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Needlestick Injuries among Nurses in Selangor Public Hospital, Malaysia

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ABSTRACT

Background: Needlestick injuries (NSIs) are one of the greatest risks nurses face. NSIs are associated with an increased risk of diseases that can be transferred through skin exposure, such as Hepatitis B, Hepatitis C, and human immunodeficiency virus. Certain factors can influence the mechanism and frequency of NSI among nurses. **Objective:** To determine the factors associated with the frequency and mechanisms of NSIs among nurses at a public hospital in Selangor. **Methods:** A cross-sectional study was conducted from April to September 2020. A total of 233 nurses was conveniently sampled from a public hospital in Selangor. A questionnaire was distributed to capture data on socio-demographic characteristics, frequency, and mechanisms of NSI. The inferential statistic was conducted using SPSS 22. **Results:** Of the 233 respondents, the incidence rate of NSI was 23.6%. Most cases of NSI occurred during the morning shift (12.4%), and the most common mechanism of NSIs was the action of recapping needles (6.9%). Factors associated with the NSI were gender, age, ward, and working experience. **Conclusion:** The prevalence of NSIs is relatively low in this study. However, nurses should still apply universal precautions to prevent NSIs. Several risk factors that influenced the NSI should be highlighted among nurses and nursing management to prevent its incidence.

Keywords: Factor; Needlestick Injuries Mechanism; Nurses

INTRODUCTION

Needlestick injuries (NSIs) are common among healthcare workers (HCWs) in patient care. NSIs refer to wounds caused by sharp needles used during screening, diagnosing, treating, and monitoring patients, and the disposal of needles and other materials (Berhan *et al.*, 2021). About two million of the total 35 million HCWs experience percutaneous exposure to infectious diseases each year (WHO, 2019). In Malaysia, limited studies have been conducted on NSI. A study reported that about 1234 cases of NSI had been reported in Malaysia in 2016 (Ishak, Haque, & Sadhra, 2019). In addition, it was estimated that 75% of the NSIs in developing countries were not reported (Sriram, 2019). Thus, the actual incidence of NSIs in healthcare facilities can be higher.

Exposures to transmissible diseases can occur via needlesticks contaminated with an infected patient's blood and contact with the patient's blood via the eye, nose, or mouth (Kebede & Gerensea, 2018). HCWs with NSIs are under serious hazards that can predispose them to various infections, including hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), and other diseases.

Nurses play an integral role as clinical service providers with significant responsibility for patient care. As a result, they are predisposed to a greater risk of NSI exposure while providing patient care (Kebede & Gerensea, 2018; Berhan *et al.*, 2021). It was prevalent among nurses because they administered most injections and were responsible for procedures

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requiring needles. Literature has also identified several socio-demographic factors associated with NSIs, including age, gender, working experience, and ward discipline. Nurses who are young and in the early phases of their careers are more at risk for NSIs due to a lack of experience in practical procedures. Fadhli *et al.* (2018) revealed a significant association between NSIs and age group, with younger and junior nurses more likely to experience NSIs (p-value < 0.001). A systematic review and meta-analysis study found that being young and male nurses are significantly associated with NSI (Hassanipour *et al.*, 2021). Furthermore, Goel *et al.*, (2017) stated that male HCWs were more likely to encounter NSIs than females. However, a study conducted in Iran revealed contrasting results in which female HCWs, particularly nurses, sustained higher NSIs than male HCW (Joukar *et al.*, 2018). Yet, most of the respondents in these two studies were female, thus likely contributing to the high prevalence of NSI.

