = 0.49817) and those who did not receive training (M = 2.1556, SD = 0.44107) was not significant (t = 0.333, p = 0.740). However, there was a significant difference based on immunisation status, with immunised staff (M = 2.0000, SD = 0.35901) having a lower practice score than non-immunised staff (M = 2.2225, SD = 0.49170) (t = -2.205, p = 0.034). This indicates that among the factors examined, only immunisation status was significantly associated with injection safety practice in this sample.

Table 16 presents the differences in injection Safety Practice according to work experience and qualification using One-Way ANOVA. The results indicate that the differences in practice scores among different qualification groups were not statistically significant (F = 0.013, p = 0.987). Similarly, the differences among staff with varying work experience were also not significant (F = 0.492, p = 0.613). These findings suggest that neither qualification nor work experience had a significant effect on injection safety practice in this sample.

Table (16). Illustrates Differences in Injection Safety Practice According to Work Experience and Qualification (One-Way ANOVA)

	Sum of Squares	Df	Mean Square	F	Sig.
Qualification					
Between Groups	0.006	2	0.003	0.013	0.987
Within Groups	19.980	87	0.230		
Work experience in years					
Between Groups	0.223	2	0.112	0.492	0.613
Within Groups	19.763	87	0.227		

Discussion

Overall, the study identified adequate baseline awareness of needlestick-related disease transmission risk among participants, with approximately two-thirds (66.7%) of participants confirming this knowledge. Overall, these findings are consistent with those of similar studies across the region, which have reported a high level of theoretical knowledge among healthcare workers [10]. While this foundational awareness is contradicted by a concerning finding: more than half of the participants (54.4%) were not aware of the correct post-exposure prophylaxis procedures to follow immediately after a potential exposure. This is a significant gap, as prompt and appropriate first aid and subsequent reporting are crucial for minimising the risk of bloodborne virus transmission (HIV, HBV, HCV). The failure to know these critical steps indicate a systemic flaw in the training and orientation programs, which place greater emphasis on general risk considerations than on essential risk reduction protocols. Furthermore, the results showed a statistically significant relationship between educational qualification and awareness of transmitted diseases (P = 0.039). Healthcare staff with a higher academic qualification (BScN, laboratory specialists) demonstrated better awareness scores compared to those with a professional diploma (PBN). This supports the concept that comprehensive undergraduate education provides a stronger theoretical foundation in infection control principles and occupational health, a finding consistent with studies confirming the role of academic preparation in clinical competency [11].

Adherence to Safe Injection Practice. The study's most critical finding lies in the disparity between knowledge and actual practice. While participants demonstrated excellent adherence to basic safety standards, such as 100% agreement on never reusing syringes or needles, a high rate of one of the most dangerous unsafe practices was reported. A substantial majority (67.8%) of staff reported they always re-cap needles after use. This widespread practice directly violates international infection control guidelines, which explicitly prohibit re-capping due to its high risk of NSI [12]. The high prevalence of re-capping suggests that this behaviour may be an ingrained cultural practice within the hospital setting, potentially driven by a lack of easily accessible sharps containers, high workload leading to rushed procedures, or a failure of organisational leadership to strictly implement safety protocols. This finding is similar to reports from resource-limited settings where recapping remains a persistent challenge despite awareness drives [13]. The high percentage highlights an

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urgent need for organisational and behavioural intervention rather than mere educational refreshers. Factors associated with injection Safety Practice.

An analysis of factors associated with injection safety practice yielded several unexpected and significant results. The study found no statistically significant difference in safe injection practice based on training received (P = 0.740), educational qualification (P = 0.987), or work experience (P = 0.613). This contradicts the conventional expectation that training and experience should correlate positively with practice adherence [8]. This anomaly may be explained by the training programs offered being ineffective, theoretical, or lacking practical hands-on reinforcement, failing to translate knowledge into sustained behavioural change. The training programs offered may be ineffective, theoretical, or lack practical hands-on reinforcement, failing to translate knowledge into sustained behavioural change. The most notable finding was the statistically significant association between HBV immunisation status and injection safety practice (P = 0.034), where immunised staff had a lower practice score than non-immunised staff. This unexpected result aligns with the theory of risk compensation. Immunised individuals, feeling protected against one of the major bloodborne pathogens (HBV), may unconsciously adopt a lower level of caution in their practice, perceiving a reduced overall risk from occupational exposure [14]. This suggests that while vaccination is a critical layer of protection, it must be accompanied by ongoing education that emphasises universal precautions regardless of personal immunity status.

Conclusion

In conclusion, although health care workers at Cyrene Teaching Hospital have a general understanding of the risks associated with needle stick injuries, some important gaps remain. In particular, their knowledge of post- exposure management is limited, while needle recapping remains a common and unsafe practice. The lack of significant association between training and safe practice suggests that current safety education may not be sufficiently effective. Therefore, there is a need to improve both the content and the way safety training is provided to ensure better protection of health care workers from NSI risk. Most crucially, the paradoxical finding regarding immunisation status highlights the complex psychological factors influencing risk-taking behaviour in the clinical setting.

Ethics

We have ethical approval from the Research Studies Office of Omer Al-Mukhtar University.

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