

Needle Stick Injuries among Registered Staff Nurses: A Cross-Sectional Study

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ABSTRACT

Nurses' health and safety are greatly risked by injuries sustained from needle sticks and related blood and bodily fluid exposure. This institutionally based cross-sectional study, aimed to ascertain the frequency of Needle Stick Injuries (NSI) and the associated risk factors, was conducted among nurses at a private healthcare facility in Klang Valley, Malaysia, from February to March 2023. Non-probability purposive sampling was used to recruit 188 nurses from various practice areas. Data were collected using a structured self-administered questionnaire. The prevalence of needle stick injury was 26.5% among the nurses. Although the majority (97.9%) of the nurses had attended sharp injury prevention training, 47.9% reported recapping the needles after use, which could be a cause of needle stick injuries. The results indicate a strong correlation between needle stick injuries, co-worker support, job experience, education level, and sleep adequacy. These findings suggest the need for more significant efforts to ensure that nurses with less experience receive proper training. In addition, measures that promote a healthy work-life balance and foster healthy work environments for nurses must be taken to reduce the number of needle stick injuries.

Keywords: *Needle stick, Sharp injuries, Occupational hazard, Needle stick injuries, Blood-borne infections, Blood-borne diseases*

1. Introduction

Needle Stick Injuries (NSIs) are a significant occupational danger affecting healthcare professionals globally. A wound from needles that unintentionally penetrate the skin is among the most frequent ways specific blood-borne virus types can infect a person [1][2]. Needle stick injuries are a recognised risk for those handling syringes, medications, and procedures involving needle equipment [3]. Needle stick injuries commonly happen during procedures such as venepunctures, injections, and while disposing of used needles. Three million healthcare workers experience needle stick or sharps injuries annually, with two million exposed to Hepatitis B [HBV], 0.9 million to Hepatitis C [HCV], and 170,000 to the human immunodeficiency virus [HIV]. Over 90% of these infections occur in developing countries [1][4]. Needles are considered the second most prevalent source of occupational injury, accounting for almost 70% of accidents due to sharp objects [2].

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The rates of NSIs differ across nations due to variations in settings and methods utilised [22]. In the United States of America, it is estimated that 800,000 professionals experience sharp-edge injuries every year. An incidence of 16.5 needle stick injuries for every 100 occupied beds in 23 hospitals in Saudi Arabia has been noted [1][5]. In addition, the average of needle stick injury incidents that occurred in one of the private hospitals in Malaysia was 0.6 cases almost every month in 2008 [23]. Compared to reports from other nations, Malaysia has a low prevalence of NSIs [5]. The Malaysian Ministry of Health requires voluntary reporting; however, the actual frequency of needle stick injuries may go unreported.

Most sharp injury incidents were found to be caused by ignoring universal precautions [9]. It is widely accepted that needle injuries are shared among medical professionals, and increase the likelihood of blood-borne infection transmission. HBV, HCV, and HIV are the diseases that healthcare professionals contract most frequently in occupational settings [6]. Because new infectious diseases are always emerging, it is impossible to predict if the following significant infection can spread by needle stick injuries [13]. Needle stick injuries also increase the risk of psychological distress, including anxiety, sadness, and post-traumatic stress disorder, as well as a lower quality of life for healthcare professionals [6].

The Occupational Safety and Health Administration (OSHA) implemented the Blood-borne Pathogens (BBPs) Standard in 1991 to shield healthcare workers from occupational exposure to blood and other potentially infectious substances [7]. Several causes have been identified as contributing to NSIs among nurses, including recapping needles after use, a lack of experience, improper use of sharp containers, and working under stress [19]. Determining the NSI contributing elements is essential to find strategies to prevent this type of injury. The standard sets forth requirements for employers to minimise the risk of exposure through the use of Personal Protective Equipment (PPE), training programs, engineering measures and other recommendations for work practices by healthcare workers. Because prior studies have shown that proper precautions can avoid about 80% of NSIs [11] healthcare industries must take precautions to minimise needle stick injury and its impact on nurses [2]. Indeed, these incidences may be reduced by 62% through training on safe injection techniques, universal safety measures, disposal of sharp waste, and providing safety-designed equipment [11][12]. Nurses must have education and training as part of an injury prevention programme to protect people who could contact the device during or after treatments. The current study was conducted to identify the prevalence and contributing factors of needle stick injuries among the Registered Staff Nurses in a private hospital in Klang Valley, Malaysia. The study focused on three variables, namely, demographic characteristics, organisational variables, and behavioural variables.

