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Knowledge, Attitude, and Practices towards Needle-stick Injuries among Nurses in a Public Hospital, Malaysia

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Abstract
Needle-stick injuries (NSI) pose a significant occupational hazard for nurses worldwide. With appropriate knowledge, attitudes, and practices (KAP), the occurrence of NSI can be minimized. This study aimed to assess the KAP of Malaysian public hospital nurses towards NSI. A cross-sectional study was conducted involving 208 nurses who completed self-administered questionnaires measuring NSI KAP. Results showed that most nurses had good knowledge, attitudes, and practices towards NSI. The study recommends NSI education, including handwashing, post-prophylaxis, and safe work practices, to increase KAP and reduce NSI incidence among Malaysian public hospital nurses.

Keywords: knowledge, attitude and practices; needle stick injury; nurses

1.0 Introduction
Needle Stick Injury (NSI) is defined as a cut or wound caused by a needle such as a hypodermic needle, collection needle, intravenous style, or needles used to connect parts of the IV delivery system, accidentally tearing/puncturing the skin that might result in exposure to contaminated blood and body fluids (Cutlip, 2000). NSIs occur commonly in Health Care Workers (HCWs) settings when contaminated needles with blood or bodily secretions are accidentally used, which can lead to blood-borne pathogens (BBPs) infections such as Human Immunodeficiency virus (HIV), Hepatitis B virus (HBV) and Hepatitis C virus (HCV), posing a serious concern to HCWs, especially nurses (Ibekwe & Adam, 2014; Sharew et al., 2017).

Nurses are at very high risk of occupational hazards and injuries during their daily activities in the healthcare environment compared to other HCWs (Memish et al., 2015). According to the World Health Organization (WHO) Report for Needle stick and Sharp Object Injuries in 2014, the total number of NSI cases estimated 40.8% of acute injuries were to nurses (*EPINet Report for Needlestick and Sharp Object Injuries*, 2014). This is because the nurses are at high risk of exposure due to contaminated body fluids of infected patients that they attend to in their daily routine (Rohde et al., 2013).

Nurses with better knowledge, attitude, and practices (KAP) about NSI can minimize the number of NSI cases (Madhavan et al., 2019). However, HCWs with strong KAP, such as nurses, were exposed to NSI, whereas those with only high practice scores were not (Bhargava et al., 2013). Nonetheless, there is research indicating that nurses have a high level of KAP, and the occurrence of NSI remains high (Dafaalla, 2016). As a result, the researchers are interested in conducting a cross-sectional study to determine nurses' KAP levels of NSI in the workplace.

2.0 Literature Review

The Occupational Safety and Health Administration (OSHA) says that 5.6 million nurses and other healthcare workers around the world could be exposed to BBP at work (Occupational Safety & Health Administration, 2015). According to a previous study, nurses are the highest-risk HCWs, accounting for up to 50% of all NSIs worldwide (Jahangiri et al., 2016). In Malaysia, there was a reported incidence rate of 6.0 NSI cases per 1000 HCWs, including nurses, in 2016 (Ishak et al., 2019).

The nursing profession is extremely vulnerable to NSI hazards and accidents while performing daily tasks in a hospital setting (Xujun et al., 2015). According to NSI worldwide, nurses contribute the most to NSI incidence statistics in health facilities (Berhan et al., 2021; Dafaalla, 2016). For example, studies on HCWs in Indonesia from 2014 to 2017 revealed that nurses had the highest incidence of NSI incidents (Yunihastuti et al., 2020). In Malaysia, on the other hand, doctors, particularly houseman officers, have the largest number of NSI-recorded cases (Fadhli et al., 2018; Ishak et al., 2019). Nonetheless, the prevalence of NSI cases among nurses in Malaysia is considerably higher at 27.9%, which is higher than Australia's 17.7% (Guest et al., 2014; Rampal et al., 2010).

