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Prevalence and factors contributing to needle stick injuries among healthcare workers at acute care hospital in central Saudi Arabia

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ABSTRACT

Background: Needle sticks and sharp injuries (NSIs) are significant occupational hazards for healthcare workers. **Objectives:** To identify the factors contributing to NSIs among healthcare workers at Armed Forces Hospital Wadi Al Dawasir (AFHWD), Saudi Arabia. **Methods:** A cross-sectional study design with 100 participants selected through purposive sampling. The instrument tools for data collection used a self-administered questionnaire adapted from previous related studies. **Results:** The study responder rate is 100%. Descriptive studies showed a low prevalence of NSIs among respondents 99%. Factors influencing NSI prevalence were primarily organization-related and skill-related, 75% and 69%, respectively. Behavioral-related factors varied widely among participants, with 41% reporting low and high levels of influence on NSI prevalence. The inferential studies revealed that while most Socio-Demographic characteristics did not significantly affect the outcomes, age ($p = 0.009$) and work experience at AFHWD ($p = 0.009$) were significant predictors of skill-related NSI factors. **Conclusion:** Study findings suggest that improving administration plans focusing on comprehensive continuous education and training on safe needle handling is crucial. Training should focus on proper injection techniques, handling sharps, and safe disposal of needles to mitigate the risk of NSIs among healthcare workers.

Keywords: Needle Stick Injury, Organization-Related Factors, Skill-Related Factors, Behavioral-Related Factors, Healthcare Workers, Occupational Injury

1. INTRODUCTION

Needle stick injury (NSI) is an occupational injury resulting from accidental puncture or pricked skin by a needle or sharp medical device. It is common for

healthcare workers (HCWs) to perform medical procedures like blood draws, injections, or handling used needles (Mengistu et al., 2021). NSIs are often inevitable and occur due to percutaneous exposure from needle stick breaks or sharps contaminated with blood or body fluids (Alfulayw et al., 2021). Hollow-bore needles like blood collection needles, hypodermic needles, and intravenous catheters can cause NSIs, resulting in transcutaneous injuries (Rajesh and Thamizhmaran, 2019). Also, NSI refers to any transcutaneous injury related to a penetrating attempt wound from a sharp object or needle, possibly resulting in contact with blood or other body fluids (Ahmed et al., 2020).

NSIs are significant workplace risks for healthcare professionals and frequently link to their practice guidelines. Exposed HCWs to blood and potentially infectious bodily fluids by NSIs are more susceptible to contracting blood-borne infections like HIV, hepatitis B, and hepatitis C viruses. "World Health Organization" (WHO) has guidelines to decrease NSIs in healthcare settings, yet NSIs still happen at every stage of using or disposing of sharps devices. An estimated 32.4% to 44.5% of healthcare professionals worldwide report experiencing at least one unintentional sharp injury yearly (Abalkhail et al., 2022). Based on global statistics, the occupationally related infections reported due to NSIs is up to 86%, and approximately 3 million infections were recognized annually as the disease burden caused by percutaneous sharps injuries (Berhan et al., 2021).

A study conducted in Botswana reported that 57% of the HCWs had sustained NSI while working in the hospital setting, with the most affected HCWs being nurses (Ketshabile, 2022). A systematic review reported that the prevalence of NSI ranges from 19.9% to 54%. It reported that 64.1% of NSIs occurred the previous year, and 100% of NSIs were reported throughout their career (Mengistu and Tolera, 2020). An Ethiopia study revealed that 60.2% of the NSI prevalence occurred among HCWs working in private hospitals (Bazie, 2020). In the last twelve months, up to 60.4% of the HCWs experienced NSI, and 43.8% experienced at least one NSI. The study also reported that the HCWs experienced 36% of NSI during surgery and suturing (Bazie, 2020). Occupational exposures are common in developing countries, and 40-75% of these injuries are not reported (Abalkhail et al., 2022; Alfulayw et al., 2021).