Most cases occur mainly in the ward setting (58.7%) (Fadhli *et al.*, 2018). A study showed that medical and surgical wards were the two most common wards where NSIs occurred (Gita & Rao, 2017). The high incidence of NSIs in these wards could be attributed to the increased frequency of using a needle for clinical care among the nurses there. Joukar *et al.* (2018) stated that more than half of the participants had experienced injuries with sharp instruments, and some of them had experienced NSI incidences more than once. NSIs commonly occur during morning shifts (Akhuleh *et al.*, 2019). In addition, the actions of recapping a needle, transporting needles to be disposed of, drawing blood, or administering injections have been listed as the mechanisms leading to NSIs (Fadhli *et al.*, 2018; Ishak, Haque, & Sadhra, S., 2019). A study conducted in Ethiopia also showed a significant association between NSI and the recapping of needles (Getie, Wondmieneh, & Tesfaw, 2020). Therefore, the correct practice must be emphasized whereby staff nurses dispose of needles or sharp devices in sharps bins instantly after use. In addition, it is recommended for healthcare personnel use a hands-free technique when turning over sharp objects during the procedure to prevent NSI (Akhuleh *et al.*, 2019).

Despite the common occurrence of NSI in the healthcare setting, there are a limited number of local studies on NSIs among staff nurses. Therefore, this study aimed to investigate the factors related to NSIs, specifically the relationship between the socio-demographic characteristics and the frequency and mechanism of NSIs among the staff nurses at a public hospital in Selangor, Malaysia.

METHODOLOGY

Study Design

This was a cross-sectional study.

Study Sample

This study included nurses from the Surgical, Medical, Orthopaedic, Paediatrics, Obstetrics and Gynaecology, Otolaryngology, Ophthalmology, and Nephrology departments in a public hospital in Selangor. Inclusion criteria were Malaysian nurses in grade U29 with a nursing diploma. The respondents were selected through convenient sampling. Those who needed to perform night shifts and those from the emergency department, operation theatre, dental surgery, intensive care unit, cardiology ward, cardiothoracic surgery ward, rehabilitation medicine unit, and day-care clinics were excluded due to the different management of needles and sharp instruments. Nurses on a long leave of absence, such as confinement leave, were also excluded.

Sample Size

The sample size was 310 after calculation with Cochran's formula and considering a 10% dropout rate.

Data Instrument

The questionnaire was divided into three parts. Firstly, Part A included personal and occupational information, namely age, gender, ward discipline, and work experience. Part B captured data on the frequency of NSIs as either never or > 1 and the working shift when the NSIs happened. This part of the question was adapted from Ebrahimi & Khosravi (2007) and Joukar *et al.*, (2018). Part C consisted of questions about the mechanism of NSIs, as adopted from Rampal *et al.*, (2010). These three parts were conducted to assess the factors influencing NSI.

Validity and Reliability

Two experts reviewed the questionnaire in a quantitative study and sent it to two clinical nurse managers for validity confirmation. Moreover, the content validity was checked. The results of the Scale level Content Validity Index (S-CVI) were deemed excellent as they were 1 for both S-CVI/Ave (Average) and S-CVI/UA (Universal Agreement) (Shi, Mo, & Sun, 2012).

The questionnaire was pre-tested among 10% of the 310 staff nurses for the reliability test. These participants were excluded from the actual study. The findings from the pre-test were analysed to obtain the values of Kappa. Test-retest was conducted. The values of Kappa for item frequency of NSIs, shift during NSIs, and mechanism of NSIs were 0.795, 0.651, and 0.626, respectively, all of which constituted as substantial agreement (Altman 1991).

Data Collection

The data was collected between April and July 2020 via face-to-face questionnaire distribution. The researcher obtained permission from the nursing sisters in the wards before distributing the questionnaires to the ward staff nurses.

Data Analysis

The data were analyzed using Statistical Analysis Package for Social Sciences (SPSS for Windows version 22.0). Descriptive statistics and inferential analysis of Point-biserial correlation were performed. A p-value of 0.05 was considered statistically significant.

Ethical Approval

The study obtained ethical approval from Medical Research Ethics Committee (MREC) on 20th February 2020 [NMRR-19-3536-52283 (IIR)]. The consent was obtained from the participants before the distribution of the questionnaire.