2. Methodology

2.1. Research design

An institutional-based cross-sectional survey was conducted among nurses in the private specialist hospital of Klang Valley, Malaysia. The online survey was conducted using Google Forms in January and February 2023.

2.2. Study setting

The survey was conducted among registered nurses at a private specialist hospital in Kuala Lumpur. The Registered nurses were from the medical-surgical, maternity, paediatric, intensive care, high-dependency, operational theatre, day ward, and emergency departments.

2.3. Sample size determination

The study population included 330 registered staff nurses employed at various departments of the Specialist Hospital. The study recruited registered nurses with at least one year of experience in the medical ward, surgical ward, emergency department, paediatric ward, maternity ward, intensive care unit, and high-dependency unit. The study excluded nurse educators, nurse instructors, unit managers, and administrative nursing personnel as they were not currently hands-on in patient care.

The Krejcie-Morgan formula determined the sample size. Based on a known population of 330 registered staff nurses employed at various departments of the Specialist Hospital, data were collected from 178 registered nurses.

2.4. Instruments

The researchers used a self-administered questionnaire to obtain information about the prevalence and contributing factors of needlestick injury. This questionnaire was adapted with permission from a previous study [11]. The study instrument has four Sections.

2.4.1. Section A: Socio-demographic characteristics

Section A had six items related to demographic profile, including socio-demographic variables such as age, sex, marital status, level of education, work experience, and years of working in the current hospital. It consisted of dichotomous, single-response questions, multiple-choice questions, and two items with open-ended questions.

2.4.2. Section B: Prevalence of NSI

Section B consisted of dichotomous, single-response questions using checkbox answers and two items with open-ended questions. Five questions related to the prevalence of needlestick injury, experience in needlestick injury, number of experiences, reason for the needlestick injury, and Hepatitis B vaccination.

2.4.3. Section C: Organisational/occupational factors

This section had seven items related to organizational and occupational background. It consisted of dichotomous, single-response, and multiple-choice questions requiring a checkbox answer. This section asked about the working department, health safety training, safety guidelines, working the night shift, workplace supervision, length of working hours/day, and availability of sharp disposal containers.

2.4.4. Section D: Behavioral factors

This section is related to the nurses' behavioural variables. It consisted of 15 dichotomous questions that required a checkbox answer. This section involved needle prick experience, needle recapping, training on disease transmission by sharp injuries, use of PPE, staffing unit, health and well-being, sleep pattern, feelings, and job satisfaction.

As reported from the pilot study, a Cronbach's alpha coefficient of 0.78 suggests a satisfactory level of internal consistency reliability among the items or variables measured within the study instrument.

After obtaining permission from the hospital management and the Chief Nursing Officer, the questionnaire was sent to each unit manager via e-mail using a Google Forms link. The unit managers disseminated the link to the staff nurses using WhatsApp social media.

2.6. Ethical approval

The university's Institutional Review Board (IRB) approved the ethical application (Reference number eXXX/SON/RMC/EC/2022/463). The Chief Nursing Officer (CNO) and hospital management granted permission to distribute the questionnaire to registered staff nurses with the assistance of unit managers.

A consent form, clearly stating that participation was voluntary, was included at the beginning of the questionnaire. By proceeding, the respondents gave consent to participate in the study. Also, a checklist was added, asking respondents to confirm their willingness to participate in the study before proceeding with the rest of the form.

3. Results

3.1. Demographic profile of the respondents

[Table 1] shows the distribution of nurses according to their demographic information. The majority were female (93.1%), married (42.6%), aged 28-30 years, held Diplomas in Nursing (39.4%), and had 4-6 years of experience (44.1%).

Table 1. Demographic profile (n=188)

Characteristics	Variable	Frequency (n)	Percentage (%)
Age (years)	25-27 years old	62	33.0
	28-30 years old	72	38.3
	31-33 years old	29	15.4
	34- 37 years old	12	6.4
	Above 38 years old	13	6.9
Sex	Male	13	6.9
	Female	175	93.1
Marital status	Single	104	55.3
	Married	80	42.6
	Divorced	2	1.1
	Single parent	2	1.1
Level of Education	Diploma	74	39.4
	Post- Basic	59	31.4
	Degree	48	25.5
	Master	7	3.7
Total Working Experience as RN	1- 3 years	49	26.1
	4-6 years	83	44.1
	7 to 9 years	22	11.7
	More than nine years	34	18.1
Years of Working in Current Hospital	1- 3 years	96	51.1
	4-6 years	59	31.4
	7 to 9 years	13	6.9
	More than nine years	20	10.6

3.2. Prevalence of needle stick injuries

As per [Table 2], a total of 50 (26.5%) nurses experienced needle stick injuries at work.