Evaluating the frequency and causes of these types of NSI can help develop effective and appropriate strategies and plans for reducing related incidents among HCWs to improve patient safety (Ishak et al., 2019). The risk of NSI is high for treating physicians, nurses, laboratory staff, and staff working in medical waste management during screening, diagnosing, treating, and monitoring medical waste management processes (Al-Khalidi and Nasir, 2022). HCWs also commonly deal with injury-related objects in the clinical area, such as lancets, syringe needles, cutting needles, surgical scalpels, broken vials, blood vacuum tubes, scissors, and razors (Ahmed et al., 2020; Mengistu and Tolera, 2020). In the healthcare setting, NSI is the most common injury, with more than one million NSIs annually (Abdo-Almoliky et al., 2024).

In addition, the HCWs who were involved in NSI were at high risk of at least 20 different highly virulent pathogens, including HBV, HCV, and HIV, which are more vulnerable to being transmitted to the HCWs during the NSI incidence (Assen et al., 2020). Additionally, it reports that the NSI exposed 37%, 39%, and 4.4% of workers to HBV, HCV, and HIV, respectively (Rapiti et al., 2005). A study conducted in Botswana reported that NSI commonly occurred due to high levels of fatigue, high workload, inattentiveness, and distraction while handling the needles (Ketshabile, 2022). The HCWs who work in the medical and pediatric wards, busy wards, working more than 40 hours per week, and non-utilization of the Infection Prevention and Control Guidelines lead to a high risk of NSI prevalence.

A systematic review reported several factors that influence NSI prevalence among HCWs, including gender, workload, needle recapping practice, overuse of injection, working experience, and availability of personal protective equipment (Mengistu and Tolera, 2020). An Ethiopian study mentioned that most of the NSI prevalence occurred in males rather than females HCWs, with 74.2% and 25.8%, respectively (Assen et al., 2020). Besides that, a cross-sectional survey conducted in North Ethiopia reported that NSI commonly occurred among HCWs who work in private hospitals and private clinics, have less working experience, have a higher workload, and have a shortage of stock of sharp disposal containers (Bazie, 2020).

Another study found that NSIs had a 29.5% prevalence during the last twelve months, with 46% of the NSIs being moderate, 33.3% being superficial, and 27% being severe (Berhan et al., 2021). It also highlights that nursing staff is at high risk for NSI compared to other HCWs, and NSI is also commonly reported due to the practice of disposing of sharp materials in places other than safety boxes and feeling sleepy at work. There are risks of psychological consequences following NSIs for the HCWs. Other than that, the HCWs who had experienced the NSI tend to experience feelings of guilt, vulnerability, and stigma following NSI, which may impact the quality of job performance, quality of life, and overall psychological health of the HCWs (Roosbeh et al., 2023).

It emphasizes how crucial it is to follow infection control procedures, report NSIs as soon as possible, and administer post-exposure prophylaxis to reduce the chance of infection among patients and healthcare professionals (Alshehri et al., 2023). This study will evaluate the prevalence and factors contributing to NSIs among AFHWD HCWs and assess the associations between the HCWs' Socio-Demographic characteristics and the behavioral, skill-related, and organizational factors contributing to needle stick injuries.

2. MATERIALS AND METHODS

Study Design

A cross-sectional survey was conducted for approximately 110 nurses and physicians currently working in 105 beds in AFHWD within several departments, such as the Intensive Care Unit (ICU), Male ward, Female ward, Pediatric ward, Neonatal ICU, Obstetric ward, Day Surgery ward, Operating Theater, Emergency department, and Outpatient department. Ultimately, 100 HCWs were used as the sample size, and a purposive sampling technique was used. Particular healthcare professional groups focused on nurses and physicians.

Sampling Criteria

The inclusion criteria are that all HCWs who have worked at AFHWD for more than twelve months and have passed the probation period for the full-time position should be involved in providing bedside care to the patients. However, this study excluded HCWs with the primary role of administrator or manager and those who work in the Outpatient Department.

