

Prevalence And Associated Factors Of Needle Stick And Sharp Injuries Among Healthcare Professionals

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Abstract

Background: Healthcare professionals (HCPs) are still at risk from needle sticks and sharps injuries, which can expose them to blood-borne diseases like hepatitis B, hepatitis C, and HIV. Workplace safety is essential to occupational health practices among HCPs, especially for physicians and nurses vulnerable to work-related hazards such as needle stick and sharp injuries. **The study aims:** To identify the prevalence and associated factors of needle stick and sharp injuries among HCPs in KSA. **Methods:** A cross-sectional study was conducted on a sample of 151 HCPs working in three public hospitals in Jeddah City, KSA. A semi-structured questionnaire was designed and delivered to the participants. **Results:** The prevalence of needle stick and sharp injuries among HCPs was very high (95.36%), and around half were injured more than five times. Female and those in an emergency department were more likely to be subjected to needle stick and sharp injuries ($p=0.018$ and 0.021 , respectively). Needle stick was the most common cause of injury (62.77%), and the fingers were the most exposed injury site (79.17%). Non-reporting injuries were very high (73.61%), and only one-third (34.21%) of them proceeded in the process of management, and less than one-quarter (23.68%) had been vaccinated. **Conclusion:** The prevalence of needle stick and sharp injuries among HCPs was very high, and determined by gender and place of work. Post-injury reporting and precautions were poor, which may increase the prevalence of hospital-acquired infections among clients and healthcare providers.

Keywords: Prevalence, Needle stick injuries, Sharp injuries, Safety policy.

Introduction

Needle stick and sharp injuries (NSSIs) are caused by sharp materials that accidentally puncture the skin with medical equipment that was used to screen, diagnose, treat, or follow a patient's disease condition⁽¹⁾. NSSIs include hypodermic needles, blood collection needles, and IV (intravenous) cannulas or needles as well as items such as scalpels, blades, lancets, retractors, scissors, pins, clamps, cutters, staples, and glass items⁽²⁾. Healthcare facilities can provide diagnostic, preventive, curative, and prognostic services for the community. However, while they are providing services, HCPs are exposed to blood and body fluids through occupational sharps, splashes, and NSSIs⁽³⁾.

Particularly, there is a potential exposure among doctors, nurses, laboratory

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professionals, and biomedical waste management staff to blood-borne pathogens worldwide ⁽⁴⁾. NSSIs are the most common workplace-related health hazards responsible for the transmission of blood-borne pathogens among HCPs ⁽⁵⁾. Occupational exposures to percutaneous injuries are a substantial source of infections with blood-borne pathogens among HCPs and can cause substantial health consequences and psychological stress for HCPs ⁽⁶⁾. NSSIs cause accidental puncture of the skin. The majority of injuries occur during surgical operations, blood sample collection, intravenous line administration, and negligent waste disposal practices. More than 20 blood-borne infections can be transmitted through body fluids by NSSI ⁽⁷⁻⁹⁾.

In healthcare settings, NSSIs are still among the most common injuries; the Centre for Diseases Control and Prevention (CDC) reported that more than 1 million events of NSSIs have happened annually and represent 8% of in-hospital injuries. However, only half of them were reported ⁽¹⁰⁾. NSSIs are defined as any transcutaneous contact with a sharp instrument or penetration of a sharp object or needle that may cause contact with blood or other body fluids ⁽¹¹⁾. Workplace safety is an essential aspect of occupational health practice, and all HCPs should routinely follow the barrier precautions to prevent exposure during contact with any patient's blood or body fluids ⁽¹²⁾.

Unfortunately, NSSIs are still an unavoidable issue, and at least 20 different highly virulent pathogens such as hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) are transmitted by these injuries ⁽¹¹⁾. For HCPs worldwide, the attribute fractions for work-related infections exposed to HBV, HCV, and HIV are 37%, 39%, and 4.4%, respectively. The CDC reported that over 5000 HCPs become infected by HBV annually due to work-related infections. These events have increased the health care burden as they have severe consequences, including long-term illness, disability, and death ⁽¹³⁾.