RESULTS

The total number of respondents was 233 and the mean age was 33.0 + 6.75 years old. The majority of the respondents were female (97.4%, n= 227). In addition, the mean working experience of the respondents was 9.5 ± 6.34 years (Table 1).

Table 1: Socio-Demography of the Respondents (N=233)

Characteristics	Frequency (n)	Percentage (%)	Mean	Standard Deviation
Age			33.0	6.75
Gender				
Male	6	2.6		
Female	227	97.4		
Working Experience			9.49	6.34
Ward Discipline				
General Medicine	41	17.6		
General Surgery	34	14.6		
Paediatrics	24	10.3		
Obstetrics & Gynaecology	33	14.2		
Orthopaedic	39	16.7		
Otolaryngology	11	4.7		
Ophthalmology	18	7.7		
Nephrology	33	14.2		

Three-quarters of the respondents (76.4%, n= 178) never experienced NSIs in their careers. Only 55 (23.6%) of respondents had experienced NSIs before. Out of those, 29 of them (12.4%) experienced NSIs during the morning shift as compared to 26 (11.2%) during the afternoon shift (Table 2).

Table 2: Frequency and Time of Needlestick Injuries

Questions	**Never**	**≥ 1**	**Morning shift**	**Afternoon shift**
	n (%)	**n (%)**	**n (%)**	**n (%)**
1) How frequently do you get needlestick injuries within your working years?	178 (76.4)	55 (23.6)		
2) What shift are you in during the needlestick injuries?			29 (12.4)	26 (11.2)

The mechanism that resulted in most NSIs was recapping needles (6.9%, n= 16), followed by injuries during passing/ transferring needle or sharp devices (5.2%, n= 12), and injection (4.7%, n= 11). Only one respondent was injured during suturing (0.4%, n= 1).

Table 3 shows the association between socio-demographic characteristics and the frequency of NSIs among staff nurses.

Table 3: Association between Socio-Demographic Characteristics and Frequency of Needlestick Injuries among Staff Nurses (N=233)

Characteristics	**Frequency of Needlestick Injuries**			
	Correlation (r)	***Never***	***≥ 1***	***p-value***
Age	-0.090			0.169[a]
Gender				
Male		2 (33.3)	4 (66.7)	***0.012[b]**
Female		176 (77.5)	51 (22.5)	
Working Experience	-0.116			0.078[a]
Ward discipline				
General Medicine		30 (73.2)	11 (26.8)	0.897[b]
General Surgery		27 (79.4)	7 (20.6)	
Paediatrics		19 (79.2)	5 (20.8)	
Obstetrics & Gynaecology		26 (78.8)	7 (21.2)	
Orthopaedic		31 (79.5)	8 (20.5)	
Otolaryngology		7 (63.6)	4 (36.4)	
Ophthalmology		12 (66.7)	6 (33.3)	
Nephrology		26 (78.8)	7 (21.2)	

a. Point-Biserial Correlation
b. Pearson Chi-Square
**P ≤ 0.05 considered as statistically significant*

Only gender was significantly associated with the frequency of NSIs (p= 0.012). Furthermore, age, gender, working experience, and ward discipline were all not related to the timing of NSIs among 55 of the respondents who experienced NSIs (Table 4).

Table 4: Association between Socio-Demographic Characteristics and Shift Happened of Needlestick Injuries Among Staff Nurses (N=55)

Characteristics	**Shift During Needlestick Injuries**			
	Correlation (r)	**Morning**	**Afternoon**	
Age	-0.014			0.919[a]
Gender				
Male		3 (75.0)	1 (25.0)	0.354[b]
Female		26 (51.0)	25 (49.0)	
Working experience	-0.010			0.942[a]
Ward Discipline				
General Medicine		6 (54.5)	5 (45.5)	0.063[b]
General Surgery		2 (28.6)	5 (71.4)	
Paediatrics		3 (60.0)	2 (40.0)	
Obstetrics & Gynaecology		4 (57.1)	3 (42.9)	
Orthopaedic		5 (62.5)	3 (37.5)	
Otolaryngology		4 (100.0)	0	
Ophthalmology		0	6 (100.0)	
Nephrology		5(71.4)	2 (28.6)	

a. Point-Biserial Correlation
b. Pearson Chi-Square
**P ≤ 0.05 considered as statistically significant*

There was a significant relationship between gender and the occurrence of NSIs (p= 0.012). In this study, female nurses were more likely to experience NSIs (Table 5).