Research Instruments

Data collection took place between January and March 2024. A self-administered questionnaire was adapted, validated, and guided by previous studies Berhan et al., (2021); study variables are A) *Socio-Demographic Characteristics*: Nine closed-ended items used to collect the various Socio-Demographic-demographic characteristics of the participants. Variables include gender, age, marital status, profession, nationality, highest educational status, working experience in the hospital setting, and working experience at a current healthcare institution. B) *NSI Prevalence and its Characteristics*: Utilizing four closed-ended items to collect information regarding the NSI prevalence, characteristics, Degree of injury, sharpness that caused the injuries, and when the NSI occurred. C) *Factors Contribute to the NSIs Prevalence*: Collected information regarding the factors that contribute to the NSI using the seventeen closed-ended items, with the three main factors known as organizational factors (9 items), behavioral factors (5 items), and skill-related factors (3 items).

Data Analysis

We analyzed data using the statistical software "Statistical Package for Social Sciences" (SPSS) Version 27.0, assessing the significance of differences between dependent variables using the Kolmogorov-Smirnov test. Inferential analysis determined the relationship and association between the study's variables. Types of inferential tests based on the normality test findings with $p < 0.05$ are considered statistically significant differences. We will use Parametric tests for the data normally distributed, such as the Pearson Correlation test, independent t-test (2 Categorical Data), and ANOVA (More than three categorical data). In contrast, for the data that is not normally distributed, the non-parametric test will be used, such as the Spearman Correlation test, Mann Whitney U test (2 Categorical Data), and Kruskal Wallis (More than 3 Categorical Data). Our level for rejecting a true null hypothesis was $\alpha = 0.05$; results with a p-value < 0.05 were considered statistically significant.

3. RESULTS

The study achieved a 100% response rate, indicating full participation from all selected participants. Predominantly, the respondents were female (81%), aged 21 to 30. Marital status varied among respondents, with 46% being married, 30% single, 13% divorced, and 11% widowed. Additionally, most participants identified as nurses (78%), with non-Saudi nationality being the most prevalent (54%), table 1. Regarding education, the findings indicate that a significant portion of respondents hold degrees and above (71%), while (29%) of respondents possess diplomas and diplomas with post-basics. Regarding professional experience in the healthcare sector, the study revealed that 38% of respondents have worked for 6 to 10 years, 34% with 1 to 5 years of experience, 19% with 11 to 15 years, and 9%

with 16 to 20 years. Notably, 33% of respondents reported having 11 to 15 years of experience within their current healthcare institutions.

Table 1 Respondent's Socio-Demographic Characteristics (N=100)

<i>Demographics</i>	
Age (Years)	Mean 33.5 ± 8.2; range 21 - 50
Sex	Male 19 (19.0%), female 81 (81.0%) female: male 4.3: 1
Marital status	Married 46 (46.0%), single 30 (30.0), divorced 13 (13.0%), Widowed 11 (11.0%)
Nationality	Saudi 46 (46.0%), non-Saudi 54(54.0%)
Profession	Physician 22 (22.0%), Nurse 78 (78.0%)
Education	Diploma 9 (9%), Diploma with post-basic 20 (20.0%), Degree 34 (34.0%), Degree with post-basic 24 (24.0%), Master 13 (13.0%), PhD 0 (0.0%)
Years of Working in the Healthcare Sector	1-5 years 34 (34.0%), 6-10 years 38 (38.0%), 11-15 years 19 (19.0%), 16-20 years 9 (9.0%)
Years of Working in AFHWD	1-5 years 14 (14.0%), 6-10 years 23 (23.0%), 11-15 years 33 (33.0%), 16-20 years 30 (30.0%)

In Table 2, given the participation of 100 respondents in this study, the Kolmogorov-Smirnov test was employed to determine the p-value, as it is applicable for datasets exceeding 50 participants. The findings disclosed no significant differences in prevalence, organizational, behavioral, and skill-related factors when the p-value was less than 0.05. Consequently, non-parametric tests are the primary method for data analysis.