Nurses are considered the most significant work group of HCPs in most countries, with a percentage between 60% and 65%, and they usually stand on the front-lines in direct contact with patients. Therefore, they are repeatedly exposed to sharp object injuries, intensive emotional distress, unsafe circumstances, and anxiety that may decrease their professional commitment, lower quality of health services, occupational dysfunction, and behavioral changes. Moreover, severe psychological comorbidities such as depression and post-traumatic stress disorder may occur as long-term outcomes ⁽⁹⁾. Environmental conditions play a significant role in the occurrence of NSSIs. HCPs who work in acute health care settings such as operating rooms, emergency departments, and intensive care units may be exposed to more events of injuries ⁽¹⁴⁾.

In addition, studies have shown that increased workload, staff shortages, a range of invasive activities, critical patient conditions, stressors, and multiple invasive procedures may increase the risk of injuries among nurses working in those settings ⁽¹⁵⁾. Likewise, developing countries, particularly those with collapsed health systems and war, have additional factors such as a lack of facilities, including personal protective equipment and waste disposal, and the absence of infection control policies. In the USA, there are an estimated 385,000 annual incident of needle stick injuries (NSIs) among the hospital healthcare workers ⁽¹⁶⁾, while 1,000,000 NSIs cases were reported annually among the hospital healthcare workers in Europe ⁽¹⁷⁾.

A study done in a few governmental hospitals in the Kingdom of Saudi Arabia (KSA) estimated that the annual NSI incidence was 3.2 per 100 occupied beds, and nurses were the most affected job category ⁽¹⁸⁾. A recent study conducted in a hospital in the Medina region

estimated the annual incidence of NSIs among healthcare personnel at 32%⁽¹⁹⁾. Another study by AlDakhil et al., (2019) reported that 29.8% of the dental assistants working in private dental clinics in Jeddah, KSA experience at least one event of NSIs since starting their career⁽²⁰⁾. In Yemen, a study revealed that 44% of nurses had poor knowledge regarding NSI preventive measures⁽¹²⁾. A more recent study in Sana'a revealed that 22% of clinical laboratory staff had received a biosafety manual, and 60% had been injured while working in laboratory⁽²¹⁾.

A similar study reported that 55% of laboratory staff in the three reference laboratories had been injured⁽²²⁾. Guidelines for the prevention of NSSIs have been prepared by CDC,⁽²³⁾ but unfortunately, these guidelines have not yet been well recruited in KSA, and the NSSIs have not been well considered. Therefore, the present study was designed to identify the prevalence and associated factors of NSSIs among HCP, as one of the effective efforts that shed light on this issue and provide a scientific rationale for decision makers in order to build up strategic plans aiming to reduce the incidence of NSSIs and related complications.

Methods

A cross-sectional study was conducted in three public hospitals in Jeddah City, KSA, from February to April 2023. The number of 221 HCPs who had been working in the intended hospitals were targeted as a whole sample and included in the present study. These hospitals receive patients referred from emergency departments, rural hospitals, and primary care units. A self-administered multiple-choice questionnaire with 16 questions was developed after reviewing the literature^(12, 24). The pre-trained co-workers delivered this questionnaire to 221 HCPs while giving back 160; nine were excluded due to incomplete recording (missing data); hence the response rate is 68.32%.

The questionnaire consists of two main parts; the first part (5 questions) was about socio-demographic and professional data (e.g., qualifications, experiences, training), and the second part (11 questions) was about the environment and circumstances of injury events. The questionnaire was developed in Arabic as the study samples are Arabic native speakers. Five experts examined and reviewed the questionnaire; their suggestions were considered accordingly. This questionnaire was pilot-tested in 25 HCPs, and the internal consistency was estimated by calculating Cronbach's alpha. This study considered a Cronbach's alpha of 0.83 or greater acceptable.

Ethical approval was obtained from the Research Ethics Committee at the Faculty of Medical Sciences, University for Sciences and Technology. In addition, written informed consent was obtained from the participants after explaining the study's purposes. The anonymity, confidentiality, and autonomy of the participants were ensured. Ethical conduct was maintained during data collection and throughout the research process. The Statistical Packages for Social Sciences (SPSS), version 28, was utilized for data analysis. Descriptive statistics of the study variables, including socio-demographic characteristics, were expressed as frequency *n* and percentage (%). Fisher's exact test was employed to determine the association between NSSIs and socio-demographic characteristics. *P* value ≤ 0.05 was considered to be significant.