Knowledge is a conscious or intuitive understanding of something, such as information, talents, or descriptions, gained via study or experience (Ghulam Gilanie, 2022). Since they were diploma students, nurses have been exposed to NSI-related knowledge, such as preventing NSI in the workplace (Hayati & Zainuddin, 2020). Perhaps this is why there are fewer NSIs involving nurses in Malaysia than houseman officers: nurses consistently apply their knowledge of NSI prevention to their usual work practices (Ishak et al., 2019). Besides that, a previous study found that nurses who knew more about NSIs reported more of them than other HCWs (Syakirah et al., 2018).

Cherry (2021) defines an attitude as "a mixture of a person's behaviors toward various issues". This suggests knowledge alone is insufficient without a positive attitude. Some studies, for example, have shown that nurses have a positive attitude because they were concerned about BBP infection due to NSI and performed antiseptic wound washing, incident reporting, and prophylactic drug therapy (Khraisat et al., 2015; Rampal et al., 2010). Furthermore, previous research (Bibi, 2021) has shown that nurses' knowledge of NSI is crucial and has a substantial impact on their practice in preventing NSI occurrences at workplaces (p-value =0.001). This is because the study discovered that nurses who do not acknowledge NSI also practice badly. Yet, according to a previous study, nurses have a more positive attitude and better practices regarding NSI than healthcare providers (Madhavan et al., 2019).

3.0 Methodology

3.1 Design and sample

From May to August 2022, a quantitative cross-sectional study was conducted among nurses at a public hospital in Kuala Lumpur, Malaysia. The population for the study was defined as a nurse who worked in a medical ward, (non-probability sampling was conducted via convenience sampling), was willing to participate as a respondent, and had more than three months of working experience. Researchers excluded top management (such as the matron and sister) and nurses who work during office hours since they were not more involved with needle users. Rao soft Inc.'s sample size calculator estimated a minimum representative sample of 208 nurses, with a 5% error margin, a 95% confidence level, and a 50% response distribution, based on a total of 450 nurses

3.2 Research tool, data collection and data analysis

This study uses a Dafaalla (2016) KAP NSI self-administration questionnaire. The researchers also constructed a questionnaire about nurses' NSI practices based on government hospital policies, NSI guidelines (*Guideline on Occupational Exposure*, 2019), and previous literature (Alsabaani et al., 2022; Bazie, 2020; Dafaalla, 2016). Pilot research results: KAP Cronbach alpha was 0.802 (prior study 0.7) and Practices was 0.813. Bloom's cut-off approach was used to measure nurses' KAP levels, which are good at 80% or higher and moderate at 60%–79%. Under 60% is low (Chand et al., 2022). Besides that, three experts—occupational health doctor, safety and health officer, occupational health nurse—validated the content. All data were collected and analyzed using Statistical Package for Social Science (SPSS, version 27.0). Descriptive statistics were used to analyze socio-demographic data and KAP NSI, while Chi-Square or Fisher's Test methods and Kruskal-Wallis or One-way ANOVA were used to determine the association between the respondents' socio-demographic and KAP.

3.3 Ethical Consideration

The Ethical Approval was gained from the institutional ethics committee (500-FSK-PT.23/4), Medical Research and Ethics Committee (MREC) – NMRR ID-22-00827-URK (IIR), Hospital Directors' (HKL/HCRC/AK-02-02) and the respondents' consent.

4.0 Results

4.1 Socio-demographic data

Table 1 shows the socio-demographics of the 208 participants. The majority of nurses were female (n=172, 82.7%), under 30 (n=138, 66.3%), had more than five years of work experience (n=105, 50.5%), had a diploma (n=192, 92.3%), have completed hepatitis B (n=201, 96.6%), knew hospital policies/guidelines (n=204, 98.1%), received most of their NSI knowledge from the hospital (n=113, 54.3%), had attended NSI-related courses (n=133, 63.9%), and always wore gloves when handling needles (n=138, 66.4%). A week uses 7-140 needles with a median (IQR) of 50.00 (76). Finally, 5.3% (n=11) got NSI last year.