Table 2 Assessing Normality of Distribution of the Dependent Variables (N=100)

	<i>Kolmogorov-Smirnov^a</i>			<i>Shapiro-Wilk</i>		
	<i>Statistic</i>	<i>df</i>	<i>p</i>	<i>Statistic</i>	<i>df</i>	<i>p</i>
Prevalence	0.161	100	<0.001	0.920	100	<0.001
Organizational Factor	0.131	100	<0.001	0.946	100	<0.001
Behavioral Factor	0.187	100	<0.001	0.912	100	<0.001
Skill Related Factor	0.232	100	<0.001	0.838	100	<0.001

As in Table 3, most of the respondents (91%) reported experiencing at least one needle stick injury within the previous 12 months, and 92% of these NSIs are superficial. Furthermore, the study identified disposable syringes (42%), followed by blood sugar lancets (32%), blood collection needles (12%), hypodermic needles (7%), and suture needles (7%). Respondents indicated that needle stick injuries most frequently occurred during waste disposal (36%), during the procedure (32%), recapping (26%), and misplacement (6%). The findings in this table provide valuable detail into the circumstances and types of activities associated with needle stick injuries among healthcare workers.

As illustrated in Table 4, most respondents (80%) reported working more than eight hours daily. Additionally, the study revealed that all respondents work night shifts, have standard universal precautions posters posted in their working areas related to the prevention of NSIs, have injection safety protocols in place, and receive HBV prophylaxis (HBV vaccination before working in healthcare institutions). Moreover, all respondents indicated they used proper disposal methods in their working areas. Furthermore, findings showed that most respondents work in male wards (18%) and female wards (18%), while only a small percentage work in pediatric wards (5%) and NICU (5%). NSIs were most commonly reported within each patient ward (36%), followed by occurring during medication cart (34%) and procedures performed in procedure rooms (30%).

Table 3 Prevalence of Needle Stick Injury by Questions (N=100)

<i>Question</i>	<i>N</i>	<i>%</i>
In the previous 12 months, the number of needle stick injuries		
1 (Low)	91	91
1-2 (Moderate)	9	9
Three or more (High)	0	0
Degree of injury		
Severe	0	0
Moderate	8	8
Superficial	92	92
Types of sharp that caused the injuries		
Suture Needle	7	7
Hypodermic needle	7	7
Disposable syringe	42	42
Blood Sugar Lancet	32	32
Blood Collection Needle	12	12
Other	0	0
When NSI occurred		
Recapping	26	26
During waste disposal	36	36
During procedures	32	32
Misplace	6	6
Others	0	0

Table 4 Organization-Related Factors Contribute to the Needle Injury Prevalence by Question (N=100)

<i>Question</i>	<i>N</i>	<i>%</i>
Total hours worked per day		
> 8 Hours	80	80
8 hours or less	20	20
The healthcare workers (HCWs) working a night shift occasionally		
Yes	100	100
No	0	0
Universal precautions poster posted in the working area related to the prevention of needle stick injury		
Yes	100	100
No	0	0
The presence of safety protocols in the working area related to the safety injection		
Yes	100	100
No	0	0
The Presence of an Infection Prevention and Patient Safety Committee in working area		
Yes	100	100
No	0	0
Received the HBV prophylaxis (HBV vaccination before working in a health care		

institution)		
Yes	100	100
No	0	0
Method for sharp disposal utilized in the working area		
Yes	100	100
No	0	0
Work Department		
ICU	6	6
Male Ward	18	18
Female Ward	18	18
Pediatric Ward	5	5
NICU	5	5
Obstetric Ward	11	11
Day Surgery Ward	10	10
Operating Theater	7	7
Emergency Department	10	10
Outpatient Department	10	10
Location of sharps container		
Within Each Patient Ward	36	36
Medication Cart	34	34
Within Each Procedure Room	30	30
Other	0	0

In Table 5, most respondents (56%) reported not practicing needle recapping. Additionally, a significant proportion of respondents reported feeling sleepy at work (55%). Also, findings disclose that most respondents were aware of the transmission of diseases through needle stick injuries (97%) and used personal protective equipment during their work duties (53%).