Results

Socio-demographic characteristics of the respondents

Table (1) shows that 151 respondents, 40.40% were males, while 59.60% were females. Most respondents (84.77%) were in the age group of 20–39 years, while 15.23% were in the 40–60 years age group. Approximately two-thirds of the respondents had a diploma (68.87%) and less than 10 years of experience (66.22%). The highest percent (27.82%) of HCPs worked at

emergency department while lowest (7.28%) worked at the operations department.

Environmental and circumstances feature related to NSSIs

Table (2) shows that more than half of the injured HCPs suffered injuries 1–5 times during their work, fingers were the most common site of injury (79.17%) along with needle sticks, which were the most common cause of injury (62.77%). The table also shows that recapping and removing needle cover (37.31%) were the most common circumstances of injuries. Regarding the initial procedure after injury, most nurses (70.86%) continued to provide care after injury. 47.42% of respondents had used cotton to clean the injured site. Meanwhile, only 26% of the injured HCPs had informed their direct managers about the injury, 34% had received general intervention, and 23.68% had received the related vaccine.

NSSI associated factors

Table (3) shows that the prevalence of NSSIs was significantly associated with female HCPs ($p = 0.018$) and those working in an emergency department ($p = 0.021$) regardless of their age, experience, and level of education. The table also shows that the relationship between the factors anticipated being associated with the frequencies of NSSIs. It displayed that most HCPs were exposed to NSSIs at least 1–5 times regardless of gender, age, experience, education level, training course, and working area. Regarding gender, it also showed that females have more susceptibility to frequent exposure to the NSSIs either 1–5 times or 5–10 times. In the same line, the young and middle age categories group appeared to have more susceptibility to frequency of 1–5 times ($p = 0.008$), while the elderly HCPs (50–60 years old) were exposed to a high frequency of injuries (≥ 15).

Table (1): Socio-demographic characteristics of participants (n = 151)

Variable	N	(%)
Gender		
Male	61	40.39
Female	90	59.60
Age		
20–29	64	42.38
30–39	64	42.38
40–49	12	7.96
50–60	11	7.28
Years of experience		
–10	100	66.23
11–20	32	21.19
21–30	11	7.28
More than 30	8	5.30
Education level		
Diploma	104	68.87
Bachelor	47	31.13
Place of working		
Emergency Dep.	42	27.82
Surgery Dep.	23	15.23
Operations Dep.	11	7.28

Variable	N	(%)
Labs Dep.	41	27.15
Others	34	22.52

Table (2): Environmental and circumstances features of nurses exposed to NSSIs

Variable (N)	Frequency; n (%)	Variable	Frequency; n (%)
Frequency of injury (144)		Procedures after injury (213)	
1–5 times	82 (56.94)	Cleaning by cotton	101 (47.42)
6–10 times	34 (23.61)	Washing with soap and water	45 (21.13)
11–15 times	8 (5.56)	Squeezing injury	63 (29.57)
More than 15 times	20 (13.89)	Did not do anything	4 (1.88)
Site of injury (168)		Reaction after injury (151)	
Fingers	133 (79.17)	Crying	12 (7.95)
Palms	33 (19.64)	Appealing for help	14 (9.27)
Others	2 (1.19)	Exiting from working area	16 (10.60)
		Continuing service providing	107 (70.86)
Sharp causes injury (188)		Others	2 (1.32)
Syringe	118 (62.77)	Reporting after injury (144)	
Suture	45 (23.94)	Yes	38 (26.39)
Scalpel	20 (10.64)	No	106 (73.61)
Scissor	3 (1.59)		
Others	2 (1.06)	Getting intervention (38)	
Circumstances of injury (351)		Yes	13 (34.21)
While re-capping and removing needle cover	131 (37.31)	No	25 (65.79)
During patient movement	22 (6.32)		
During surgery and suturing	52 (14.81)	Getting vaccination (38)	
During blood sampling	26 (7.40)	Yes	9 (23.68)
During cannulation and injections	59 (16.79)	No	29 (76.32)
During needle disposal	30 (8.54)		
During drug preparation	31 (8.83)		

Table (3): Relationship between NSSIs and socio-demographic characteristics of participants

Variable (n)	Injured n (%)	Not injured n (%)	P Value [†]
Gender (151)			0.018*
Male (61)	55 (90.16)	6 (9.84)	
Female (90)	89 (98.89)	1 (1.11)	
Age (151)			0.500
20–29 (64)	62 (96.88)	2 (3.12)	
30–39 (64)	60 (93.75)	4 (6.25)	
40–49 (12)	12 (100)	0 (0.00)	