Table 1: Socio-demographic of the participants (n=208)

Variables	n (%)
Age	
Below 30 years	138 (66.3)
Above 30 years	70 (33.7)
Gender	
Male	36 (17.3)
Female	172 (82.7)
Experiences	
Below five years	103 (49.5)
Above five years	105 (50.5)
Education level	
Diploma	192 (92.3)
Post-basic	16 (7.7)
Hepatitis B vaccination status	
Not completely/Not vaccination	7 (3.4)
Fully vaccinated	201 (96.6)
Know Policy Hospital/Guideline NSI	
No	4 (1.9)
Yes	204 (98.1)
Primary sources of information NSI	
College/university	22 (10.6)
Hospital	113 (54.3)
Mass media/electronic media	2 (1.0)
CME/CNE/Course	71 (34.1)
Attend courses related to Guideline and Policy Hospital	
No	75 (36.1)
Yes	133 (63.9)
Always wear gloves when handling needles at workplaces	
Rarely	3 (1.4)
Sometimes	22 (10.6)
Most of the time	45 (21.6)
Always	138 (66.4)
Use needles per week, min-max 7-140	**50.00 (76)
Frequency of contaminated NSI per year	
Never	197 (94.7)
One and more	11 (5.3)

Note: **Median (IQR)

4.2 Level of KAP toward NSI among nurses

Table 2 shows nurses' KAP levels. The majority of nurses (n=174, 83.7%) possessed high levels of knowledge, while 15.8% (n=33) possessed medium levels of knowledge and 0.5% (n=1) possessed low levels of knowledge. Attitude indicates that 81.2% (n=169) of nurses have a positive attitude, 18.2% (n=37) have a moderate attitude, and 1% (n=2) have a negative attitude. While the majority of nurses have good practices (n = 180, 86.5%), 17.8% have medium practices (n = 37), and only 4 have poor practices (2.0%).

Table 2: Level of KAP among Nurses toward NSI (n=208)

Variables	Level, n (%)		
	Low	Medium	High
Knowledge	1 (0.5)	33 (15.8)	174 (83.7)
Attitude	2 (1.0)	37 (17.8)	169 (81.2)
Practices	4 (2.0)	24 (11.5)	180 (86.5)

4.3 Association between Socio-demographic and KAP Level

Table 3 reveals a significant association between medical ward nurses' level of knowledge and their socio-demographics. Socio-demographic data (excluding Hepatitis B vaccination status, CME/CNE/Course attended, and glove use) have no significant association with knowledge level. Table 3 also reveals a significant association between medical ward nurses' level of attitude and their socio-demographics. Almost all socio-demographic data have no significant association with attitude level. Next there is a significant

association between medical ward nurses' level of Practice and their socio-demographics. All socio-demographic (excluding ages) data have no significant association with practice level.

Table 3: Association between socio-demographic and KAP level (n=208)