Table 5 Behavioral-Related Factors Contribute to the Needle Injury Prevalence by Question (N=100)

<i>Question</i>	N	%
Practice needle recapping		
Yes	44	44
No	56	56
If yes (for Question 1), the frequency of recapping		
All of the time	17	17
Most of the time	16	16
Sometimes	11	11
No	56	56
Feeling sleepy at work		
Yes	55	55
No	45	45
Awareness of disease transmission by needle stick and sharp injury (NSSI)		
Yes	97	97
No	3	3
Use personal protective equipment		
Yes	53	53
No	47	47

As shown in Table 6, most respondents reported attending training related to NSI prevention (52%) and injection safety (62%). Furthermore, findings indicated that most respondents have easy access to relevant information (75%).

Table 6 Skill-Related Factors Contribute to the Needle Stick Injury Prevalence by Question (N=100)

<i>Question</i>	<i>N</i>	<i>%</i>
Attend the training related to needle stick injury prevention		
Yes	52	52
No	48	48
Attend the training related to injection safety		
Yes	62	62
No	38	38
Access to the information on NSI		
Yes	75	75
No	25	25

Table 7 presents the results, indicating that none of the respondent's socio-demographic characteristics significantly influenced the prevalence of needle stick injury, as all p-values were more than 0.05. It is clear from the minimal differences in mean ranks observed between the categorical groups. For example, the p-value for gender ($p = 0.324$) showed that the mean rank difference between males (44.71) and females (51.86) was relatively small. Similarly, the p-value for age ($p = 0.842$) indicated insignificant differences in mean ranks between different age groups, with the most negligible difference observed between the 21 to 30 years group (49.51) and the 31 to 40 years group (50.98).

Table 7 Association between Socio-demographic Characteristics with Prevalence of Needle Stick Injury

<i>Socio-demographic data</i>	<i>Mean Rank</i>	<i>p-value</i>
Gender		
Male	44.71	0.324
Female	51.86	
Age		
21-30 years old	49.51	0.842
31-40 years old	50.98	
41-50 years old	47.98	
>50 years old	55.76	
Marital Status		
Single	47.22	0.693
Married	49.86	
Divorced	53.54	
Widowed	58.55	
Profession		
Doctor/Physician	45.30	0.331
Nurse	51.97	
Nationality		
Saudi	50.25	0.935
Non-Saudi	50.71	
Education		
Diploma	59.28	0.695

Diploma with post-basic	46.55	
Degree	47.26	
Degree with post-basic	52.23	
Master	55.77	
PhD	0.00	
Years of Working in AFHWD		
1-5 years	44.32	0.762
6-10 years	52.67	
11-15 years	49.09	
16-20 years	53.27	

*Significant p-value ≤0.05

Table 8 presents the findings, indicating that none of the respondent's socio-demographic characteristics significantly influence organization-related factors contributing to needle stick injury prevalence, as all p-values were more than 0.05; this finding supports the minimal differences observed in mean ranks between categorical groups. For instance, the p-value for profession (p = 0.586) revealed that the mean rank difference between doctors/physicians (53.45) and nurses (49.67) was relatively small. Similarly, the p-value for marital status (p = 0.207) indicated insignificant differences in mean ranks, with a lesser difference observed between single (56.65) and married (51.88) respondents.

Table 8 Association between Socio-demographic Characteristics with Factors Contribute to Needle Stick Injury Prevalence (Organization-Related Factors)

<i>Socio-demographic data</i>	<i>Mean Rank</i>	<i>p-value</i>
Gender		
Male	58.68	0.169
Female	48.58	
Age		
21-30 years old	53.43	0.833
31-40 years old	46.17	
41-50 years old	50.30	
>50 years old	49.76	
Marital Status		
Single	56.65	0.207
Married	51.88	
Divorced	40.65	
Widowed	39.59	
Profession		
Doctor/Physician	53.45	0.586
Nurse	49.67	
Nationality		
Saudi	49.26	0.692
Non-Saudi	51.56	
Education		
Diploma	52.22	0.759
Diploma with post-basic	43.45	
Degree	54.38	