Table 2. Prevalence of needle stick injury (n=188)

NSI Experience	Variable	Frequency (n)	Percentage (%)
Have you experienced a needle prick injury	Yes	50	26.5
	No	138	73.4

3.3. Organisational factors contributing to needle stick injuries

The data show that most (97.9%) nurses attended the Health and Safety training (p-value 0.01). Since the p-value is less than 0.05, the findings help to conclude that there is an association between safety training and needle stick injury. Most nurses (98%) were aware of safety guidelines for needle injury prevention. The results do not suggest an association between safety guidelines and needle stick injury (P-value 0.19). Also, 83.5% of nurses reported being under supervision during their working hours, and 89.4% of the nurses had night shifts in their schedule. The p-values were stated as 0.66 and 0.94, respectively. Since the p-value is more significant than the significance level ($\alpha = 0.05$), it can be concluded that there is no association between working under supervision or night shift work and needle stick injury. The total hours of work in a day were shown as 7-10 hours (62.2%), 11-13 hours (21.8%), and 14-16 hours (16.0%). The ep-value result is 0.77, suggesting no association between working hours and needle stick injury. Sharp disposals were always available (87.2%; P-value is 0.69). Thus, the availability of the sharp dispenser was not associated with the occurrence of needle stick injuries.

Table 3. Organisational factors contributing to needle stick injuries (n=188)

Organisational Factor	Variable	Frequency (n)	Percentage (%)	Sig.(χ^2)
Health and Safety Training	Yes	184	97.9	0.01
	No	4	2.1	
Availability of safety guidelines	Yes	185	98.4%	0.19
	No	3	1.5%	
Supervision during working hours	Yes	157	83.5	0.66
	No	31	16.5	
Night shift work	Yes	168	89.4	0.94
	No	19	10.1	
Duration of work per day	7-10 Hours	117	62.2	0.77
	11-13 Hours	41	21.8	
	14-16 Hours	30	16.0	
	16 Hours	0	0	
Availability of Sharp Disposal Containers.	Not available	0	0	0.69
	Sometimes	24	12.8	
	All the time	164	87.2	

3.4. Behavioral factors contributing to needle stick injuries among nurses

As highlighted in [Table 4], 17% of needle stick injury incidents were not reported. The finding highlighted that 47.9% did practice needle recapping. However, further analysis concluded that there was no association between needle recapping and needle stick injury (p-value= 0.22). Awareness of disease transmission by sharp injuries was known by 93.6% of nurses (p-value 0.48). Hence, there is no association between disease transmission awareness and needle stick injury. Also, 94.7% of the study's nurses said they practised using personal protective equipment to handle

the medication. There was not enough evidence (p -value = 0.26) to show an association between the practice of PPE and needle stick injury. In addition, 86.2% agreed on the adequacy of staffing in their ward. Findings show no association between staffing adequacy and needle stick injury (p -value 0.60).

Most nurses (94.7%) reported being healthy during the working hours. Since the p -value of 0.04 is less than the chosen significance level $\alpha = 0.05$, no association between nurses' health and needle stick injury was postulated. The majority (83.5%) reported having adequate sleep of 6 to 8 hours (p -value 0.08), and 91.5% reported feeling energetic during their working time (p -value 0.27); therefore, no evidence suggests an association between adequacy of sleep or energy and needle stick injury. In addition, 89.9% were satisfied with the working environment and company culture (87.2%). The p -value of 0.44 suggests no association between work environment satisfaction and needle stick injury.

Similarly, 87.2% were satisfied with the company culture (p -value 0.08). There is no association between satisfaction with company culture and needle stick injury. The nurses agreed they have supportive and cooperative co-workers (93.6%; P -value 0.00). The finding indicates an association between supportive co-workers and needle stick injury. Most nurses (95.2%; p -value 0.96) stated they had an adequate opportunity to develop their professional skills. Therefore, there is insufficient evidence to show an association between opportunity and needle stick injury in skill development. Nurses agreed they have a duty roster that fits their personal life (92.6%; p -value of 0.17); the findings showed no association between duty roster and needle stick injury.