Variable (n)	Injured n (%)	Not injured n (%)	P Value [†]
50–60 (11)	10 (90.90)	1 (9.09)	
Years of experience (151)			
1–10 (100)	95 (95.0)	5 (5.0)	0.189
11–20 (32)	32 (100)	0 (0.00)	
21–30 (11)	10 (90.90)	1 (9.09)	
More than 30 (8)	7 (87.5)	1 (12.5)	
Education level (151)			
Diploma (104)	99 (95.19)	5 (4.81)	0.959
Bachelor (47)	45 (95.74)	2 (4.26)	
Place of working (151)			
Emergency Dep. (42)	36 (85.71)	6 (13.29)	0.021*
Surgery Dep. (23)	23 (100)	0 (0.00)	
Operations Dep. (11)	11 (100)	0 (0.00)	
Labs Dep. (41)	41 (100)	0 (0.00)	
Others (34)	33 (97.06)	1 (2.94)	

[†]Fisher's exact test.

*Statistically significant (p < 0.05)

Discussion

NSSIs are a significant risk of work-related infections, forming about 44.5% among HCPs. This prevalence was substantially varied between regions, ranging from 7.7% in South America to 43.2% in Asia^(9, 11). A systematic review and meta-analysis reported that the pooled global 1-year prevalence of percutaneous injuries among HCPs was 36.4%⁽²⁵⁾. The NSSIs cause significant, potential, and intangible costs. In this study, a high percentage of the respondents (95.36%) had been exposed to NSSIs during their work at healthcare facilities; half of them were frequently injured 1–5 times. The frequent events indicate insufficient reporting, absence of preventive policies, and poor professional practices. The prevalence of NSSIs was reported in many studies; a study conducted in Iran reported that 81.7% of healthcare personnel were injured during hospital work⁽²⁶⁾.

Similarly, another cross-sectional study in Turkey found that 79.7% of nurses at a Turkish hospital experienced NSSIs⁽²⁷⁾. Also, studies from Ghana, South Korea, and India reported 74%, 70.4%, and 68.3%, respectively⁽²⁸⁻³¹⁾. In the Middle East region, 74.57% of NSSIs were reported among nurses at Zagazig university hospitals (Egypt), and 36.86% of them were exposed more than once⁽³²⁾; other studies in Egypt reported that 35.6%–67.9% of nurses were exposed to NSSIs at least one time in a year⁽³³⁻³⁶⁾. Furthermore, an Iranian systematic review and meta-analysis included 21 articles reported that the estimated overall 1-year period prevalence of NSSIs was 44%⁽³⁷⁾, while, in a more recent review that included 62 articles reported that the prevalence of NSSIs was 51.1%⁽³⁸⁾. Similar result (53%) was reported in the United Arab Emirates (UAE)⁽³⁹⁾ and 32.90% in Saudi Arabia⁽⁴⁰⁾.

According to a study conducted in Saudi Arabia, nurses are the most affected group, which showed that nurses represent 56.5% of injured healthcare workers⁽⁹⁾. Lower percentages were reported in studies conducted in Ethiopia and Malaysia (36.2% and 23%, respectively)

that may be related to continuous in-work training, in addition to the application of safety measures and the availability of safety boxes in their work settings^(15, 41). The highest prevalence of NSSIs in the current study may be attributed to: the extreme shortage of trained nurses, absence of safety policy, lack of administrative supervision, and increased pressure on health care. Regarding gender, the present study found that females (98.89%) were significantly more exposed to NSSIs than males (90.16%); this result agrees with other cross-sectional studies conducted in Saudi Arabia, Malaysia, and Iraq^(9, 11, and 41).

On the contrary, a study in Ethiopia found that male HCPs were exposed to NSSIs more than female (50.65% vs. 30.36%)⁽¹⁵⁾. In the present study, HCPs were at risk for NSSIs regardless of age; this finding agreed with two studies conducted in Johannesburg⁽⁴²⁾ and US⁽⁴³⁾, which found that age is not an associated factor with NSSIs. On the other hand, other studies reported a significant association between age and NSSIs and noted that older HCWs were more exposed to NSSIs^(44, 45). HCPs with more than 10 years of experience were less exposed to NSSI than those without experience. Likewise, a study in Egypt reported a negative correlation between NSSIs and years of experience, and the highest rate of NSSIs was among HCWs who had 5–10 years of experience⁽⁴⁵⁾.