Degree with post-basic	50.94	
Master	49.19	
PhD	0.00	
Years of Working in AFHWD		
1-5 years	52.93	0.877
6-10 years	53.74	
11-15 years	47.85	
16-20 years	49.80	

*Significant p-value ≤0.05

As presented in Table 9, the results indicate that none of the respondent’s socio-demographic characteristics significantly influenced the factors contributing to needle stick injury prevalence (behavioral-related factors), as all p-values were more significant than 0.05; this supports the minimal differences observed in mean ranks between categorical groups. For example, the p-value for nationality (p = 0.888) revealed that the mean rank difference between non-Saudi (50.87) and Saudi (50.07) respondents was relatively small. Similarly, the p-value for education (p = 0.206) indicated insignificant differences in mean ranks, with the slightest difference observed between respondents with diplomas (50.22) and those with diplomas with post-basic qualifications (53.90).

Table 9 Association between Socio-demographic Characteristics with Factors Contributed to Needle Stick Injury Prevalence (Behavioral-Related Factors)

<i>Socio-demographic data</i>	<i>Mean Rank</i>	<i>p-value</i>
Gender		
Male	50.97	0.936
Female	50.39	
Age		
21-30 years old	56.22	0.301
31-40 years old	43.21	
41-50 years old	46.08	
>50 years old	53.56	
Marital Status		
Single	49.23	0.207
Married	46.23	
Divorced	55.96	
Widowed	65.36	
Profession		
Doctor/Physician	43.98	0.224
Nurse	52.34	
Nationality		
Saudi	50.07	0.888
Non-Saudi	50.87	
Education		
Diploma	50.22	0.206
Diploma with post-basic	53.90	
Degree	57.47	
Degree with post-basic	44.88	
Master	37.62	

PhD	0.00	
Years of Working in AFHWD		
1-5 years	54.00	0.357
6-10 years	57.57	
11-15 years	44.21	
16-20 years	50.37	

*Significant p-value ≤0.05

Table 10 discloses that age (p = 0.009) and years of working experience in AFHWD (p = 0.009) significantly influenced factors contributing to needle stick injury prevalence (skill-related factors), evidenced by substantial differences in mean ranks, such as the higher mean rank for respondents aged 21 to 30 years (62.22) compared to those aged 31 to 40 years (41.26) and for those with 1 to 5 years of experience (66.11) compared to 6 to 10 years of experience (59.85). However, gender (p = 0.811), marital status (p = 0.124), profession (p = 0.111), nationality (p = 0.066), and education (p = 0.482) did not significantly influence skill-related factors contributing to needle stick injury prevalence when the p-value was more than 0.05.

Table 10 Association between Socio-demographic Characteristics with Factors Contribute to Needle Stick Injury Prevalence (Skill-Related Factors)

Socio-demographic data	Mean Rank	p-value
Gender		
Male	49.13	0.811
Female	50.82	
Age		
21-30 years old	62.22	0.009*
31-40 years old	41.26	
41-50 years old	41.60	
>50 years old	49.50	
Marital Status		
Single	47.72	0.124
Married	57.03	
Divorced	44.46	
Widowed	37.91	
Profession		
Doctor/Physician	58.80	0.111
Nurse	48.16	
Nationality		
Saudi	44.98	0.066
Non-Saudi	55.20	
Education		
Diploma	48.00	0.482
Diploma with post-basic	42.45	
Degree	55.44	
Degree with post-basic	48.29	
Master	55.77	
PhD	0.00	
Years of Working in AFHWD		

1-5 years	66.11	0.009*
6-10 years	59.85	
11-15 years	45.97	
16-20 years	41.03	

*Significant p-value ≤ 0.05

4. DISCUSSION

Prevalence of Needle Stick Injury and Its Characteristics

Most of the HCWs had experienced at least one-time NSI incidence, with most of them having a superficial degree of NSI at 91% and 92%, respectively. Also, disposable syringes and blood sugar lancets were recognized as the sharpest cause of injuries, with 42% and 32%, respectively. The prevalence of NSI also commonly occurred during waste disposal and procedure, with 36% and 32%, respectively. The overall prevalence of NSI is low. A survey conducted at “King Fahad Medical City” (KFMC) in Riyadh, Kingdom of Saudi Arabia, also mentioned that the disposal of sharp objects caused NSI incidence with 19.3% of them (Alshehri et al., 2023). A survey noted that long hours and high workloads among nurses significantly result in fatigue, also known as a distraction source (Ahmed et al., 2020).