Variables	Knowledge			p-value	Attitude			p-value	Practices			p-value
	Poor	Moderate	Good		Poor	Moderate	Good		Poor	Moderate	Good	
Age				0.388[a]				0.618[a]				*0.006*
<30years	1 (0.7)	25 (18.1)	112 (81.2)		2 (1.4)	23 (16.7)	113 (81.9)		2 (1.5)	22 (16.0)	114 (82.6)	
>30years	-	8 (11.4)	62 (88.6)		-	14 (20.0)	56 (80.0)		2 (2.9)	2 (2.9)	66 (94.2)	
Gender				0.682[a]				0.419[a]				>0.995[a]
Male	-	7 (19.4)	29 (80.6)		1 (2.8)	6 (16.6)	29 (80.6)		-	4 (11.1)	32 (88.9)	
Female	1 (0.6)	26 (15.1)	145 (84.3)		1 (0.6)	31 (18.0)	140 (81.4)		4 (2.3)	20 (11.6)	148 (86.1)	
Experiences				0.705[a]				0.097[a]				0.217[a]
<5 years	1 (1.0)	15 (14.5)	87 (84.5)		1 (1.0)	13 (12.6)	89 (86.4)		2 (2.0)	16 (15.5)	85 (82.5)	
>5 five years	-	18 (17.1)	87 (82.9)		1 (1.0)	24 (22.8)	80 (76.2)		2 (1.9)	8 (7.6)	95 (90.5)	
Education level				<0.995[a]				0.113[a]				0.349[a]
Diploma	1 (0.5)	31 (16.2)	160 (83.3)		2 (1.1)	31 (16.1)	159 (82.8)		3 (1.5)	23 (12.0)	166 (86.5)	
Post-basic	-	2 (12.5)	14 (87.5)		-	6 (37.5)	10 (62.5)		1 (6.3)	1 (6.3)	14 (87.4)	
Hepatitis B vaccination				*0.009[a]*				0.086[a]				>0.995[a]
Uncompleted/Not vaccination	1 (14.3)	2 (28.6)	4 (57.1)		1 (14.3)	1 (14.3)	5 (71.4)		-	-	7 (100)	
Fully vaccinated	-	31 (15.4)	170 (84.6)		1 (0.5)	36 (17.9)	164 (81.6)		4 (2.0)	24 (11.9)	173 (86.1)	
Know Policy/SOP				0.513[a]				0.567[a]				>0.995[a]
No	-	1 (25.0)	3 (75.0)		-	1 (25.0)	3 (75.0)		-	-	4 (100)	
Yes	1 (0.5)	32 (15.7)	171 (83.8)		2 (1.0)	36 (17.6)	166 (81.4)		4 (1.9)	24 (11.8)	176 (86.3)	
Sources NSI				0.476[a]				0.434[a]				0.371[a]
College/university	-	3 (13.6)	19 (86.4)		1 (4.5)	2 (9.1)	19 (86.4)		-	3 (13.6)	19 (86.4)	
Hospital	-	17 (15.0)	96 (85.0)		1 (0.9)	20 (17.7)	92 (81.4)		4 (3.5)	16 (14.2)	93 (82.3)	
Media /electronic	-	1 (50.0)	1 (50.0)		-	-	2 (100)		-	-	2 (100)	
CME/CNE/Course	1 (1.4)	12 (16.9)	58 (81.7)		-	15 (21.1)	56 (78.9)		-	5 (7.0)	66 (93.0)	
Attend courses				*0.009[a]*				0.204[a]				0.103[a]
No	-	19 (25.3)	56 (74.7)		2 (2.6)	14 (18.7)	59 (78.7)		-	12 (16.0)	63 (84.0)	
Yes	1 (0.8)	14 (10.5)	118 (88.7)		-	23 (17.3)	110 (82.7)		4 (3.0)	12 (9.0)	117 (88.0)	
Wear gloves				*0.024[a]*				0.699[a]				0.169[a]
Rarely	-	1 (33.3)	2 (66.7)		-	-	3 (100)		-	-	3 (100)	
Sometimes	-	6 (27.3)	16 (72.7)		-	6 (27.3)	16 (72.7)		-	2 (9.1)	20 (90.9)	
Most of the time	1 (2.2)	2 (4.5)	42 (93.3)		-	9 (20.0)	36 (80.0)		-	1 (2.2)	44 (97.8)	
Always	-	24 (17.4)	114 (82.6)		2 (1.5)	22 (15.9)	114 (82.6)		4 (2.9)	21 (15.2)	113 (81.9)	
Use needles/per week min-max: 7-140	-	*50.00 (90)	*50.00 (75)	0.307[b]	*10.00 (0)	*50.00 (80)	*50.00 (75)	0.086[b]	**26.50 (7.23)	**72.13 (39.07)	**53.15 (38.64)	0.063[c]
NSI per year				0.705[a]				0.480[a]				0.493[a]
Never	1 (0.5)	31 (15.7)	165 (83.8)		2 (1.0)	24 (17.3)	161 (81.7)		4 (2.0)	24 (12.2)	169 (85.8)	
One and more	-	2 (18.2)	9 (81.8)		-	3 (27.3)	8 (72.7)		-	-	11 (100)	

Notes: *Median (IQR), **Mean (SD), Fisher Test[a], Kruskal Wallis[b], one-way ANOVA[c] and Statistically significant (p<0.05)