Furthermore, a study conducted in Ghana found that the long working experience was significantly associated with the increasing risk of NSSIs exposure⁽²⁸⁾. This finding could be attributed to the fact that a longer career would expose HCPs to more NSSIs events^(42, 46). Regarding the qualifications, no differences between NSSIs and the qualifications were revealed in the current study. In contrast to our finding, a significant relationship between NSSIs and educational level was reported in previous studies^(11, 44). Low education level was one of the most significant predictors of NSSIs among nurses⁽³²⁾. HCPs in the emergency department were less likely to be subjected to NSSI than HCPs in other departments. This finding agrees with a descriptive cross-sectional study on HCWs at tertiary hospitals in Ghana; it found that the emergency room was one of the lowest places of NSSIs, which may refer to applying some precautions in an emergency more than other departments⁽²⁸⁾.

Fingers were the most exposed to injury (79.17%); HCPs used the traditional manual preparation of drugs and procedures, and the absence of a safety policy exposed their fingers to injury. Many studies also reported the same findings^(15, 47, and 48). In addition, finger exposure to NSSIs could be related to the substantial role of the fingers in handling and recapping the needles, suturing, and setting intravenous lines⁽¹⁵⁾. The syringe was the most common cause of NSSIs among the respondents in the present study; specifically, recapping was the most circumstance-related injury in NSSIs cases. Safe and proper handling of injection needles and following safety protocol could minimize and prevent the syringe-related NSSIs among nurses⁽⁴⁶⁾.

The situation and circumstances by which the injury has happened are varied. In the present study, incidents during recapping and removing the needle cover (37.31%) were the most frequent circumstances that caused injury, followed by incidents during surgery and suturing, preparation of drugs, and needle disposal, respectively. A similar finding was reported in a study carried out in Saudi Arabia; it showed that 28% of NSSIs cases happened during recapping needles⁽⁴⁹⁾, similar to what was reported in the studies from India and Egypt⁽³²⁾; as they also found that needle recapping was the most frequent procedures (62.87% and 66.3% respectively). On the contrary, one study revealed that only 1.6% of NSSIs occurred during recapping of the needle⁽⁵⁰⁾.

In contrast, another study found that opening ampules was the most common way nurses were exposed to injuries⁽⁵¹⁾. These findings could be attributed to the absence of safety protocols, training, and infection control program. In addition, a lack of facilities, staff shortage, and increased workload are also attributable⁽²⁶⁾. Post-injury procedures were concluded in this study as follows: cleaning the injury site with cotton (47.42%) followed by

squeezing the injury (29.57%) and washing the injury site with water and soap (21.13%). In contrast with these findings, washing the injured site with water and soap was reported among 46.5% of participants in Manipur, India ⁽⁵⁰⁾, and washing the injury site with an antiseptic solution and letting blood flow after exposure were reported in a study conducted in Egypt ⁽³²⁾.

As for the intervention after injuries, immediate reaction and incident reports are typically technical and administrative steps that should be implemented when NSSIs occur. In the present study, only near to one-quarter (26.39%) of the injured HCPs reported the incident of injuries, 34.21% of them had received interventions, and 23.68% of them had received vaccination. Reporting injuries is an indispensable procedure and must be mandatory to ensure legal and ethical responsibility. The rate of reported injuries was higher in many studies; 63.2%, 57%, and 38% ^(50, 52, 53). The most common factors for not reporting are the increased workload, fear of job loss, and lack of awareness ^(11, 54). In order to manage NSSIs among HCWs, an effective reporting system and sufficient education on occupational safety should be implemented by the relevant institutions ⁽⁵⁵⁾.

Conclusion

NSSIIs are highly prevalent among HCPs. Needle stick is the common cause of injury, and needle recapping is the primary injury circumstance. However, one-third of HCPs have taken training about NSSIs and infection control; the training does not make sense regarding the reduction of NSSIs times, and this may be attributed to the implementation of insufficient and ineffective training courses. Lack of protective equipment supplies and the absence of infection control and safety policies in healthcare facilities may be the main reasons behind highly prevalent NSSIs. An effective reporting system and sufficient occupational safety education should be implemented to manage NSSI incidence.

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