These may also increase the risk of accidents while handling the sharps. Both blood sugar lancets and disposable syringes are the standard medical devices used in the clinical area. Due to their frequent use, it may increase the risk of NSI incidence during the handling, administration, or disposal of blood sugar lancets and disposable syringes. Also, both blood sugar lancets and disposable syringes are designed explicitly with sharp needles for piercing the skin. The sharpness of these needles and improper disposal practices increase the risk of unintentional punctures and NSI if the needles are not appropriately handled (Bouya et al., 2020; Mengistu and Tolera, 2020). The cleaning and waste disposal activities may contribute to the rushed and distracted behavior among HCWs. It may cause lapses in attention and adherence to safety protocols, increasing the risk of NSI (Naidu et al., 2023).

Organization-Related Factors Contribute to the Needle Injury Prevalence

There are several organization-related factors associated with the prevalence of NSI. Firstly, longer working hours, more than eight hours, may contribute to increased fatigue and decrease the attention of HCWs toward implementing safety protocols. These may increase the risk of NSI incidence (Alfulayw et al., 2021). It also mentioned that the HCWs who are working a night shift may have an increased risk of NSI incidence—it also noted that the night shifts could interfere with the circadian cycle, which results in increased fatigue levels and decreased alertness levels, which increases the potential for the risk of NSIs due to lapses in concentration (Fathizadeh et al., 2023).

The availability of educational materials at the workplace, such as posters, can increase awareness among HCWs regarding preventing NSI and encourage adherence to safety protocols. All participants mentioned that the proper disposal methods utilized among HCWs in the clinical area can reduce the risk of NSI prevalence. It is because it promotes the safe handling and proper disposal of sharp objects (Roozbeh et al., 2023). The working departments of HCWs, like the Emergency Department and Operating Theater, may also accompanied by varying levels of exposure to the procedures related to sharps, which increase the risk of NSI (Hassanipour et al., 2021).

Behavioral-Related Factors Contribute to the Needle Injury Prevalence

This survey found that feeling sleepy at work resulted in the prevalence of NSI in the clinical area among HCWs. Then, awareness of disease transmission due to NSI is known as a factor contributing to the NSI incidence. HCWs who feel sleepy while serving patients in the clinical area tend to be less vigilant when performing tasks, especially those involved in the sharps. It may also increase the risk of accidental NSI prevalence (Kwanzaa et al., 2020). Sleepiness may also impair fine motor skills and coordination, significantly affecting the ability of HCWs to handle safely. Besides that, sleepiness may result in increased risk-taking behavior where the individual HCWs become more inclined to take shortcuts or disregard safety protocols while performing their tasks, such as any task that involves sharps, which may increase the risk of NSI incidence (Sepandi et al., 2023).

Next, the HCWs, with awareness of the potential consequences of NSI incidence, such as HBV, HCV, and HIV, can motivate the HCWs to prioritize the safety and preventive measures of NSI. The HCWs also tend to comply with and utilize the proper protocols when handling sharps (Fathizadeh et al., 2023). Other than that, the HCWs who show awareness of the risk associated with NSI are more vulnerable to following measures such as using “personal protective equipment” (PPE), properly disposing of the sharps, and practicing safe needle handling techniques. Finally, awareness of the diseases transmitted due to NSI encouraged the HCWs to report incidences as soon as they occur and to seek the proper medical examination and treatment (Ketshabile, 2022).