5.0 Discussion

5.1 Socio-demographic

This study reported that the 208 nurses working in the public hospital, Malaysia had high levels of knowledge, high levels of practice, and a positive attitude. This study backs up what the previous study found: nurses are better HCWs than other HCWs in terms of their KAP (Al-Khalidi & Nasir, 2022; Yunihastuti et al., 2020). The study indicated NSI case experience was lower (5.3%), compared to 34.5% in northeast Ethiopia (Berhan et al., 2021) and 33.3% in Jordan (Yunihastuti et al., 2020). In addition, most respondents are female nurses who are under 30 years old and have fewer than five years of work experience. Contrary to Yunihastuti et al., (2020) report, young and inexperienced nurses do not cause NSI. However, eight NSI-affected nurses have fewer than five years of experience. This study supports Bazie, (2020) result that HCWs with less than five years of experience, including nurses, are 2.76 times more likely to get NSI. Next, the majority of nurses reported NSI incidents to supervisors and knew the NSI hospital policy (SOP), although only 63.9% had attended NSI and information resource courses through hospitals and CME/CNE courses. This contradicts the NSI cases in Malaysia in 2016 which found that HCWs lack the knowledge and training to reporting NSI cases (Ishak et al., 2019). Researchers believe nurses don't report NSIs due to their extensive workload, low-risk perception, and fear of consequences (Jahangiri et al., 2016; Nagandla et al., 2015). Next, most respondents had a complete Hepatitis B vaccine to prevent blood-borne diseases. This study outperforms the previous study, which reported that 71.3% of nurses had Hepatitis B immunization and 82.2% wore gloves when handling sharp tools (Ozdelikara, 2012).

5.2 Knowledge of NSI
In terms of immediate hand washing and post-exposure prophylaxis (PEP), this study is better than the previous study (Dafaalla, 2016). However, the study found that nurses are confused between washing their hands with water alone, soap, and antiseptic, which contradicts the guideline recommendations (*Guideline on Occupational Exposure*, 2019). Handwashing with soap and water reduced bacteria by 8%, whereas water alone reduced it by 23% (Burton et al., 2011). If soap and water are unavailable, antiseptic is recommended (*Guideline on Occupational Exposure*, 2019). Next, NSI knowledge was found in junior female nurses under 30 years of age with less than 5 years of experience. Similar to Bhargava et al., (2013), 88 female nurses with the same factors had good knowledge compared to other HCWs. Last but not least, although most nurses know the risk of BBP infection, attend courses from hospitals, and know the policy and SOP, only 53.8% know about PEP. Similarly, a study reported that HCWs, including nurses, know the hospital policy and have taken training without learning about PEP (Berhan et al., 2021).

5.3 Attitude toward NSI
The study found young female nurses under 30 years old with fewer than five years of experience had a positive attitude toward NSI. This study had the same variables as the previous study (Hamzah & Mahmood, 2017), where HCWs, including nurses, have a positive attitude toward NSI. The study also indicated that young female nurses are positive, especially those who are fully immunized against Hepatitis B, have college or university knowledge, use gloves (from rarely to always), and are never affected by NSI. This is because nurses learn how to handle sharp instruments and follow NSI universal precautions as part of their training, which gives them a good attitude and a high level of practice (Hayati & Zainuddin, 2020). Next, post-basic nurses had a lower attitude than diploma nurses but were knowledgeable about NSI. This study indicated that HCWs, particularly nurses with less education, had more positive attitudes toward NSI events than their colleagues (Bekele et al., 2015). Last but not least, nurses who take NSI courses and know the hospital policy and NSI SOP have a positive attitude toward NSI. The researcher's findings are consistent with Berhan et al., (2021) reported that nurses who do not receive NSI training at work are more than four times more likely to be affected by NSI because they lack a positive attitude toward universal NSI precautions.