Table 5: Association Between Socio-Demographic Characteristics and Needlestick Injuries Among Staff Nurses (N=233)

Characteristics	**Previous experience of needlestick injuries**			
	Correlation (r)	**Yes**	**No**	***P* value**
Age	-0.090			0.169[a]
Gender				
Male		4 (66.7)	2 (33.3)	***0.012[b]**
Female		51 (22.5)	176 (77.5)	
Working Experience	-0.116			0.078[a]

Ward Discipline				
General Medicine		11 (26.8)	30 (73.2)	0.897[b]
General Surgery		7 (20.6)	27 (79.4)	
Paediatrics		5 (20.8)	19 (79.2)	
Obstetrics & Gynaecology		7 (21.2)	26 (78.8)	
Orthopaedic		8 (20.5)	31 (79.5)	
Otolaryngology		4 (36.4)	7 (63.6)	
Ophthalmology		6 (33.3)	12 (66.7)	
Nephrology		7 (21.2)	26 (78.8)	

In addition, older female nurses working in the general medicine ward had a higher likelihood of sustaining NSIs due to the recapping of needles (Table 6).

Table 6: Association Between Socio-Demographic Characteristics and Mechanism of Needlestick Injuries (Recap) Among Staff Nurses (N=55)

Characteristics	**Injured when Recapping Needles**			
	Correlation (r)	**Yes**	**No**	***p*-value**
Age	-0.271			***0.046[a]**
Gender				
Male		4 (100.0)	0	***0.001[b]**
Female		12 (23.5)	39 (76.5)	
Working Experience	-0.257			0.058[a]
Ward Discipline				
General Medicine		3 (27.3)	8 (72.7)	***0.018[b]**
General Surgery		4 (57.1)	3 (42.9)	
Paediatrics		0	5 (100.0)	
Obstetrics & Gynaecology		3 (42.9)	4 (57.1)	
Orthopaedic		0	8 (100.0)	
Otolaryngology		0	4 (100.0)	
Ophthalmology		1 (16.7)	5 (83.3)	
Nephrology		5 (71.4)	2 (28.6)	

DISCUSSION

Based on this study, the incidence rate of NSI was low compared to studies from Ethiopia and Iran (34.5%) and (100%), respectively (Kebede & Gerensea, 2018; Akhuleh *et al.*, 2019). Nevertheless, NSIs among nurses in hospitals still warrant the attention of healthcare managers. The majority of participants in this study were female. It was not surprising because a WHO report showed that 75% of the healthcare workforce worldwide was dominated by women (2008). Thus, females are the backbone and main contributors to the healthcare sector.

In this study, male nurses showed a significant association with NSI. It was supported by a local study that found male HCWs were significantly associated with an increased frequency of NSIs (Ishak, Haque, & Sadhra, 2019). Similarly, a study in Ethiopia also revealed that male HCW were ten times more likely to encounter NSIs (Dilie, Amare, & Gualu, 2017). One of the reasons could be that female nurses are usually more alert in terms of safety precautions as compared to male nurses who might be inclined to complete the tasks quickly, thus side-lining the necessary precautions in handling needles or sharp. However, a survey of Iranian indicated that NSIs were higher in women than men (Joukar *et al.*, 2018). Nevertheless, it is essential to note that very few male nurses worked in these countries, thus possibly leading to the lack of significant difference in the NSIs between gender.