Skill-Related Factors Contribute to the Needle Stick Injury Prevalence

Adequate training received regarding NSI prevention and injection safety, known as skill-related factors, contributes to the prevention of NSI prevalence. Sufficient access to information related to NSI is also able to prevent NSI prevalence. At the same time, it can also increase awareness among HCWs to recognize the potential hazards related to NSIs and take proactive measures to avoid NSIs (Ketshabile, 2022). It also addressed that mastering the correct techniques and safety procedures while handling the sharps can enhance the HCWs in minimizing the risk of accidental NSI in clinical areas (Ahmed et al., 2020). Lastly, proper training guarantees that HCWs understand pertinent rules, policies, and recommendations about injection safety and NSI prevention. Healthcare institutions can lower the risk of NSIs and promote a safer working environment by being aware of and adhering to these guidelines (Bouya et al., 2020).

Association between Socio-demographic Characteristics with Prevalence of Needle Stick Injury and Factors Contributed to Needle Stick Injury Prevalence

Only age and working experience in AFHWD were associated with the skill-related factors contributing to the NSI prevalence with $p < 0.009$. The HCWs aged 21 to 30 years old and 1 to 5 years of working experience in the current healthcare institution are more vulnerable to contributing to the skill-related factors associated with NSI prevalence. Less experienced HCWs are more prone to refer to those aged between 21 and 30 years old and with 1 to 5 years of working experience in AFHWD. Thus, it may be associated with the need for more understanding and familiarity with the safety protocols and best practices for NSI prevention implemented in the clinical area compared to the more experienced colleagues.

Other than that, as the HCWs gain more experience in their roles and become more familiar with the healthcare or workplace environment, they are more likely to acquire more knowledge in preventing NSIs effectively. Unfortunately, during the initial years of their careers, the HCWs are still learning and adapting to the demands of their profession. Consequently, it tends to make the HCWs more susceptible to errors or lapses in adherence to the safety protocols related to the preventive measures of NSI (Ishak et al., 2019).

Limitations

Single-center study may limit the generalizability of the study's findings to another healthcare setting in Riyadh, Saudi Arabia. Generally, the factors influencing the NIS prevalence may vary across hospitals, regions, and countries. Moreover, this survey is also at risk for self-report bias. Self-report measures are more susceptible to response bias, recall bias, and social-desirability bias, which may affect the accuracy and reliability of the responses. In this study, the HCWs may over- or under-report the prevalence and characteristics of NSI and its associated factors, significantly leading to bias in assessing its prevalence and associated factors.

5. CONCLUSION

NSI Prevalence among AFHWD HCWs is low, age and working experience are significantly associated with the skill-related factors of NSI incidence. The findings of this study addressed the importance of understanding the Socio-Demographic and professional factors influencing NSI prevalence. It helps the administration of healthcare institutions to identify and implement interventions that enhance occupational safety in the clinical area. However, it is highly suggested that healthcare administration prioritize effective and targeted training programs to promote awareness among HCWs regarding NSI risk factors. This awareness also enhances a culture of safety and prevention among HCWs.

There is a need for future research to explore any additional risk factors, evaluate the effectiveness of preventive measures, improve understanding, and to promote a culture of safety among HCWs and patients. Enabling a culture of safety and prevention within the healthcare setting can maintain long-term improvement in NSI prevention and promote occupational safety. It is also recommended

that activities promote a just culture and continuous occupational health control measures in the workplace. It can encourage the HCWs to open up and address safety concerns without fear of disciplinary reactions. Also, advancing the knowledge, evidence-based policies and practices among HCWs can create safer healthcare environments and protect the well-being of both HCWs and patients.

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Author's Contributions

Author AES set the study design and methodology, shared the preparation of the study instrument, data display, discussion guidelines, manuscript preparation, set recommendations, and final write-up. Author NJ set research proposal and concept, conducted statistical analysis, data display, report review, ethical approvals, study instrument validation, supervised data collection, data entry, manuscript preparation, and study progress. All authors read and approved the final manuscript.

Ethical approval

The study was approved by the Research and Ethics Committee of AFHWD (Ethical approval code: 0025 March 10, 2024).

Informed consent

Written and oral informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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