5.4 Practices toward NSI
The survey found that 86.5% of respondents have good practices, which is similar to what the NSI found about UKM Medical Center House Officers (Azman et al., 2020). Next, NSI preventive practices including hepatitis B vaccination and wearing gloves when handling needles at work, showed no significant differences. Despite Hepatitis B vaccination or glove use, their practice level is high. In contrast, Al-Khalidi & Nasir, (2022) reported that HCWs had a good practical score of just 61.5%, with 58.1% wearing double gloves and 33.8% getting Hepatitis B vaccinations. The researchers also found that nurses who had taken the course and were familiar with hospital policy and NSI SOP had good practices. This differs from a previous study that found that NSI-affected nurses had low practice despite having 93.80% knowledge from attending NSI training workshops before the incident [36]. Last but not least, the study found that nurses who have experienced NSI have high practices, whereas those who have not have high knowledge and attitudes. However, more than half of the affected NSI nurses only washed their hands with water, while the remaining ones followed the Malaysian Ministry of Health's advice and washed their hands with soap (*Guideline on Occupational Exposure*, 2019). Besides that, NSI prevention must be improved because only 54.55% of nurses use gloves, 90.91% are injured carelessly, and 27.27% still recapping needles. Previous research has found that recapping needles causes many NSIs (Bazie, 2020). Meanwhile, not wearing gloves can increase the risk of BBP, especially Hepatitis B, which can infect 30% of its hosts and survive in dry blood for seven days (Bezerra et al., 2022).

5.5 Association KAP with demographic
The study found NSI knowledge level was only strongly associated with hepatitis B vaccination status, CME/CNE/course attendance, and glove use (p > 0.05). The researcher's survey found that 66.3% of responders are under 30 years old and 49.5% have fewer than 5 years of work experience, demonstrating the nursing division's junior nurse course's success. Moreover, the nurses who were not trained in occupational health safety, such as NSI prevention in the workplace, were 14.5 times more likely to sustain an NSI than those who were trained (Nawafleh et al., 2017). The study also found a strong association between nurses' age and NSI practice, where senior nurses (94.3%) outperformed juniors (82.6%). This study supports the findings of horsemanship officers in Malaysia are more likely to get NSI than experienced nurses because they lack sharp-handling (Azman et al., 2020; Ishak et al., 2019).

6.0 Conclusion and Recommendation
Nurses who have never been affected by NSI have a more knowledgeable and positive attitude related to NSI than nurses who have been. This is because they have received sufficient training and education during their diploma program, making them more skilled and cautious when handling sharp tools in the workplace. Besides that, senior female nurses above 30 years old with more than 5 years of experience and a diploma have a higher level of attitude and practice compared to junior female nurses. Next, even though they have the same level of practice and a good attitude, nurses who constantly and mostly use gloves have excellent knowledge. Hence, NSI-related training must be enhanced because nurses who attended were able to improve their level of knowledge on NSI. The primary focus should be on the necessity for post-exposure prophylaxis, hand washing after NSI with soap or antiseptic wash, and blood sampling for hepatitis C within six weeks for nurses at risk of contracting the disease. In addition, emphasis should be placed on workplace practices such as being cautious when on duty, using gloves while handling needles, and not recapping needles.
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Paper Contribution to Related Field of Study

Previous studies have been limited in their ability to determine if there is an association between KAP levels and demographic data related to needle-stick injuries (NSI) incidents among nurses (Madhavan et al., 2019). While many KAP studies have sought such associations, the present study stands out for its ability to show a strong association between KAP levels and demographic data (Azman et al., 2020; Syakirah et al., 2018). This study is also unique in its focus on Malaysia, where the nursing profession plays a significant role in the healthcare system. Additionally, this study assesses nurses' compliance with government-recommended hospital policies (*Guideline on Occupational Exposure*, 2019), which could help improve NSI standard operating procedures (SOP) implementation. Recommendations for improving the situation include developing improvements based on the study's findings, expanding or comparing KAP studies to all healthcare workers, and focusing on houseman officers, who are responsible for many NSI incidents in hospitals. Although self-administered questionnaires have limitations, such as reliance on participants' honesty and potential biases, this cross-sectional study still provides significant insights into the KAP levels of Malaysian public hospital nurses regarding NSI. These insights have important implications for policy and practice, emphasizing the need for ongoing education and training to improve KAP levels among nurses and prevent NSI incidents. Overall, this study contributes to the growing body of research on NSI prevention and underscores the importance of addressing KAP among healthcare workers.

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