In terms of the workplace, the highest rate of NSIs was reported in the general medicine department. Similarly, a study conducted in Iran reported a higher incidence of NSIs in the general medicine ward than others (Tabatabaei *et al*., 2016). The general medicine ward is among the busiest wards in any hospital. Patients with multiple ailments such as respiratory problems and infections are admitted to the general medicine ward. Heavy workload and stressful working environment can increase the risk of NSIs among HCWs (D'Ettorre, 2017). Apart from that, HCWs in the orthopaedic, surgical, obstetrics and gynaecology, and nephrology departments were also at a high risk of NSIs (Akyol & Kargin, 2016; Nagandla *et al.*, 2015). Frequent exposure to needle-related procedures is possibly the reason behind the elevated risk of NSIs.

In this study, a higher rate of NSIs occurred during the morning shift. This was consistent with Alfulayw, Al-Otaibi, & Alqahtani, (2021). A high workload of nurses can increase the risk of performance errors, including NSIs. Presumably, a higher rate of NSIs during the morning shift could be attributed to the heavier workload. The nurses can be busy and in a rush due to the number of tasks and medical procedures such as receiving newly admitted patients, turnover of patients after discharge, transferring patients for surgery or investigations, completing documentation and paperwork, and assisting doctors in performing procedures (Akhuleh *et al.*, 2019; Alfulayw, Al-Otaibi, & Alqahtani, 2021).

In the literature, gender, age, and ward discipline were significantly associated with the habit of recapping needles among HCWs. Saadeh *et al*. (2020) reported the same finding as this study, whereby male HCWs were more likely to get NSIs from recapping needles. A survey conducted locally also revealed that male nurses have less experience handling sharps than female nurses. However, it did not result in any significant differences in the rate of NSIs (Ishak, Haque, & Sadhra, 2019).

In terms of age, younger nurses in this study were more at risk of getting NSIs due to recapping the needle than their senior counterparts. This finding was parallel with a study in Ethiopia in which nurses with less than five years of work experience showed a higher risk of NSIs (Assen *et al.*, 2020). Junior nurses at the beginning of their careers have less working experience but are expected to undertake a greater proportion of routine nursing tasks that involve sharps and needles such as giving injections and setting branulas. Kuppusamy, Suchi, & Dioso, (2018) also emphasized that junior nurses were more exposed to NSIs as they are required to perform more one-on-one patient care. Furthermore, a lack of work experience can lead to poor practice, such as recapping the needle, resulting in a higher rate of NSIs among young nurses (Bazie, 2020).

NSIs resulting from the recapping of needles are also significantly higher in ward disciplines involving needle-related procedures. In this study, the Nephrology ward recorded the highest incidence of NSIs due to the recapping of needles. The nurses dealt with many needles and sharps when handling the dialysis procedure. This was concurred by a study in Iraq that reported the highest incidence of NSIs in the wards that commonly used needles in daily practice (Ali, Majeed, & Huwiezy, 2020).

CONCLUSION

In summary, this study highlighted the risk factors associated with NSIs among the nurses. Several factors, including male, younger age, working in a department that frequently dealt with needles, and the habit of recapping needles are linked with a higher rate of NSIs. The findings can be disseminated to the nurses to increase their awareness when dealing with needles or sharps at work. Furthermore, nursing managers must conduct regular training to educate the HCWs on NSIs prevention.

Limitation of Study

This study has several limitations. Firstly, the number of respondents from each department was not equal. Secondly, the researcher encountered difficulty entering the ward for data collection during the COVID-19 pandemic, especially during Movement Controlled Order (MCO). Therefore, the researcher only managed to obtain a response rate of 82%. Due to the scarcity of NSI- relevant studies in Malaysia, a comparison cannot be made in the local setting. In view of this, more studies need to be conducted on this issue in the future. Thirdly, the sampling procedure was convenient, and it is recommended for future studies in this field to be conducted using a random sampling to enable a valid inference.

Conflict Interest

The authors have no conflict of interest for this study.

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