Table 4. Behavioural factors contributing to needle stick injuries among nurses (n=188)

Behavioral Factor	Variable	Frequency (n)	Percentage (%)	Sig (χ^2)
Reporting of the Injuries/injuries	Yes	156	83.0	0.40
	No	32	17.0	
Practice needle recapping	Yes	90	47.9	0.22
	No	98	52.1	
Awareness training in Disease Transmission by Sharp Injuries	Yes	176	93.6	0.48
	No	12	6.4	
Use of Personal Protective Equipment in handling medication	Yes	178	94.7	0.26
	No	10	5.3	
Adequacy of Staffing of the unit.	Yes	162	86.2	0.60
	No	26	13.8	
Health/well-being status	Yes	178	94.7	0.04
	No	10	5.3	
Adequate sleep of 6-8 hours	Yes	157	83.5	0.08
	No	31	16.5	
Stays energetic during working hours	Yes	172	91.5	0.27
	No	16	8.5	
Satisfaction with the working environment.	Yes	169	89.9	0.44
	No	19	10.1	
Satisfaction with the company's culture	Yes	164	87.2	0.08
	No	24	12.8	
Supportive and cooperative co-workers	Yes	176	93.6	0.00
	No	12	6.4	
Supportive and cooperative superiors	Yes	172	91.5	0.80
	No	16	8.5	
Opportunities to develop professional skills	Yes	179	95.2	0.96
	No	9	4.8	
Duty roster fits personal and family life	Yes	174	92.6	0.17
	No	14	7.4	

4. Discussion

4.1. Prevalence of NSI across the globe and Malaysian healthcare Settings

Nurses play a crucial role in various healthcare settings by administering injections and performing venipunctures, Intravenous (IV) fluid administration, and other needle procedures. These tasks are essential parts of patient care and treatment. Due to the nature of their work, nurses are at an increased risk of needle stick injuries and other occupational hazards. Healthcare facilities need to provide proper training, safety protocols, and equipment to protect nurses and minimise the risks associated with these procedures. Despite substantial advancements in policy, practice, and products, Healthcare Workers (HCWs) are still at risk for Needle Stick and Sharps Injuries (NSIs), which expose them to fatal viruses and other blood-borne diseases. Across the globe, approximately 2 million incidences of needle stick injuries occur annually [25]. The Centre for Disease Control's (CDC) guidelines on universal precautions and the Occupational Safety and Health Administration's (OSHA's) blood-borne pathogens standard eight are intended to minimise and prevent occupational exposure of HCWs to Blood-Borne Pathogens (BBPs) [12]. In this study, the prevalence rate of NSI among nurses is moderate. According to the study findings, 26.5% of the individuals had at least one NSI episode the year before. Few studies have reported similar findings [4][7][12][13][14]. The lowest cases were reported in Singapore, Australia and New Zealand [14]. Lower risk of NSIs in those countries may be related to higher adherence to infection control protocols, awareness of workplace safety, and resources available [15]. On the other hand, substantially greater incidences were observed in Srilanka (94.6%), South Korea (69.5%), and Poland (69.2%) [14].

4.2. Contributing factors of NSI

The study aimed to identify factors associated with needle sticks and sharp injuries among state-registered nurses in a private hospital in Klang Valley. The findings highlighted that work satisfaction, health status, NSI training and supportive co-workers were significantly associated with needle stick injuries. A similar study in Sub-Saharan Africa reported a lack of exercise, long working hours, recapping needles, and not using gloves. In contrast, handling needles was associated with a high prevalence of needle stick injuries [16]. Nurses with less experience were reported to be more likely to sustain needle sticks and other types of sharp injuries than those with more experience [11][18]. Other reported potential causes of needle stick injuries include stressful situations at work, poor training, not knowing how to handle and process used sharp objects, and possibly being less concerned about the potential consequences of injury than more experienced workers [17][19]. In this study, the surgical ward had a high prevalence of needle stick injuries. This finding is consistent with research done in India [22] and the Kingdom of Saudi Arabia [23] and is consistent with earlier research demonstrating that surgery units are the most typical setting for NSI occurrence [24]. The nature of the work and the medical activities performed in these disciplines account for the higher frequency of NSIs there [25]. The findings also show that the practice of needle capping and needle stick injuries is highly correlated, which is similar to other study reports [26].

A limitation of this study is that recall bias affected the percentage of needle stick injuries in this study. Nevertheless, conducting a multicentre study involving a large population is recommended to investigate the prevalence and contributing factors of needle stick injuries.

5. Conclusion

In this study, the prevalence of needle stick injury was moderate. The finding shows that level of education, work experience, adequate sleep, working culture satisfaction, and supportive co-workers were significantly associated with needle stick injuries. There is a need to provide proper training for nurses with less experience. Also, to minimise needle stick injuries, effort is needed to ensure work-life balance and offer a positive working climate for nurses.

6. Conflict of interest

This study has no conflict of interest.

7. Funding information

Therefore, this study is part of undergraduate nurses' training and was not funded by any organisations.

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